CONSTRUCTED WETLAND USED FOR RECOVERING AND PURIFYING WASTEWATER AROUND ROAD PARKING AREA

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Abstract. The purpose of this research is to propose a solution for the wastewater from the resting areas near Gilău-Câmpia Turzii highway, Cluj-County consisting of a constructed wetland in, by using submerged and floating aquatic plant species, as: *Phragmites australis, Acorus calamus, Iris pseudocorus, Schoenoplectus lacustris, Lemna minor, Spirodela polyrhiza, Salix vinimalis Energo*, placed into a shallow basin. The specific plant species used in this area will have an aesthetical role by providing a diverse shaping of the landscape, habitat for several species and a functional role, due to the biological purification filter of the plants.

Keywords: constructed wetland, specific plants, rest area, wastewater

INTRODUCTION

The communication pathways, mainly roads, evolved along with society and life during the centuries. These represents the infrastructure for transport which favours the development of all sectors. They are of particular importance in terms of cultural, political, administrative and social aspects. For the proper development of these activities it is necessary to build gas-stations, rest and recreational places, offering the possibility to use a restroom, walk around, stop for a meal etc. in the vicinity of highways. The aim of this paper is to present a planning project of a constructed wetland, used for purification of wastewater (Vesilind, 2003) produced in resting areas, by using specific plants. The area is located on A3 Highway, section 2B (Gilău-Câmpia Turzii), in accordance with PD 162/2002 normative which stipulates the necessity of building on extra urban highway, rest areas in each 30-50 km. A constructed wetlands is a system with a mechanism similar to wetlands, which act like a transition zone between aquatic and terrestrial environment, with the main purpose of treating contaminated runoff water and wastewater from businesses and municipalities (Kumar, 2004).

MATERIALS AND METHODS

Specific plants (*Phragmites australis, Acorus calamus, Iris pseudocorus, Schoenoplectus lacustris, Lemna minor, Spirodela polyrrhiza, Salix vinimalis Energo*) were used in this project for purifying wastewater, sizing the parking plot and the cleaning basinets, water needs and wastewater generation and recirculation, taking into account the mean number of cars and tracks that pass over the highway daily. The system is composed by an horizontal tank dug into the soil at a depth of 0.60 m. The edges are protected with an anticontaminant material and geomembranes. The tank is over filled with stones 20/40 thickness, on a height of 0.40 m and with grit, on another 0.10 m height, where floating or submerged aquatic plants are planted (Figure 1). At the exit of the horizontal basin, is built a

small water purification device, to control the evacuated material quality before entering into the storage tank.

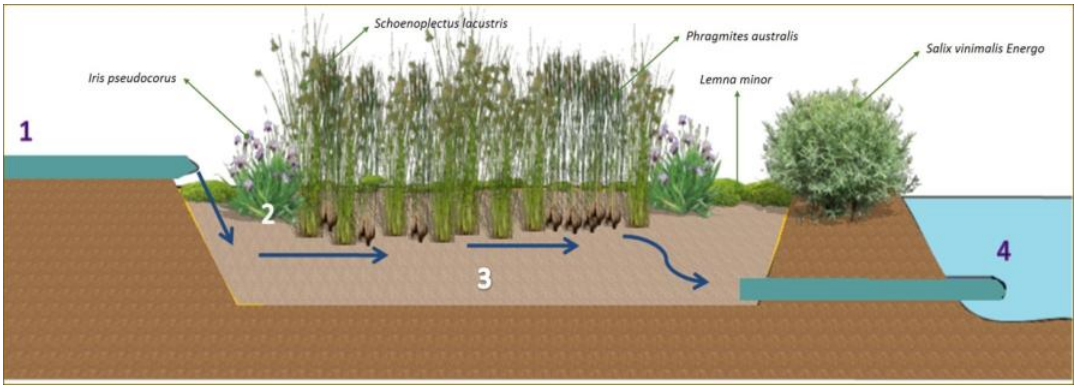

Fig 1. Representation of constructed wetland: 1. water entry area; 2. plant filter; 3. nutrients are absorbed by vegetation; 4. purified water evacuated from the filter tank into storage tank.

A constructed wetland area nearby a highway for eight passengers with daily common needs requires $10m^2$ of ecological constructed area designed. Statistical data offered by CNADNR reveals the fact that the mean number of transporters will increase in the next 20 years by 2000 vechicles each five years (5895 vehicles in 2010 to 7309 in 2015). To cope with the traffic and to meet the needs of the people who stop in this area for a short break in 2016, the surface occupied with tanks should have $950m^2$ in the certain year taken into consideration.

RESULTS AND DISCUSSIONS

The natural growing aquatic plants enhance the removal of pollutants by consuming part of them as plant nutrients. The plants behave like a natural filter and have a lot of advantages: plants can be used as low-cost extraction devices to purify polluted water, plants decompose wastes faster than microorganisms. The described method can be applied to large areas or to complete the decontamination of the water used in the resting areas for long periods. The application of purifying system using plants that is not connected to the sewage network, makes unnecessary building emptying septic tanks (Figure 2).

Fig. 2. Constructed wetland: 1. wastewater filtration tank; 2. construction detail (original)

CONCLUSION

The wastewater purification and recirculation network built beside highways, containing purifying plants is more aesthetic than the classic ones, it can be carried out by lower costs and it also filters out noxes and odors. These systems require no maintenance, consume no electricity, and cost less than one quarter that of a traditional waste treatment systems. Such constructed wetlands - purifying tanks employ different species of plants that commonly abound in the natural environment.

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