

## Case study

### Constructed wetland Dorweiler/Germany Waste water treatment without any energy

#### Background

The rural Hunsrück town called Dorweiler located in Rheinland Pfalz, Germany (100km west of Frankfurt/Main) and its 350 inhabitants had only an outdated mechanical waste water treatment system up until October 2001. An additional biological treatment step was urgently required. Its local government had the option to be connected to the public sewage network or to treat their waste water themselves based on legal parameters. Since this rural area is quite a distance away from the main sewage network it would have meant to have a number of expensive pumping stations and a long pipe infrastructure. Not only the investment costs would have been very expensive but also the long distance operational and maintenance costs. After initial consulting it became clear that a waste water treatment based on constructed wetland would be the far cheaper option.

Due to the specific geographical situation at this village the whole waste water treatment system would not need any form of external energy for the entire operation. Through gravity alone it was possible to not only collect the waste water from private households but also to collect and treat the surface water runoff from streets, snow, rain etc .



Construction during September/October 2001 – 2 months only



Constructed wetland one year later – August 2002



Constructed wetland currently: Front view



Constructed wetland currently: rear view with homes on the top

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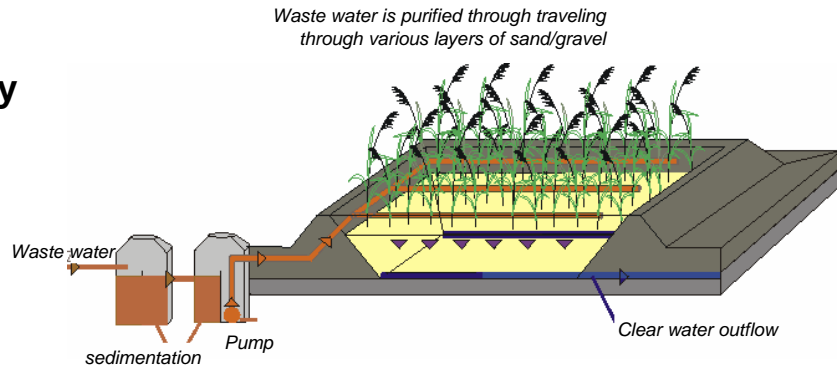
Waste water treatment without any energy

#### Functioning

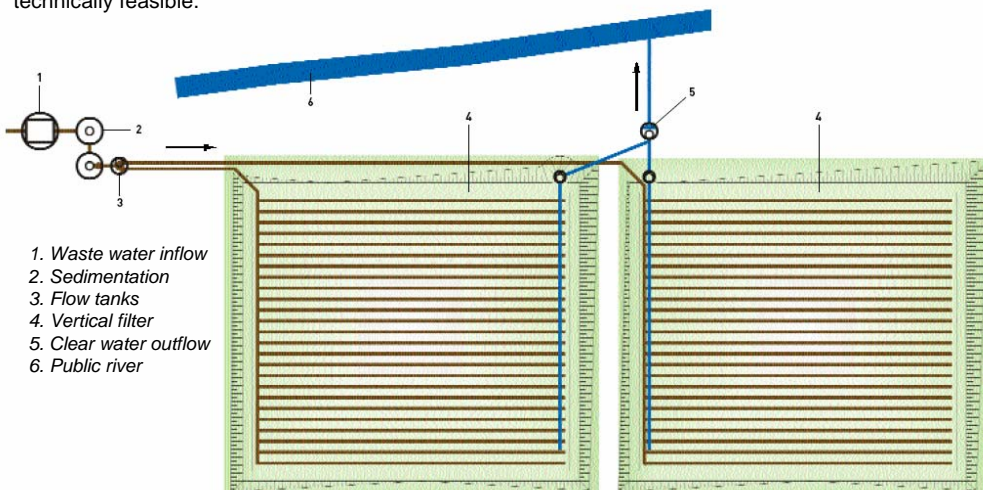
The waste water flows through gravity into a mechanical pre treatment system. The waste water overflows into a flow tank and is stored for a certain period. Upon a specific storage quantity a mechanical valve opens the tank so that the pre treated waste water flushes in intervals onto the wetland. Once the tank has been emptied to a predefined level the valve automatically closes off the tank and the process starts again.

Due to the geographical situation the wetland has been divided into 2 identical size areas that totals 1800m<sup>2</sup>.

The vertical flow of the waste water through the earth filter allows a high oxygen level year round so that the purification performance is always constant. The treated waste water leaving the constructed wetland is crystal clear and totally odorless. In this case it flows into the nearby river and helps the environment with clear, fresh water. Reuse was not considered although technically feasible.



Principle functioning of vertical wetlands with interval flushes either through pumps or through hydraulically systems



Clear water leaving the constructed wetland and feeds the nearby river

#### Extract of actual purification performance indicators\*

Date	Waste water in				Clear water outflow						
	BSB5	CSB	N total	P total	BSB5	CSB	NH4-N	NO3-N	No2-N	N Total	P Total
19.01.2005	210	668	51,6	6,7	5	15	0,1	33,5	0,03	33,6	3,3
16.02.2005	164	389	36,7	4,2	4	18	0,12	22,9	0,03	23,1	2,2
16.03.2005	40	83	28	2,1	4	13	0,29	18,2	0,05	18,5	2
14.04.2005	240	450	56,6	8,2	2	16	0,03	33,9	0,02	34,0	2,7
18.05.2005	350	718	44,8	4,7	5	12	0,02	31,6	0,02	31,6	2,3
08.06.2005	450	794	88,5	13,3	3	15	0,02	30,6	0,11	30,7	2,8
06.07.2005	350	736	86	18,6	6	15	0,03	27	0,03	27,1	3,5
10.08.2005	380	793	109	12,6	4	19	0,07	35,7	0,02	35,8	3,3
29.08.2005					7	16	0,02	36,6	0,01	36,6	3,4
14.09.2005	1000	2256	133	16	5	15	0,02	50,4	0,02	50,4	3,7
12.10.2005	1040	1928	125	19	7	13	0,02	36,1	0,02	36,1	3,7
09.11.2005	660	752	76	10,9	5	14	0,03	57,6	0,02	57,7	4,4
07.12.2005	330	552	61,6	8,1	4	17	1,26	5,56	0,03	6,9	4,9
Average:	435	843	75	10,4	5	15	0,2	32,3	0,0	32,5	3,2

\*no benchmarks have been issued for N or P, however, the achieved levels are acceptable despite the fact that the wetland has not been optimized for that purpose.

#### Technical summary

Waste water parameters to comply  
 CSB: 150 mg/l  
 BSB50: 40 mg/l  
 Achieved purification rate:> 95%

Type of waste water: Households, surface runoff  
 Construction period: Sept/Oct 2001  
 Waste water quantity: 90m<sup>3</sup>/day  
 Waste water peak: 140m<sup>3</sup>/day  
 Size of wetland: 1800m<sup>2</sup>  
 Construction costs: € 150,000  
 Operation costs: € 0



Client: Waste water company / Germany  
 Abwasserwerke Verbandsgemeinde Kastellaun  
 Telefon: 067 62/4 03-0