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Publisher *Taylor & Francis*

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Chemistry and Ecology

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713455114>

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To cite this Article Gelabert, Pedro A. and Singh, Naresh C.(1992) 'Strategy for the Control of Land-Based Sources of Marine Pollution in the Wider Caribbean Region', *Chemistry and Ecology*, 7: 1, 117 – 121

To link to this Article: DOI: 10.1080/02757549208055435

URL: <http://dx.doi.org/10.1080/02757549208055435>

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STRATEGY FOR THE CONTROL OF LAND-BASED SOURCES OF MARINE POLLUTION IN THE WIDER CARIBBEAN REGION

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(Received 6 January, 1992)

The pollution of the marine environment caused by land-based sources threatens or impairs the health of the ecosystems and the value of human uses of the coastal waters. The Contracting Parties to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region agreed to take all appropriate measures to prevent, reduce and control pollution. In the first meeting of the Contracting Parties, the development of a protocol on the control of marine pollution from land-based sources was recommended as a measure to protect the marine environment.

A small group of experts from the Caribbean Region formulated a strategy for controlling land-based sources of marine pollution. Due to the diverse nature, resources and capabilities of the countries comprising the Region, the pollution control strategy suggested by the group of experts included the following techniques or their most appropriate combination: (1) pollution prevention measures, (2) effluent limitations, (3) water quality limitations, (4) environmental planning, and (5) best management practices. The desirable control strategy should be based on a system of discharge permits in the case of point source pollution, which includes effluent and water quality limitations. The technology based effluent limitations could be applied as a short-range strategy to control pollution from industrial and domestic point source discharges. The use of water quality standards could become part of a long-range strategy for controlling point sources. For nonpoint sources, it would be virtually impossible to develop effluent limitations. Thus, the implementation of best management practices and effective environmental planning would be the most reasonable control strategy for non-point sources. However, pollution prevention measures could consist of a "black list" of substances that should be completely banned, and a "grey list" for those that should be strictly limited. These lists should be adopted or appropriately modified for the conditions of the Wider Caribbean Region.

The development of control based on the water quality of the receiving body of water involves the collection and analysis of effluent and ambient data to develop water quality based permit limits and to assess compliance with these permits. Finally, any marine pollution control strategy developed by the countries of the Region should be mutually agreed upon and implemented within a period of ten years from the ratification of a protocol on land-based sources of marine pollution.

INTRODUCTION

The pollution of the marine environment caused by land-based sources throughout the world threatens or impairs the health of the ecosystems and the value of human uses of the coastal waters. In 1983 the Contracting Parties to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, also known as the Cartagena Convention, agreed to take all appropriate measures to prevent, reduce and control pollution. In the first meeting of the Contracting Parties, the development of a protocol on the control of marine pollution from land-based sources was recommended as a measure to protect the marine environment of the Wider Caribbean Region.

Using the 1985 UNEP Montreal Guidelines on Land-Based Sources of Marine Pollution (UNEP, 1985) and protocols from other regional seas programmes, a small group of experts from the Caribbean Region met in 1989 under the auspices of the Man and Biosphere Program (MAB) and formulated a strategy for controlling land-based sources of marine pollution (US MAB, 1990). In the Caribbean, sources of land-based pollution include sewage and industrial discharges, and non-point sources consisting of dispersed substances such as pesticides, fertilizers, hazardous wastes and sediments.

The participants divided their work plan into the following four major sections:

1. inventory of land-based sources of marine pollution;
2. impact of land-based sources of marine pollution;
3. development of tropical water quality criteria and effluent standards, and
4. recommended marine pollution control strategy.

INVENTORY OF LAND-BASED SOURCES

In order to control or mitigate the nature and level of marine pollution, it is essential that the pollutants be identified. This identification must involve a knowledge of the types and sources of the pollutants, their volumes, concentrations and paths.

The sources of marine pollution in the Caribbean Region are both point and non-point sources (UNEP/ECLAC, 1984). The point sources were subdivided into industrial wastewaters, sewage discharges, storm sewers and other discharge conduits (UNEP/CEP, 1989). The industrial discharges comprised: (1) petroleum refineries and petrochemical plants (Battelle, 1979), (2) sugar mills and rum distilleries (Mood, 1977), (3) breweries, soft-drink plants and canneries (UNEP/ECLAC, 1984), (4) abattoirs and meat canneries, (5) tanneries (UNEP/CEP, 1989), (6) metal and electroplating plants (GESAMP, 1990), (7) textile dyeing industries (UNEP/ECLAC, 1984), (8) edible-oil production plants (Archer, 1984), (9) cooling or scale-removal activities at electric power plants (Escobar *et al.*, 1985), and (10) banana washing and packing activities (Archer, 1984). The sewage discharges into the marine environment are generally *via* pipelines in specific locations and sizes to cope with peak flows from contributing residential, commercial and industrial facilities (Archer, 1984). The use of small size pipelines discharging raw sewage or effluents from small package treatment plants into the near shore is a common source of pollution (Norman, 1986). Storm sewers and conduits also discharge black and grey waters to the shoreline.

Non-point sources are numerous and arise from a wide variety of activities, such as: (1) agriculture and forestry, (2) construction works, (3) urban run-off, (4) atmospheric fall-out, (5) groundwater seepage, (6) chemical and oil spills, (7) solid waste disposal and their leachates, (8) sub-surface disposal of sewage and other wastes, and (9) mining operations including sand and gravel pits (GESAMP, 1990).

The experts recommended that each country should prepare its own detailed inventory using a previously agreed standard format in order to store and retrieve compatible information at the regional level (US MAB, 1990).

IMPACT OF LAND-BASED SOURCES

Concerns related to land-based sources of marine pollution stems from their effects on the ecological, cultural and economic life of any country. From an ecological point of view, the effects of land-based pollution extend not only to the quality of the sea water, but beyond to the continued existence of coral reefs, seagrass beds, mangroves, beaches, fisheries and endangered species (Rodriguez, 1986). Tourism, recreational and commercial fishing, real estate developments, desalination plants and even cooling waters for industrial use require sea waters of certain healthful qualities. If land-based sources of pollution lessen these qualities, the economic conditions of the affected areas will also suffer degradation. If the economic activity of a small island is adversely affected, or its beaches become polluted and tourism declines, the economy of the island dries up, since these islands do not have the resources of the continental landmass.

MARINE POLLUTION CONTROL STRATEGY

Due to the diverse nature, resources and capabilities of the countries comprising the Wider Caribbean Region, the pollution control strategy suggested by the group of experts includes the following techniques or their most appropriate combination: (1) pollution prevention measures, (2) effluent limitations, (3) water quality limitations, (4) environmental planning, and (5) best management practices (US MAB, 1990). The group of experts selected this broad spectrum of approaches to provide the countries of the region with sufficient flexibility within their own limitations to derive a reasonable control strategy.

The desirable control strategy could be based on a system of discharge permits in the case of point sources, which includes effluent and/or water quality limitations. The technology-based effluent limitations could be applied as a short-range strategy to control pollution from industrial, commercial and residential point-source discharges. The use of water quality standards could become an integral part of a long-range strategy for controlling pollution from point sources.

For nonpoint sources, it would be virtually impossible to develop effluent limitations. Thus, the implementation of best management practices, environmental planning and preventive measures would be the most reasonable control strategy for nonpoint sources. However, pollution prevention would probably be the most effective control strategy to eliminate marine pollution in the region. Some pollution prevention measures could consist of a "black list" for those substances that should be completely banned from coastal discharges and a "grey list" for those substances that should be strictly limited. These lists must be adapted or appropriately modified for the conditions of the Wider Caribbean Region.

DEVELOPMENT OF TROPICAL WATER QUALITY STANDARDS

The development of water quality standards for each of the desired uses of the marine waters is the cornerstone of an ideal control strategy for land-based sources of marine pollution. Some of these uses include, but are not limited to, primary contact recreation, secondary contact recreation, shellfish growing, protection of marine ecosystems and propagation of marine life. Water quality standards will establish the

minimum physical, chemical and biological parameters that must be maintained to comply with the water quality criteria for the intended or designated use.

Tropical water quality standards must be developed because currently available water quality criteria for marine waters are based on tests performed with species from temperate zones. Marine waters of the Caribbean Sea and the Southern Part of the Gulf of Mexico differ significantly from marine waters in temperate zones, not only in temperature variations, but also by containing fewer nutrients, organic carbon and suspended particulates. Marine biota in tropical waters have different physiological requirements regarding temperature and salinity gradients than those in temperate waters. Temperate marine species used in existing procedures for bioassays may not be representative of tropical species' responses to similar testing. Cultures of tropical marine organisms should be developed to protect the communities of sensitive areas such as coral reefs and mangroves which are unique to tropical waters, and sea grasses which are important coastal habitats. The lack of site specific water quality standards may ultimately contribute to irreversible ecological damage, with corresponding adverse effects on sport fishing, tourism and human health.

CONCLUSION

The development of a control strategy based on the water quality of the receiving body of water involves the collection and analysis of effluents and ambient data to formulate water quality-based permit limits and assess compliance with these permits by periodically monitoring the discharges. Therefore, it might be an expensive proposition for some countries in the region. These countries could select from the suggested technologies an adequate control strategy for their particular conditions within their capabilities. Preventive measures can be taken and the adoption of black and grey lists of substances is appropriate as a short-range strategy. The United Nations Environmental Programme (UNEP) can develop tropical water quality criteria for adoption or use as a basis for the development of the countries' long-range water quality standards. Finally, the marine pollution control strategies developed by the nations of the region should be mutually agreed upon and implemented within a timeframe of approximately ten (10) years from the date of ratification of the Protocol on Land-Based Sources of Marine Pollution.

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