

Chapter 2

Nutrients Pollution in Water Bodies: Related Legislation in Europe and the United States

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ABSTRACT

The pollution of water bodies by an excess of nutrients (N and P) is a worldwide problem with effects on the human health, ecosystems status, climate change, etc. To face with this important issue different regulations were promulgated by the countries, sometimes based on the results from international conventions and programmes. In this chapter, a review of the laws and regulations that affect the discharge of nitrogen and phosphorus is addressed, focused in the case of Europe and the United States. Finally, a brief explanation about international initiatives was performed to understand the global framework concerning nutrients pollution.

INTRODUCTION

The water resources are subjected to anthropogenic pressures derived from human activities (discharge of municipal and industrial wastewater, agriculture and farming, hydromorphological alterations, etc.). These activities are frequently responsible for the presence of an excess of nitrogen (N) and phosphorous (P) in natural environments provoking nutrient pollution of water bodies. This presence of large nutrients loads causes problems of eutrophication, reduction of biodiversity in aquatic ecosystems and deterioration of water quality. For these reasons in the last decades the problem of nutrients pollution has received much attention to avoid its potentially harmful effects and reduce nutrient losses to the aquatic environment.

The efforts to reduce nitrogen and phosphorus pollution have been focused not only on the development of treatment systems, to guarantee the adequate discharge of treated wastewater from industry and

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municipal activities, but also on the improvement of the agriculture practices, principally concerning the use of fertilizers. An efficient use of these elements has clear environmental, socioeconomic, and national security benefits and contributes to the reduction of some of the effects of the global climate warming.

Nowadays attention is also paid to the ecosystems capacity to absorb the excessive and growing levels of nitrogen and phosphorous. In a recent study (Karabulut, Bouraoui, Grizzetti, Bidoglio, & Pistocchi, 2014) the production of reactive nitrogen in the world has been estimated. This study indicates that it increased more than 20 times from 1860 to 2005, and it currently amounts to around 187 tonnes annually, representing around 1.5-2.0 times the natural rate for the planet. From this reactive nitrogen, produced by anthropogenic activities, 90 tonnes have been estimated to end up in the oceans. With respect to the phosphorous the same study estimates that nearly half of the amount mined (10 Mtonnes annually) ends up in the oceans, which represents eight times the natural rate of input.

The nutrients are natural resources essential for life, but when they are released to the environment in excessive amounts severe problems arise. For this reason, the authorities and governments of the different world regions have the responsibility to develop regulations and directives that deal with these significant impacts. The developed policies need to be considered within an integrated and holistic approach to addressing the nutrient cycle including anthropogenic activities. Despite the establishment of common emission value limits (ELV) by international directives, each country established different limit values depending on their particular situation. Therefore, the laws and regulations for nitrogen and phosphorous effluent discharges differ around the world. This chapter will focus on reviewing regulations referred to nutrients for two regions in the world: Europe Union (EU) and the United States of America (commonly U.S.)

Among the different laws that concern water allocated for water uses or sources like bathing, drinking water, surface waters, inland and coastal waters, etc.; this chapter will focus especially on those related to water discharged from industrial activities. The composition of the wastewater originated from industrial activities varies widely according to the type of process taking place. For this reason, certain types of industrial wastewater contain higher concentrations of nutrients than others. Therefore, the discharge limits imposed by the regulations need to take into account not only this variability but also the geographic region and the class of water body receiving the effluent (lake, river, ocean, etc.). To fulfill the discharge limits each industrial facility needs to implement the corresponding treatment, if the wastewater is directly discharged into a water body, or a simpler pre-treatment if the effluent goes to a municipal wastewater treatment plant (WWTP). In general, an enhanced aeration treatment process is used to remove the nitrogen content, while the chemical phosphorus precipitation process is used to remove the phosphorus content from wastewater.

EUROPEAN UNION

The European Union (EU) has set up some policy instruments (summarized in Table 1) to protect water bodies from nutrients pollution provoked by nitrogen and phosphorus contained in effluents discharge. A specific directive is devoted regulating nitrogen discharges (e.g. Nitrates Directive (91/676/EEC)) and although a particular directive is not available for phosphorous discharges, some European Member States address the phosphorus environmental detrimental effects by the implementation of the Nitrates Directive (91/676/EEC), the Water Framework Directive (2000/60/EC) and the Industrial Emissions Directive (2010/75/EU).

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