

STATE OF ENVIRONMENT IN INDIA:AN ANALYTICAL STUDY WITH REFERENCE TO MARINE POLLUTION

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ABSTRACT

This overview of marine pollution follows the methodology as proposed below. Firstly, well-known databases (*Science Direct, GeoRef, SpringerLINK, etc.*) on technological research were studied. All collected references were divided into 27 sections following the key words associated with marine pollution, oil spills, alien species migration, etc. The most commercially promising research and development (R & D) activities seem to be market-oriented sections: detection of oil spills at sea, containment and recovery of floating oil at sea, detection of oil spills on land, disposal of oil and debris on land, alien species migration prevention from ballast water and underwater hull cleaning in water, NO_x and SO_x emissions, pollutions from ship-building and repair, and biogeochemical modelling. Great market demands for commercially patented innovations are very attractive for initiating new R & D projects.

Key words: oil spills, modelling, MARPOL, IMO, alien species migration Received 01 December 2007, accepted 03 January 2008

Introduction

Today the world and particularly Europe are concerned with the pollution of marine environments, which result in instant and long-term damages to coastal and marine habitats and ecosystems. Unfortunately, various recent disasters (e. g., in Alaska), alongside all other current sources of pollutions, have proven that the current means of struggle are inefficient. It is thus increasingly urgent to develop new solutions for fighting pollution by combining actors' skills from the maritime field. Worldwide seas and oceans are under threat where recent accidental oil spills, such as the ERIKA tragedy or the IEVOLI SUN accidents, have jeopardized the marine environment, causing both immediate and long-term damage to coastal and marine habitats and ecosystems. The last tragedy in Alaska (December 2004) demonstrates the permanence of such phenomena.

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However, according to the report “The EU Fleet and Chronic Hydrocarbon Contamination of the Oceans”, dated November 2004, chronic hydrocarbon contamination from washing-out tanks and dumping bilge water and other oily waste represents a danger at least three times greater than that posed by oil slicks that result from oil tanker accidents. Every year around 3,000 cases of illegal hydrocarbon dumping are detected in European waters. The amount of hydrocarbons received by European waters each year has been estimated to be 109,000 tons, 62% of them (around 90,000 tons) being small spillages of less than 20 tons.

In addition, land-based activities (industry, agriculture) and ‘run-offs’ from land are major sources of coastal water pollution. Other issues which are equally or even more dangerous than oil pollution also threaten the marine world, for example, alien species migration, NO_x and SO_x emissions, hydrocarbons in ballast water, biocides, pollution from ship-building, pollution from ship repair, pollution from ship scrapping, and noise pollution that affects sea mammals.

Oil spills in Marine environment

Detection of oil spills

Different methods are available to detect oil spills, including both airborne and space-borne techniques (e. g., Synthetic Aperture Radar (SAR) (Keramitsoglou et al., 2006; Martinez and Moreno, 1996), Radarsat ((Marghany, 2004), European Remote Sensing Satellite (ERS) (Gade and Alpers, 1999), etc.) following from regional services, but a global observing/monitoring system has not yet been developed.

The SAR system analyses satellite images and detects a dark image shape which could be an oil spill (Keramitsoglou et al., 2006). The difference between oil spills, present as a film with reduced roughness on the sea surface, and the surrounding water can be detected on SAR images. The RADARSAT data are used to model the current movement and easy detection of an oil spill area (Marghany, 2004). The RADARSAT model, for instance, contains texture algorithms for automatic oil slick detection and can be used for oil slick trajectory forecast. The ERS is used to acquire SAR images and to detect of oil spills, for instance, in the southern Baltic Sea, the North Sea, and the Gulf of Lion in the Mediterranean Sea (Gade and Alpers, 1999). Analysis of SAR images has shown that the seas are most heavily polluted along the main shipping routes and that oil spill depends on wind speeds.

Oil spill detection techniques are well developed, but some additional research could be carried out to improve the existing systems (Brekke, Solberg, 2005).

Modelling of oil spills

This requires knowledge and computerized modelling systems (e. g., for the prediction of drifting oil spills (Jorda et al., 2007) or of tides (Young et al., 2000), but their level of both validation by governments and usage by oil spill responders remains pretty low. There are a great variety of oil spill models (James, 2002) and many of them have a low level of accuracy in making predictions; therefore, previous to new research, it is recommended that one should carry out a study and evaluation (including validation) of existing models and then use the results to propose a new study.

THE DOCTRINE OF FREEDOM OF THE HIGH SEAS AND THE PRINCIPLE OF MARINE POLLUTION

The doctrine of the freedom of the high seas is a typical example of Eurocentric law. It was devised and developed at a particular period of history to serve the needs the interests of the rich and powerful Industrial States of Western Europe and United States of America, it has been aptly remarked by Senator Metcalfe of the U.S.A that “under the freedom of the seas doctrine there is not much equity, between developed and under-developed coastal nations” and “a less developed nations is a second class citizen”. In the U.N. Seabed Committee, the representative of Kenya pointed out in 1970 the developed countries with less than one-third of the world’s population, had taken 60% of the world catch of the fish while only 40% had gone to the developing countries². In the name of the freedom of the High seas the developed maritime countries have been using high seas for activities such as naval military operations, dumping radio active water and oil wastes, testing nuclear weapons and sending submarines equipped with nuclear missiles near the coasts of other States. The freedom of the Seas was always interpreted by the technologically advanced and powerful military States as giving them a right to move across the wide open seas to threaten smaller States or to subjugate and colonize other people.

BACKGROUND

Although marine pollution has a long history, significant international laws to counter it were not enacted until the twentieth century. Marine pollution was a concern during several United Nations Conventions on the Law of the Seabeginning in the 1950s. Most scientists believed that the oceans were so vast that they had unlimited ability to dilute, and thus render pollution harmless.

In the late 1950s and early 1960s, there were several controversies about dumping radioactive waste off the coasts of the United States by companies licensed by the Atomic Energy Commission, into the Irish Sea from

² U.N. Document, A/AC 138/SC, II S.R. 29 March, 1976 P.6

the British reprocessing facility at Windscale, and into the Mediterranean Sea by the French Commissariat à l'Energie Atomique. After the Mediterranean Sea controversy, for example, Jacques Cousteau became a worldwide figure in the campaign to stop marine pollution. Marine pollution made further international headlines after the 1967 crash of the oil tanker Torrey Canyon, and after the 1969 Santa Barbara oil spill off the coast of California.

Marine pollution was a major area of discussion during the 1972 United Nations Conference on the Human Environment, held in Stockholm. That year also saw the signing of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, sometimes called the London Convention. The London Convention did not ban marine pollution, but it established black and gray lists for substances to be banned (black) or regulated by national authorities (gray).³

REASON AND OBJECTS OF THE ENVIRONMENT (PROTECTION) ACT, 1986.

The global concern for Environmental Protection to tackle the various kinds of pollution problem has been felt all over the world, more so because of the growing threat of pollution, loss of vegetation, biodiversity, excessive concentration of chemical uses in the atmosphere, in food chains, growing risk of environmental accidents and threats to life support systems call for the world communities resolve to protect and enhance environmental quality, which means quality of life accelerated the need for holding the first U N conference on the Human Environment held in Stockholm in the first week of June 1972. This conference attended by more than 100 countries called for taking urgent measures to contain the malady of Environmental degradation without encroaching upon the jurisdiction over natural resources of the neighboring countries resulting in Transboundary pollution posing a threat to the people of other countries.

JUDICIAL APPROACH(Case study)

Puducherry Environment ... vs The Union Of India This writ petition has been filed as a Public Interest Litigation. In the instant writ petition, a notification dated 14.03.2017 bearing reference S.O.804(E) made by the Union of India (hereinafter referred to as 'UOI' for brevity) has been assailed. Bare minimum facts essential for understanding and appreciating this order are set out infra under the caption 'Facts in a nutshell'.

Indian Council for Enviro-Legal Action and others Vs. Union of India.⁴ **S. Nandakumar Vs. Secretary** to Government of Tamil Nadu and others [W.P.Nos.10641 to 10643 of 2009, etc., dated 22.4.2010] (Madras High Court); public hearing.

³ Hamblin, Jacob Darwin (2008). *Poison in the Well: Radioactive Waste in the Oceans at the Dawn of the Nuclear Age*. Rutgers University Press. ISBN 978-0-8135-4220-1.

⁴ [(1996) 3 SCC 212]

Indian Council For Enviro-Legal ... vs Union Of India (Uoi) And Ors. on 29 August, 1997⁵

In the year 1991 the Government of India decided to liberalise the policy for the development of power Sector in India. Electricity (Supply) Act. 1948 was amended by the Electricity Laws (Amendment) Act of 1991 to enable private parties to establish, operate and maintain generating stations. A scheme was formulated by Government of India on 22nd October, 1991 to encourage the private enterprises to take part in power generation, supply and distribution which was published in the Gazette of India, The said scheme provided that the Generating company can enter into a contract for the sale of electricity generated by it with the State Electricity Board in any State where it owns/operates generating station/stations or in any other State it is carrying on its activities or with any other person with the consent of the competent Government concerned.

Ms Cox India Ltd vs M P Pollution Control Board on 9 May, 2013⁶

The natural identity of an individual should be treated to be absolutely essential to his being. What nature gives is natural. That is called nature within. Thus, that part of the personality of a person has to be respected and not despised or looked down upon. The said inherent nature and the associated natural impulses in that regard are to be accepted. Non-acceptance of it by any societal norm or notion and punishment by law on some obsolete idea and idealism affects the kernel of the identity of an individual. Destruction of individual identity would tantamount to crushing of intrinsic dignity that cumulatively encapsulates the values of privacy, choice, freedom of speech and other expressions.

S. Jagannath vs Union Of India & Ors on 11 December, 1996⁷

Shrimp (Prawn Culture Industry is taking roots in India. Since long the fishermen in Indian have been following the traditional rice/shrimp rotating aquaculture system. Rice is grown during part of the year and shrimp and other fish species are cultured during the rest of the year. However, during the last decade the traditional system which, apart from producing rice, produced 140 kgs. of shrimp per hectare of land began to give way to more intensive methods of shrimp culture which could produce thousands of kilograms per hectare. A large number of private companies and multi-national corporations have started investing in

⁵ ILR 1997 KAR 2956

⁶ The national green tribunal, central zonal bench, bhopal
application no. 10/2013 (p.b.76/2012 thc)

⁷ S. Jagannath vs Union Of India & Ors on 11 December, 1996 Author: K Singh, Bench: Kuldip Singh, S. Saghir Ahmad.

shrimp farms. In the last few years more than eighty thousand hectares of land have been converted to shrimp farming.

Oil containment and recovery

World producers offer a broad selection of containment and pumping equipment (booms, skimmers, sorbents, etc). IMO and ISO cooperated to develop guidelines for evaluating the performance of such recovery systems. Many difficulties are encountered by oil spill responders in order to obtain a good efficiency level from this type of equipment. The general opinion of experts involved in the response operations is that the traditional booms are useful to contain or concentrate the oil in ports, bays and other sheltered waters or in calm seas, but in the open sea, the level of efficiency is very low. Innovative booms combined with some kinds of collecting devices were used during the “PRESTIGE” oil response operations. Therefore, it is suggested to continue the research on these types of boom / skimmers (Oebhius, 1999; Mullin, Champ, 2003). Similar comments on efficiency are applicable to the use of traditional skimmers in open seas or in calm waters for which reason the present tendency is to develop other types of oil recovery equipment such as the catamaran or trimaran mentioned in the Oil Sea Harvester (OSH) project (OSH, 2007), or skimmer vessels in general.

Disposal of oil and debris

In some cases, oil and debris can be placed in a landfill. Governments strictly regulate the disposal of such materials. Landfill, land farming and similar methods have important environmental implications and its practice is less and less used, so research should focus mainly on recycling (oil), incineration or on finding oil spill debris clean-up methods, e. g., thermal desorption (Araruna et al., 2004).

Control of hydrocarbons in ballast water

The existing technology requires samples to be tested in a laboratory; and need real time decisions. Since the entry into force of Annex I of MARPOL Convention in 1983, equipment (oil content meters, oil water separators, interface detectors, etc.) has been developed and improved so that at present research should be focused on the design of new and more reliable devices based on the new IT systems.

Biocides

New biocides could be introduced if they are registered. A need for an affordable registration system that enables new innovative ideas (from small companies) to be tested / used also exists. The existing legislation inhibits all new biocide introductions because of registration cost, and biocides that already exist are under threat.

Pollution from shipbuilding and from ship repair

Pollution of water, land and air mainly from coating activities, including VOC emissions, needs a uniform implementation of regulations. Some software systems are available for VOC management, but not for other activities, to enable prompt and accurate real-time reporting. Waste disposal of removed antifouling paints from ships is a matter of important priority for further research.

Pollution from ship scrapping

There are many different issues in the subject of pollution from ship scrapping, mainly related to the containment of waste, classification of hazardous materials and identification of materials. A Green Passport has been introduced for new ships, but 90,000 ships afloat do not have such registration. The system requires the collecting of data over time, so that one can be issued with a Passport retrospectively. As above, the waste disposal of scrapped materials having antifouling paints from ships is another matter of important priority for research.

The model complexity considerably increases the number of poorly known biological parameters, and the degrees of freedom in the model cannot be constrained by the available data. A common result of much data assimilation studies performed so far with various marine ecosystem models is that while none of the models are able to fit the observations within their uncertainty range, all models contain parameters (degrees of freedom) that cannot be constrained by the available data. Often, it is not clear to what extent errors in the physical environment that forces the ecosystem model are responsible for the model–data misfits.

MARPOL, IMO Conventions

The MARPOL Convention is the main international convention covering the prevention of pollution of the marine environment by ships from operational or accidental causes.

There are a lot of various conventions focused on different areas of marine pollution, such as *Particularly Sensitive Sea Areas (PSSA)* (Larsen et al., 2007; Detjen, 2006), *International Convention for the Control and Management of Ships' Ballast Water and Sediments*, which have been criticized but are still appropriate tools for marine pollution control (Gollasch et al., 2007). MARPOL and other pollution-related conventions are more a question of the control of compliance through Port State and Flag State controls than a matter of research.

Classification societies

Classification societies are organisations that develop and apply technical standards to the design, construction and assessment of ships as well as carrying out survey work on ships. Flag states can authorise classification societies to make inspections and statutory certification of ships (EMSA, 2007). There are more than 50 organisations worldwide, which define their activities as providing marine classification, but only 13 classification societies are presently recognised by the European Union.

A stricter monitoring of classification societies is required. This is already done through the Council Directive 94/57/EC of 22 November 1994 *on common rules and standards for ship inspection and survey organizations and for the relevant activities of maritime administrations*. Attention should be focused on the improvement of low-cost methods and new solutions in social-political behaviour. In fact, this is rather a matter of monitoring the operation of Classification Societies than a re-search activity. In order to grant initial recognition to those classification societies wishing to be authorised to work on behalf of the EU Member States, compliance with the provisions of the Directive 94/57/EC must be assessed more effectively by the European Commission together with the Member States re-requesting the recognition.

Liability and compensation

Legislation must be urgently set in motion because this is the only action which severely penalises offenders and prevents the pollution of seas. There are no international instruments on liability and compensation for operational pollution that are regulated in the MARPOL Convention. The infractions are penalized under the National legislations.

Control of compliance and penalization of infractions related to land-based pollution is an internal competency of National Authorities in any case following the concerned EU Directives.

PREVENTION OF OIL SPILLS ON LAND

Prevention of oil spills on land is one of the possible measures to avoid oils being discharged from land-based sources into the marine environment.

Soil-water management at catchment and river basin scales requires identification of the relevant processes and the quantification of associated parameters, and the development of numerical models of the groundwater-soil-sediment-river system to identify adverse trends in soil functioning, water quantity and quality. The AquaTerra models will integrate the key bio-geochemical, climatic and hydrological processes over relevant scales in time and space. The AquaTerra integrates across multiple disciplines, from

geosciences, environmental engineering and chemistry to socio-economic sciences, from catchment to the regional scale with case studies located in major European river basins (Barth et al., 2007). The AquaTerra involves practitioners and end-users to elaborate operational tools for the different stakeholders, i. e. policy-makers, river basin managers, regional and urban land planners..

STATISTICAL ANALYSIS OF MARINE POLLUTION REFERENCES

Approximately one hundred special articles and presentations on research related to marine pollution have been found and divided into different sections. The figure presenting the general analysis shows the biggest percentage of references related to the behaviour and fate of oil spills at sea (15.7%), as well as 14.6% of ship scraping references (Figure). Fewer references were found regarding the behaviour and fate of oil spills on land, control of hydrocarbons in ballast water (9%), prevention of pollution from ballast water (7.9%), pollution from shipbuilding and repair (5.6%). Very few references were found related to liability and compensation (2.3%); only 1% of references concerned the following sections: the notification / reporting system, disposal of oil and debris, detection of oil spills on land, and modeling of oil spills at sea. This marine pollution overview provides an information on the sections of marine pollution that need to be researched more intensively and can therefore be useful while preparing proposals for the FP7 program.

CONCLUSION

In the context of environmental scenario in the country and the available environmental instruments, the issues including the concerns and gaps related to the sectors of environment and energy emerge significantly. Their analysis leads to specific action plans in the fields of standards for pollution control, implementation of the EIA notification, management of various kinds of wastes, promotion of green buildings and combating climate change. The vision extends to life cycle management in the entire gamut of development activities. Rooted in the Constitution of India, environmental protection is reflected in all the five year plans for economic development. Gradually, environmental governance has emerged as the key to sustainable development. Environmental management system in India is founded on environmental legislation, development of environmental standards and establishment of institutions and instruments for enforcement of law. However, varying interpretations by States and multiplicity of agencies proves to be an impediment in the implementation of environmental programmes.