Environmental Protection and Management: A Need for Oil Spill Survey

SURV. NWAKUCHE, EMEKA E.
Department of Physics, University of Lagos, Akoka - Yaba, Lagos.

AN ABSTRACT

The problem of oil pollution in various land, marine and estuarine environments has received considerable scientific attention with respect to the rates and effects of petroleum spills, as well as inherent toxicities to the specific biological and physical ecosystem components and individual species. It is most certain that the incidence of oil spills resulting from tanker traffic, offshore and onshore drilling and associated activities will increase in the years to come as the world's demand for petroleum and petroleum products continues to be on the rise.

Drift is a large scale phenomena and is a measure of the movement of the centre of mass of an oil slick. Drift is primarily controlled by wind, waves and surface currents and is independent of the spreading and spill volume. Drift is also strongly influenced by tidal currents.

This paper seeks to detail how to improve the management of basic resources (e.g., oil) and the rehabilitation of environmental conditions through the involvement of surveyors.

Numerous government agencies have specific functions and activities related to environmental protection and management. Assembling the environmental components from these agencies requires detailed survey of the environment. The surveyor's details in terms of plans, maps, photographs and database provide a strong centralized control.

The surveyor have four major functions in the control of oil pollution: evaluation which involves prospective investigation of the polluted area; research which involves adopting standards through mathematical model, monitoring which involves the impact assessment and information exchange with other professionals.

INTRODUCTION

Attitude to environmental management throughout the world leaves much to be desired. They are generally apathetic, often pointless, sometime thoughtless. Everything has become dirtier, but I suppose it's the price we pay for progress. Often, pollution has been the price which leads to environment degradation; forest dwindle, farmlands erode, deserts encroach, rivers silt, flooding increases, fisheries disappear. There is ample evidence everywhere both visible and documentary of the deterioration of terrestrial and marine resources. Planners and administrators in all systems of government are deluged with a baffling array of advice on environmental problems. Lack of realistic corrective and preventive measures is apparent because the efforts to overcome them are frustrated by misguided national priorities and the imprisonment of professional expertise.

The word pollution implies specifically that a natural or man made occurrence is harmful to the human environment of plant and life with which man is in sympathy with. Pollution is a primary consideration in environmental management programmes and it has an important role to play in checking environmental degradation. Pollution control relates to measures to minimize air, water, land, noise, visual and other pollution and the disposal of solid and liquid waste.

“Environmental management” does not mean “management of the environment”, it does mean management of activities within environmentally tolerable limits (Jack Beale). It is possible to accelerate development within environmental limits that are tolerable. This involves the use of conventional strategy for pollution control which includes mapping (spill survey) as the basic framework for a multi-disciplinary and multi-agency approach.

THE OIL SPILL

Oil spill may be defined as the flowing oil that emerge at the surface, but more commonly the exudations are sluggish and the oil may be seen as iridescent films on water.

Oil spills come in various sizes and they are found in diverse locations - open sea, narrow estuaries, sheltered calm waters (ports and harbours), rivers, creeks, swamps, and onshore. Observation and calculation has shown that when the spill spreads to the sea, they often threaten the coastline, littoral zone or bird population, fisheries, etc. Movement of oil slicks is affected by waves, and currents and the intrusion of physical obstacles such as jetties or rocks further complicates the circumstances. Oil movement is also affected by tides and winds and oil may be expected to travel in the direction of the prevailing wind at a velocity of approximately 3.3 % of wind speed. The thickness of the resulting slick is mainly a function of time for which the oil is allowed to remain on the surface.

TYPES OF OIL SPILL

There are four main types of oil to be considered:
(i) Crude oils which spread on contact with water
(ii) Crude oils which have weathered on the sea
(iii) Water – in – oil emulsions
(iv) Waxy oils which tend to coagulate into lumps on contact with the sea.

QUANTITY OF SPLIT OIL

The quantity of oil involved in a pollution incident is also of importance in deciding what remedial measures should be undertaken. Methods of treatment which are relevant for spills of thousands of tons of oil, for example, could be completely inappropriate for dealing with one or two tons of oil, and vice versa.
It is difficult to estimate the amount of oil which has been split from the appearance and dimensions of the resulting slick. Table 1 relates the appearance of oil to their thickness and to the total quantity of oil per unit area of film.

### Table 1: APPEARANCE OF OIL FILMS ON WATER

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Films Thickness (10^{-3} mm)</th>
<th>Quantity Of Oil For Film 1</th>
<th>(litres)</th>
<th>(tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barely visible under most favourable light conditions</td>
<td>0.005</td>
<td>50</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>Visible as silvery sheen on water surface</td>
<td>0.100</td>
<td>100</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>First traces of colour observable</td>
<td>0.150</td>
<td>150</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>Bright bands of colour</td>
<td>0.300</td>
<td>300</td>
<td>0.24</td>
<td></td>
</tr>
<tr>
<td>Colours begin to turn dull</td>
<td>1.000</td>
<td>1000</td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>Mark darker colours</td>
<td>2.000</td>
<td>2000</td>
<td>1.60</td>
<td></td>
</tr>
</tbody>
</table>

Below are the major functions of surveyors in the control of oil pollution.

1. **FIELD INVESTIGATION**: This involves the individual assessment of the impacted area and the collection of data thereof for a background report. The background report involves collection, collation and evaluation of relevant existing information — (topographic maps, tidal observations) to determine the rate of oil drift and its predictable extent and the readily available data on the national and cultural environments. This background report will assist in the identification of constraints in the delineation of the impacted area and the evaluation potential pollution problems. See Table 2 below.

### Table 2: POTENTIAL POLLUTION PROBLEMS

(Format for preliminary survey)

<table>
<thead>
<tr>
<th>Name (industry, or project, or system, or action, etc)</th>
<th>Information required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pollutant</td>
<td>Type</td>
</tr>
<tr>
<td>Liquid effluents</td>
<td></td>
</tr>
<tr>
<td>Gaseous or particulate emissions</td>
<td></td>
</tr>
<tr>
<td>Solid Wastes</td>
<td></td>
</tr>
<tr>
<td>Noise</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3: RESEARCH AND MODELLING:

Comparison of old spills and performances against regulatory standards with proposals satisfying existing regulations being presumed environmentally sound. With the introduction of geographic information system and / or the land information system, compliance with standards can easily be assessed from the automated system.

- maps can be keyed directly to regulations, thereby providing a clear rational for evaluation
- Trade — off between environmental variables are well shown
- Dealing with numerous overlay maps of specific parameters is easy in both computation and representation.

2. **MONITORING THE SPILL**

This involves

(a) **ENVIRONMENTAL IMPACT STATEMENTS**: This is a technique for compiling and assessing the multi-disciplinary information needed to weigh the likely impact on its surroundings by a particular spillage. The multi-disciplinary information will include the characteristics and conditions of the environment as it is being affected by the pollution. Such information include

(i) **EARTH**: landform, unique features, productive quality of soils, erosion of soils, dereliction and deposition of land, flooding and wetlands.

(ii) **WATER**: (marine conditions) — quality of surface water as affected by the pollution, extent of the pollution on the estuarine, eutrophication.

(iii) **FLORA**: The effect on trees, shrubs, herbs, grass, crops, aquatic plants including phytoplankton, endangered species and forest.

(iv) **FAUNA**: land animals, including reptiles.

(v) The ecosystem structure and its effect on the functions and synergistic effects.

(vi) Monuments, historical or archaeological events and human habitat.

(b) **THRESHOLD ANALYSIS**: This is a quantitative adjunct to background reports or certain aspects of environmental impact statements and a very valuable precursor of compensation payable to the owners of the impacted area. This is based on the Polluter Pays Principle.

(i) From threshold analyses, the EIS can be tested in the real world, so that potentially erroneous planning conclusions are avoided and the impacted area assessed and the actual compensation payable determined.

(ii) It recognizes the inter-relationship of environmental components, and need to specify ‘land systems’ as the basis for classifying environmental zones of similar geology, vegetation, climate, landform and also by physical and biological processes such as susceptibility to erosion, sedimentation or deposition. Environmental consequences can be predicted with reasonable accuracy within the mapped units.
Preparing and interpreting the data could be easily done without abstract technological skills.

Creation of a series of integrated spill records. This provides a complete picture of the spillage which can be challenged and perfected.

Various strategies can be tested which is impossible in real life without committing resources.

Time is compressed in the evaluation and quantisation of the impacted area.

Prediction of the anticipated area of coverage through tidal analysis is easily done.

4. INFORMATION EXCHANGE:

An environmental programme that is based solely on pollution control treats the symptoms of environmental degradation without curing the disease. However, oil spill control programme must be coordinated with surveyors resources management maps, and the survey maps in this regard becomes an educational tool for other professionals who would otherwise be unable to visualize all major and minor side effects and interactions over lengthy periods. The surveyors and other interest groups are able to interact in the educational context. See interaction table 3.

Table 3: INTERACTION TABLE FOR ENVIRONMENTAL IMPACT STUDY

<table>
<thead>
<tr>
<th>Characteristics and conditions of the environment</th>
<th>Proposed activities which may cause temporary environmental impact</th>
<th>Proposed activities which may cause permanent environmental impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability of occurrence of activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project: Location: (Indicate alternative being considered)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Courtesy: Beale G. Jack – The manager and the Environment

Basically, from the interaction table, the various actions which cause environmental impact are listed on the horizontal axis of the table and the characteristics and conditions of the environment are listed on the vertical axis.

A number of approaches to the format are possible and it is anticipated that experience in the preparation of environmental impact statements will provide a format in agreement with environmental impact policy objectives. It is intended that the format should remain flexible and that the nature and scope to the project, the associated environmental conditions, and the possible adverse effects will dictate the methodology and format used.

CONCLUSION:

The aim of environmental management is to ensure intelligent management of the environment. Within the United Nations Environmental Programme, there is practical and realistic belief in the ability of man to solve his environmental problem and protect his environment, while at the same time achieving a sustainable level of development that will not damage the finite resources of the earth. Sustainable development is about balance and integration.
of economic, social and environmental aspect of everything we do and balancing short – term wants with long – term needs. The central proposition in this paper is that SPILL SURVEY (MAPS) is a key element in the environmental management process. It is a technical structure which must be used to implement pollution control and environmental strategies.

REFERENCES


European Model Code on Safe Practice for dealing with oil spills at sea and onshore (1975), Applied Science Publisher Ltd., London.


