Contamination of the port area by hydrocarbons

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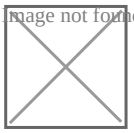

Rivers, since ancient times, have been the cause of contamination mainly by garbage produced by human activity, as well as by the dumping of foreign matter, such as microorganisms, chemical products, industrial waste, among others. The main factors that pollute the rivers are: dumping of residential garbage, sewage discharge (clandestine drains), car washes, residential, commercial, mineral and inorganic wastes, and chemical compounds due to bad practices of farmers who dump fertilizer containers and agricultural inputs into the river. We are currently experiencing an ecological crisis that is the sum of problems related to overpopulation, scarcity of resources and pollution. Part of this crisis varies depending on the development of the country, in several nations have implemented laws for the care and conservation of water, however, there are still places where companies and inhabitants are not educated enough to take care of water. In poor nations, water pollution is predominantly caused by animal and human waste, some pathogenic organisms present in waste and sediments from agricultural practices. Similarly, rich nations suffer from these problems, having a more developed lifestyle and extensive industry, creating large-scale polluting problems, including pesticides, the use of toxic metals, acids and other organic compounds. With the passage of time, these wastes produce more and more pollution, to the extent that it is possible that in the future the water in rivers and seas may no longer be useful. ¨Land-based sources of pollution.¨ About 70%-75% of global marine pollution is a product of human activities that take place on the surface of the land. Some 90% of pollutants are transported by rivers to the sea. On the other hand, between 70% and 80% of the world's population (approximately 3.6 billion people) is located on or near the coasts, especially in urban areas, where a significant part of the waste produced there is deposited directly into the ocean. As a result, many critical ecosystems, such as mangrove forests, coral reefs, coastal lagoons and other land-sea interface sites, have been altered beyond their capacity to recover. In turn, the modification of the course of rivers that drain into the sea and the alteration of the flow of water that drains into these rivers, due to the construction of dams, extraction of aggregates or channeling, have also affected marine ecosystems and associated environments. This is due to the reduction and/or increase of nutrients, sediments and pollutants, and their effects on water movement and circulation patterns. These alterations mainly affect estuaries, gulfs and other water bodies that have limited movement and renewal. En 1995, los Gobiernos adoptaron el Programa de Acción Mundial para la Protección del Medio Marino Frente a las Actividades Realizadas en Tierra PAM, que reconoce, en el manejo de la contaminación de las áreas costeras las “vinculaciones básicas entre los medios de agua dulce y marino, entre otras cosas cuando proceda, la aplicación de criterios de ordenación de cuencas hidrográficas”, (PNUMA, 1995). In 1995, governments adopted the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities GPA, which recognizes, in the management of pollution in coastal areas, the "basic linkages between freshwater and marine environments, including, where appropriate, the application of watershed management approaches" (UNEP, 1995). According to the definition given by the GESAMP Group, and adopted by the international community in the United Nations Convention on the Law of the Sea (Art.1 .4), "pollution of the marine environment means the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such harmful effects as damage to living resources and marine life, hazards to human health, impairment of maritime activities, including fishing and other legitimate uses of the sea, impairment of the quality of sea water for use and impairment of amenities" (United Nations, 1984). In this definition, watershed pollution is conceptually considered with the inclusion of "estuaries". This concept of marine pollution has been reformulated to include a wide range of factors of degradation of coastal strips and the marine environment, with Agenda 21 making the greatest contributions to include and differentiate land-based sources of marine pollution. These are all the

various point and non-point sources that contribute to marine pollution and pollutants that are transported by rivers, estuaries, canals and other watercourses, including seepage into the sea and from surface and subsurface flows as well as from submarine sewage outfalls. Land-based sources of pollution of coastal strips and the sea should occupy as prominent a position in environmental issues today as concerns about climate change. However, in practice this is not yet the case. Habitat alteration and destruction, effects on human health, eutrophication, reduction of fish populations and other living resources, changes in sediment flow, are aspects linked to fixed and diffuse sources of pollution produced by activities that take place on land and that, due to the water catchment effect of watersheds, generate concentrated effects at the mouths of rivers in the sea and the surrounding coastal areas. The most important case is the effect of pollutants at river mouths. Non-point sources of land-based pollution are known as "diffuse sources", generated by a wide range of human activities in which the pollutants produced by them, and contained in their discharges, have no obvious point of entry into receiving water bodies. The sources add up when they reach the rivers and everything ends up flowing into the seas at points of high concentration, even worse if they are closed bays or wide estuaries as is the case of the Bay of Havana. Las fuentes difusas más evidentes corresponden a la agricultura, por el uso de pesticidas e insecticidas, así como el aporte de residuos de insumos agrícolas y restos de vegetales y animales. The most evident diffuse sources correspond to agriculture, due to the use of pesticides and insecticides, as well as the contribution of residues of agricultural inputs and vegetable and animal remains. The main fixed sources of contamination are industrial plants, municipal waste and extraction, exploitation and construction sites such as excavations (agricultural exploitation, forestry, mining, etc.). Industrial wastes also contain high amounts of organic matter from food and beverage processing plants and from the leather and wood industry. Other activities increase sediment discharge such as mine tailings. Waste components are pathogenic microorganisms, nutrients and organic carbon and are combined with oils, greases and chemicals derived from industries, which enter domestic waste streams through sewage systems. Aquifers are often contaminated. Intensive forestry activities, especially plantations, are also a diffuse source of pollutants and, like agricultural activities, produce loads of nutrients, pesticides and sediments. The main effect of these activities is the increased mobilization of sediments and nutrients. Sedimentation. Eighty percent of the sediments transported by river flows are stored on beaches and shallow marine waters, and the remaining 20% reach them by the action of wind, volcanoes, etc. Changes in the flow of sediment to the sea, whether due to anthropogenic actions or natural causes, produce effects on coastal morphology, ecosystems and living resources, ranging from moderate to profound. Chronic sediment inputs greater than 10mg/cm2/day are considered "high". Erosion along coastal strips is one such change. Approximately 60% of the world's beaches have been eroded by a combined action of decreased sediment supply and sea level rise. Conversely, and according to prevailing marine currents, many coastal sectors are altered by high sedimentation, the main cause being the high rate of deforestation and unmanaged agriculture, or the use of unsuitable agricultural practices that cause erosion processes in river basins (Photo No.2 Sedimentation in rivers). Some rivers in the region transport significant sediment loads to the sea, which are deposited in the lower parts of the basins and in the coastal strips. In general, the influence of the river on the sea, as is obvious, is greatest when the flow is high and can be very localized when the discharge is small. In both cases, however, the encounter between freshwater and saltwater creates very special conditions for the reproduction of a number of living species. In these cases, suspended materials and pollutants carried by rivers tend to be deposited at the mouths where freshwater meets seawater and in other areas where circulation is impeded. Habitat alteration and ecosystem loss occur, especially wetland drying, mangrove forest alteration and reduction, sediment contamination, whose particles serve as organic binders for many pollutants. The marked decrease in sediment input from rivers to coastal areas translates into increased erosion of the coastal zone, increased overwash processes, changes in beach profiles, migration of barrier islands, and increased susceptibility to flooding. What impact do oil spills have on marine life and the environment? When a spill occurs in a marine area, it can have a huge impact on the surrounding ecosystem. The effect on local wildlife can be severe. The most serious impacts are: - Oil and its derivatives can poison organisms, causing damage to their skin, digestive system and internal organs. This can lead to respiratory and swimming problems, immune system disorders and death. - In the case of an oil spill, a layer of very opaque oil can be created on the surface

of the water, preventing light from reaching the depths and thus preventing plants below the water column from photosynthesizing and the entire ecosystem from dying. - Oil spills can have an impact on the food chain in an area, as they can disrupt the predatory relationships that many animals depend on for survival. - The effects of an oil spill, by having a lasting impact on the health of an ecosystem, impact the human food chains in the area. The fishing sector and local communities that live off the sea can be severely affected. For the above reasons, efforts must be made to clean up any spills quickly and effectively to minimize further damage. The oil film reduces the oxygen content of the water, which causes the death of plankton and fish, which in turn causes the death of the organisms that feed on them. It can also be considered that the hydrocarbons form an impermeable layer with the water that blocks the passage of sunlight used by phytoplankton to carry out the photosynthesis process, so the marine flora dies, and when these plants die, the consequences are that herbivorous fish migrate or die, that is, the first link in the trophic chain is broken. The main victims of oil spills are the local fauna and flora. Fish are poisoned by consuming prey containing crude oil and the entire trophic chain is affected and can even affect human beings. In addition, hydrocarbons destroy eggs or produce malformed offspring (See Photo No.1. Marine bird affected by oil spill). ¨The containment booms¨. Containment booms are the most commonly used system to contain an oil spill at sea. It is a large floating device used to contain spills of oil, hydrocarbons and other pollutants in waters and also on land. They are usually constructed of a durable material such as steel or corrosion resistant plastic and can be deployed individually or in advance of a potential spill risk as a passive safety (See Photo No.3. Containment boom). Regardless of the specific use, containment booms are essential equipment to protect marine ecosystems and human health whenever working in ports, ship repair facilities or storage and/or treatment of hydrocarbons and their derivatives, as well as in the case of works and works in areas close to the coast. Containment booms can be used to surround a vessel, restrict the spread of oil from one location and then collect the spilled fuel in the water, usually by means of special suction pumps or skimmer-type equipment. ¨Oil storage systems¨. Transporting or handling combustible substances can be dangerous, not only because of the risks to marine life if done at sea, but also because of the fact that they are highly combustible substances. It is very important to use safe and reliable tanks and cisterns for the transport of diesel oil and hydrocarbons. Hydrocarbon absorbers. Oil absorbents are a type of absorbent that can be used to treat spills of hydrocarbons, such as oils or fuels, on land. They absorb liquids very quickly and effectively, preventing leaks and spills from becoming a problem. Absorbent solutions for hydrocarbons are specially formulated to provide a high level of absorption and contain a number of surfactants and binders that help facilitate the absorption process. Therefore, in the case of handling hydrocarbons on land, it is necessary to have absorbents that can be used to collect the spill and block any further movement of the liquids and fuels until removal or clean-up can be initiated. ¨Controlled fire¨. The crude oil that accumulates on the surface of the sea is burned, using special confining booms. It is a simple option that can help remove large quantities of oil. However, the smoke it generates is toxic. Experts warn that this technique should be used when the weather is calm and the slick is far from the coast. It is the worst method, as it is the least reputable because it transforms marine pollution into atmospheric pollution, which has serious consequences if the toxic smoke is blown to nearby cities by the wind. In addition, it is not widely used because of the difficulty of controlling the flames without adequate monitoring of weather and infrastructure conditions.