



L I M N O W E T

constructed wetlands

for co-natural waste water treatment

Constructed wetlands (CW) imitate the self-cleaning ability of nature for the treatment of polluted waters. In general, CWs operate without machinery and electrical equipment and thus render possible savings at construction, maintenance and operation. The system consists of several successive beds isolated with foil and filled with substrate. The flow of water through the beds is gravitational and subsuperficial with the purpose to prevent development of unpleasant odours and insects. The water is treated up to the required standards with the cooperation of microorganisms, wetland plants and, as anticipated, an active role of physical and chemical processes.



EUREKA

Lillehammer Award
2001



Okoljska
tehnologija
leta 1995



Mednarodno
priznanje
SPRINT-SPIM



Okoljska
tehnologija
leta 2001

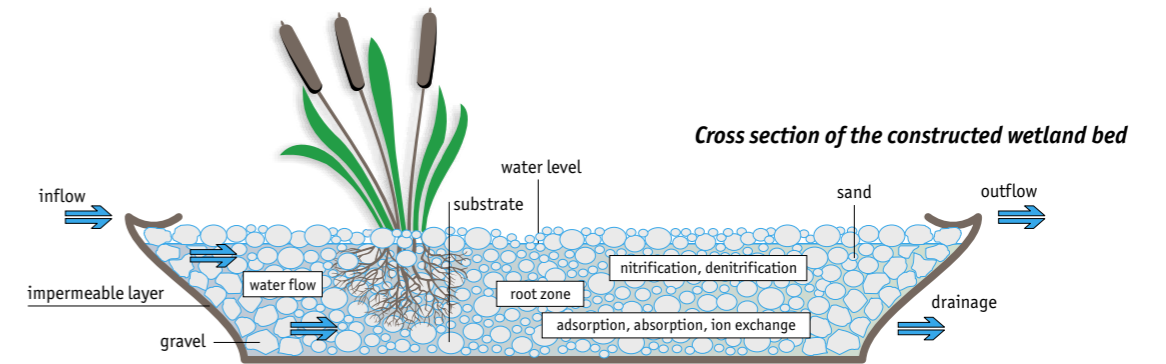
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During the treatment process, the toxic compounds degrade, partly build in the plants and partly remain in the substrate from where they can be removed from the first basins in cyclic periods and at moderate costs. If necessary, the system can end with an open lagoon for multipurpose use of purified water (irrigation or watering of green areas, fire extinguishments, aqua cultures) or as a landscape element. The sludge from mechanical treatment is composted in the composting bed, which is basically similar to CW beds. For 1PE (person), by which environmental burden is expressed, 2 to 2.5m² of surface is needed for the efficient treatment of municipal waste water.

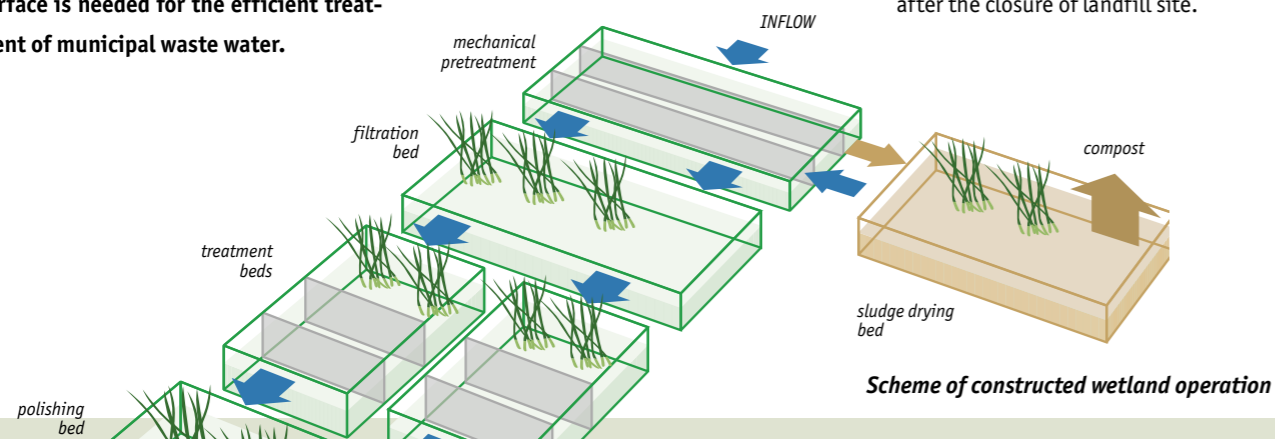
The most important CW characteristics

- new biotope for plants and animals;
- efficient elimination of nitrogen compounds, phosphorus and other toxic substances from the waste water and thus protection of groundwater, drinking water sources, running water and lakes (70–90% efficiency);
- efficient elimination of faecal and other bacteria (90–99%);
- energy and machinery are generally not required for the operation;
- operation and maintenance are simple and without high costs;
- purified water can be used for various purposes (irrigation or watering of green areas, fire extinguishment, aqua cultures);
- higher number of treatment beds enables adaptation of CW to the existing spatial configuration;
- in case of increased load (increase of the population), additional treatment beds can be added;
- CWs fit nice into the environment and contribute to a favourable appearance of degraded areas;
- in treatment of landfill leachate, they perform the treatment function also after the closure of landfill site.

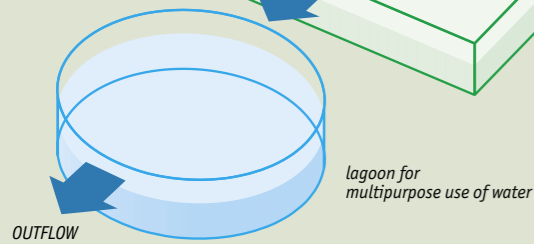


Application purposes

- treatment of water from settlements, individual houses, farms, tourist complexes (hotels, camps);
- treatment of water in natural parks;
- treatment of landfill leachate and other water with toxic substances (pesticides, phenols, heavy metals, etc.);
- treatment of industrial waste water from smaller industrial plants (textile, food processing industry, wood industry);
- treatment of municipal waste water with a variable load (tourism, restaurants);
- treatment of dyed water (textile, food processing industry);
- tertiary treatment at the existing treatment plants;
- treatment in water protected and vulnerable areas (drinking sources, karst area, lake protection, breeding streams);
- treatment of surface run-off from high-ways;
- areas with water deficiency (treatment, accumulation, multipurpose use of treated water – recycling);
- in all areas where economic and ecological construction is justified.



parameter (mg/l)	LEACHATE WASTE WATERS				MUNICIPAL (INDUSTRIAL) WASTE WATERS			
	INFLOW average	OUTFLOW average	efficiency %	NORM SLO	INFLOW average	OUTFLOW average	efficiency %	NORM SLO (EU)
BOD5	218	25	86	30	89–130	10–23	84–93	25 (25)
COD	1,062	121	88	300	234–970	31–97	87–90	120 (125)
NH3-N	410	20	94	50	7–61	1–8	86–90	10 (15)
Phosphorus	25	0.1	96	2	22–25	0.1–1	96	2 (2)
Suspended solids	63	9	86	60	107–125	31–33	76	80 (60)
Settable solids	3.5	0.5	86	0.5	0.5–4.6	0.1	80–90	0.5
Nitrite				1	0.009–0.3	0.001–0.03	85–90	1
Nitrate				1	1.6	0.4–23	75–84	30
Iron	4	0.1	94	2				



Constructed wetland for municipal waste waters



Constructed wetland for industrial waste waters



Constructed wetland for landfill leachate



Constructed wetland for surface run-off waters from roads



Services of the Limnos Company

- outline scheme;
- outline technological project;
- project for the acquisition of construction permit (in accordance with the construction regulation);
- supervision services during construction;
- services after the beginning of operation (monitoring of operation, preparation of operation/maintenance procedure);
- elaboration of the studies for construction of CWs in different areas;
- assistance in the acquisition of funds.

References

- the Company is entered in the Register of Research Institutes and Organizations at the Ministry of the Education, Science and Sport, Republic of Slovenia (No. 1509);
- the Company has a licence for the elaboration of environmental impact reports at the Ministry of the Environment, Spatial Planning and Energy, Republic of Slovenia (No. SP 32-37/02);
- the Company is registered at the PHARE/TACIS Central Consultancy Register (No. SLO-21665);
- the Company is a representative of the Global Water Partnership for Slovenia;
- the Company is a holder of two patents: Biological Treatment Plant (Patent No. 9500262, 1997) and Leachate Treatment and Regulation of Hydraulic Circulation at the Remediation of Municipal Solid Waste Landfill Sites (Patent No. 9700036, 1998);
- participation in different PHARE, COST and LIFE projects, coordinator of EUREKA projects.

Constructed wetlands in Slovenia



Municipal waste waters

1 Ajdovščina I	8 Sveti Tomaž
2 Ajdovščina II	9 Velika Nedelja
3 Planina	10 Kortina
4 Planinca	11 Korte
5 Studenec Sevnica	12 Katarina
6 Krasinec Metlika	13 Šempas
7 Ponikva	14 Vrhnika
8, 9, 16, 19, 27, 28	

Leachate from landfill sites

15 Dragonja	19 Ljutomer
16 Ormož	20 Gornji Grad
17 Barje I	21 Lubevč Idrija
18 Barje II	

Industrial waste waters

22 Kanal	26 Črnomelj
23 Renče	27 Središče ob Dravi I
24 Gradišče pri Kozini	28 Središče ob Dravi II
25 Slivje	29 Celje

More than 63 constructed wetlands have been designed in Slovenia, 17 in Italy and 10 in Croatia.



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