Constructed wetland and flowforms for sewage treatment

Camphill village Rozkalni, Latvia

The constructed wetland sewage treatment system in Camphill Village, Rozkalni (Latvia), is a biological purification system incorporating ponds and flowforms which was designed and developed for a community of 40 people. Built due to the previous lack of a communal option, the system requires very little maintenance. The system's output after purifying grey and black water has been certified by specialists from the state environmental service as being of very high quality. The layout of its cascades and waterways has also provided the opportunity to develop a beautiful landscape and a functioning, holistic ecosystem in the Rozkalni ecovillage.

Technical description of the system

Construction and operation

The system consists of a large area of approximately one hectare comprised of two ponds and two gravel filters. After the settling basin, the purifiable water flows to the first pond in the pre-purification process—the aeration lagoon. Partly purified, the water then flows down through a vertical filter: this consists of gravel, broken stones, and small pebbles of different size and shape, which have also been planted with river reeds and irises. From there, it then heads to a second pond, its banks also planted with reeds and irises; finally, before returning to nature, the water crosses a horizontal filter of granite chips.

Selection of the location

First, a location to install the system was selected. It was important to find a place convenient for both the inflowing sewage and outflowing purified water.

Materials and construction

The next step was to find the necessary liners to ensure that the treatment area was kept separate from the groundwater, and to select a supplier (we already had construction workers lined up for the project). Sourcing the granite chips required for the filters and the banks of both ponds was a complicated issue in Latvia. The easily available dolomite chips were not suitable since a dolomite filter clogs easily. It was also necessary to seek approval in Latvia for the project equipment developed

in Norway. However, we managed to do this fairly easily thanks to a Latvian architect who agreed to submit the project for approval under her license.

Construction of the system

A professional construction company was involved in the actual construction of the system. Due to the lack of experience with the construction of such systems in Latvia, an expert from Norway was invited for the duration of the construction. It took four people and several vehicles—excavators, bulldozers and trucks—working at the same time to complete the system in three and a half months. Constructed in 2002, the system cost 30,000 LVL. Since operations ceased in autumn, the planting of reeds and irises and other water plants had to wait until the next spring.

Maintaining the system

The system is very simple and requires hardly any maintenance. In summer, it's necessary to clean the pond's water blooms biweekly (depending on the temperature). Once every four years it's necessary to pump out the settling basin. According to the project description, it's necessary to clean the bottom of the first pond once per decade. We tried to do it once, but found out that it isn't yet necessary. Cleaning the bottom of the pond is done via the inlet pipe by simply pumping out the sediment, which can be used as fertilizer.

It's also possible that in the course of time it will become necessary to clean the filters, or replace the sand and gravel in the filters, or the granite chips. All of these processes are time-consuming work, although we've found that during 10 years of continuous operation, it has not yet been necessary to perform this. Part of the reason for this infrequent maintenance is due to the fact that the system is designed for up to 40 people but only used by half that number. In autumn, before winter arrives, we mow down all the reeds in the filters and cover them with straw so that the water can continue to flow underneath without freezing. Before the first frost and snow, we also mow down the dry reeds in the ponds so that no unnecessary biomass accumulates: the mown reeds are composted or burnt.

Monitoring the system's operation

Once a year the inlet and outlet water have to be tested and the results determine the level of the "natural resources tax" we have to pay. So far this has been approximately 3 LVL per year: the low sum indicates how little hazardous waste is released into nature by our system.

User experiences

Motivation for the system's selection and its history

Vilnis Neimanis, one of the main implementers who helped to establish the system, says that this treatment system was selected not only because it was possible to solve the complicated issue of communal sewage treatment, but also to develop a beautiful park and new ecosystem in the village Rozkalni.

The system is one which was adapted from a similar installation in the Camphill community of Vidaraasen, Norway, where he lived for 5 years. It's also where he met the architect who had designed that system, who was also interested in designing a similar one for Rozkalni. There's also a concrete workshop in Vidaraasen fabricating the concrete flowforms—water cascades, an invention of John Wilkes—used in this system and others.

Conclusions from the residents of Rozkalni

The residents of Rozkalni think that the sewage system is a great addition to the community: not only have they obtained a great purification plant, but also a nice park and newly developed ecosystem, fed by the purified water that enters the landscape. They hope that the system will serve them well for a long time to come. They are therefore working to maintain the landscape of the system by making sure no trees or bushes grow in the filters.

The residents would recommend the installation of similar purification systems to others. It's definitely not suited to small families and households, but it's a great solution for larger ecovillages and communities. It's also very important that the system is used by people who are careful about what enters the sewage system; for example, residents should be prepared to use biodegradable detergents and soaps.

Further information

www.camphillrozkalni.lv/en/; contact person: Vilnis Neimanis