Technology	Optimization of engineered Constructed Wetland systems: Alternative filter material for the reduction of pathogen contamination of waste water
Research organization	Vita 34 AG business unit BioPlanta is a team of engineers and scientists highly specialized in bio- and phytotechnologies. BioPlanta renders engineering and consulting services for passive treatment and recycling of municipal and industrial wastewater, landfill leachate and mine water in international projects.
Description of the technology being developed	Slow sand filtration is coupled to an alternative filter material (sand-black peat filter) to enhance pathogen reduction, especially coliform bacteria including *E. coli*. Filter module comprise one column for water and downstream one column with sand and respective alternative filter material (black peat granulate). Black peat granules are suitable for pathogen removal from waste water. The treated waste water meets the European regulations for irrigation water. According to international threshold of WHO (2006) with 1,000 CFU/100 ml for *Escherichia coli*, Vita 34 demonstrated that sand-black peat filter treatment met this standard. Total phosphorus and total nitrogen remained almost stable within the system but COD decreased significantly. Results were used for design of full-scale plant (figure 1) and completed with cost estimation (investment and operation costs). Compared with alternative techniques (figure 2) developed technology is much more cost efficient.

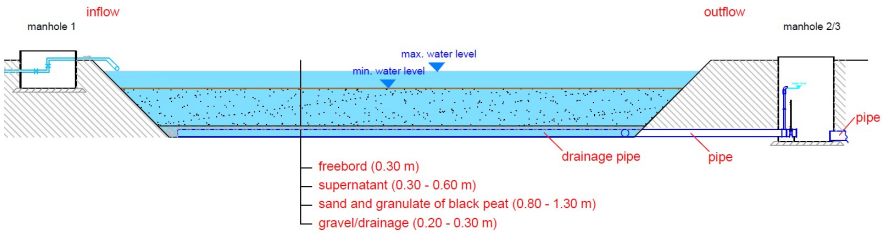

Figure 1: Extract of technical design of a full scale slow sand filter with granulate of black peat

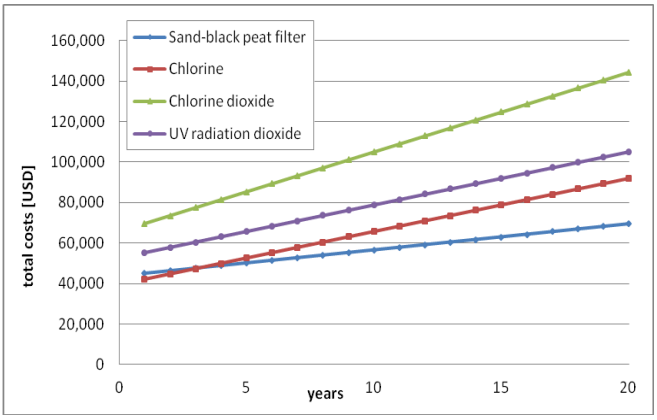

Figure 2: Assesment of different treatment techniques

Benefits	• Removal of pathogen from the waste water and making the water suitable for irrigation • Technology can treat water with high bacterial load • Low maintenance technology without need of chemical additives • Low energy demand and low operating cost
Financial viability	Has to be evaluated on a case-by-case basis. Final cost-benefit ratio depends on the water quality (level of bacterial load) and target criteria of water to be treated. In case of a small community with about 3,000 inhabitants (360 m^3/d waste water) about 43,800 – 64,300 USD investment costs (depends on site conditions and local costs for material and construction services) and 1,280 USD operation costs per year are estimated. Treated water can be re-used for irrigation of crops.
Potential users	Small and medium sized communities (decentralized) and industry
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