

# USE OF VEGETATION FOR THE REMOVAL OF POLLUTANTS FROM WASTEWATER AS AN ALTERNATIVE ENVIRONMENTAL TECHNIQUE FOR WASTEWATER TREATMENT

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## Abstract

The paper focuses on the evaluation of the use of vegetation for the removal of contaminants from wastewater through vegetation-based wastewater treatment plants. Subsequently, the specific efficiencies of wastewater treatment using a selected vegetation-based wastewater treatment plant are evaluated. The results show that vegetation-based wastewater treatment plants generally work at relatively high treatment efficiency, but one of the main factors influencing the treatment efficiency is the values of pollution indicators at the inflow to the wastewater treatment plant.

## Evaluation of the wastewater treatment efficiency using a vegetation-based wastewater treatment plant

### Treatment plant in Lužany near Topľa

- It was put into operation in 1996 for a population of 250 PE.
- It is used to treat wastewater from a mechanical WWTP.
- The filter area is 440 m<sup>2</sup> (20x22m).
- Treatment zone consists of the aquatic plant *Phragmites australis*, which is mowed once a year.
- The average daily inflow of wastewater is 31 m<sup>3</sup> per day. The treated wastewater is discharged into the Topľa river.



### Treatment plant in Hostetín

- It was put into operation in July 1996 for a population of 280 PE.
- It consists of two filter fields, which occupy an area of 1240 m<sup>2</sup>.
- The wastewater flow is horizontal.
- Treatment zone consists of the aquatic plant *Phragmites australis* and *Phalaris Baldingeri* *Arundinacea*.
- The average daily inflow is 47.6 m<sup>3</sup> per day.



## Results and discussion

Efficiency of WWTP in the village of Lužany near Topľa (SR) according to the regulation of the Government of the Slovak Republic no. 269/2010

Indicator	Inflow (mg/L)	Outflow (mg/L)	Limit concentration of pollution in outflow (mg/L)	Treatment efficiency (%)
COD	83	45	135	46
BOD <sub>5</sub>	12.2	4.8	30	61
insoluble particles	82	14	30	83

Efficiency of WWTP in the village of Hostetín (CR) according to the regulation of the Government of the Czech Republic no. 401/2015

Indicator	Inflow (mg/L)	Outflow (mg/L)	Limit concentration of pollution in outflow (mg/L)	Treatment efficiency (%)
COD	120.5	28.2	150	77
BOD <sub>5</sub>	51.9	7.1	40	86
insoluble particles	30.1	14.4	50	52

- The achieved treatment efficiency was higher in the Czech Republic by approximately 30% compared to the Slovak Republic in the BOD<sub>5</sub> indicator and even 40% higher in the COD indicator.
- Insoluble particles were removed from WWTP in the Slovak Republic almost 60% more efficiently than in the Czech Republic.

## Conclusions

The results showed that although the vegetation root wastewater treatment plant in the Czech Republic shows higher values of efficiency for removal of pollutants expressed by COD and BOD<sub>5</sub> indicators compared to the Slovak Republic, this situation is influenced by the fact that the vegetation root wastewater treatment plant in Slovakia is classified as a treatment stage and the wastewater is already pre-treated. Thus the values of the COD and BOD<sub>5</sub> pollution indicators meet the limit values already at the inflow to the root wastewater treatment plant. As for the removal of insoluble particles, they are treated in WWTP in Slovakia with relatively high efficiency. The values of pollution indicators in selected WWTP in the monitored period complied with the limit values of pollution indicators at the outflow into surface waters according to valid regulations in the Slovak Republic and the Czech Republic.

In conclusion, it can be stated that root-zone treatment plants generally work on relatively high treatment efficiency and one of the main factors influencing the treatment efficiency is the values of pollution indicators at the inflow to the wastewater treatment plant. Under certain conditions, they appear to be a suitable alternative for the treatment of wastewater from smaller sources from an environmental, aesthetic and economic point of view, as they do not represent a strong negative impact on the landscape and their operating costs are minimal.



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