Impacts of wastewater disposal on the marine environment

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The issues associated with wastewater disposal have become a major problem of the urban world due to increase in human population and urbanization**.** Wastewater effluents have historically been discharged through outfall in shallow coastal marine areas and is one of the major stresses impacting coastal ecosystems. Significant environmental, socio-economic, food quality and security, public health and aesthetic impacts may result from wastewater disposal in the marine environment. Wastewater coming into the sea can be municipal wastewater (treated or untreated sewage, rainwater), water from power stations, industrial effluents and agricultural runoff.

The potential effects of wastewater disposal on the receiving marine water quality are manifold and depend on: a) the volume, the composition and the condition of the discharge. Of great importance are: the temperature of the effluent, the organic content, the content of suspended solids, the nutrient (mainly nitrogen and phosphorous) content, the concentrations of various hazardous chemicals (trace metals, organochlorines, organic micropollutants), emerging compounds and pharmaceuticals, the content of microplastics and of possible pathogens (including bacteria, viruses and protozoa), b) the oceanological characteristics of the zone affected by the discharge and the characteristics of sediments and the vegetal and animal communities present. Of particular and primary interest is the study of the destination of pollutants in the sea, which should be revealed by the examination: of the capacity of the environment to degrade the substances discharged therein; of the mechanisms of accumulation and transfer the traces of non-biodegradable pollutants; of the processes of decay of the colibacteria (indicators of pollution of urban wastewaters); of the capacity for survival of pathogenic organisms (viruses, bacteria, etc.); of the specification and understanding of the processes that take place in the deeper layers; of the interaction between suspended particles and dissolved pollutants.

The main effects of wastewater disposal can be summarized as follows: 1) impacts on water quality (eutrophication, hypoxia, turbidity, elevated concentrations of pollutants); 2) loss of submerged aquatic vegetation; 3) impacts on fish and shellfish (bioaccumulation of toxic chemicals, disease and abnormalities, reproductive failure, mortality); 4) impacts on entire marine communities (changes in diversity and abundance, alteration of trophic interaction among species, declines in commecial fisheries); 5) closures of beaches and aquacultures because of microbial or chemical contamination; 6) accumulation of toxic pollutants in sediments.

Legislation, directives and water quality standards have been developed to limit problems associated with wastewater disposal, but in many cases these standards are not realized due to poor wastewater management. The poor management usually arises from the fact that waste-management decisions take place in complex situations governed by political, bureaucratic, and financial forces that often interfere with the implementation of existing regulations and standards.