The Role of Treatment Wetlands in Resource Oriented, Small Sanitation Systems

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INTRODUCTION

Treatment wetlands are used for many different applications. They can be applied to diffuse pollution as well as point-source pollution. They treat water towards particular reuse purposes, sludge from wastewater treatment for agricultural application, stormwater runoff, combined sewer overflows, etc. To cover the wide range of possible applications very different types of treatment wetlands have been designed and are still further developed. In general treatment wetlands emulate natural wetlands in both form and function. This is part of their beauty. As with natural wetlands, which can be large or small, have free water or mainly underground flow, have a stable or varying water table, be saturated or not, have a continuous, an interval or an intermittent feeding, and many more variations, all these possibilities are tapped into to create the best treatment environment according to the task at stake. Additionally some features have been taken from technical developments, e.g. forced aeration. Treatment wetlands can be something of a riparian zone, along of rivers or lake shores; they can restore former, drained, wetlands or create new wetland zones. It is possible to design them as integrated part of a park or garden, to put them up on walls or even inside of buildings or on their roofs. They have even been built on boats. Beside the particular treatment aimed at, wetlands can provide a variety of other typical ecosystem functions, some of which are wildlife habitat, evapotranspiration and thus cooling, water storage and management, recreation, landscaping, green in the built environment. All available evidence points towards the need for a major decoupling of our well-being from resource demand very soon. Forecasts predict the necessity to:

- cut greenhouse gas emissions to 4% of present levels globally;
- all but no fossil fuel consumption;
- eliminate mined phosphorus demand within the next 80 years;
- drastically reduce reactive nitrogen production and release into the biosphere
- massively cut biodiversity loss.

These are quite respectable challenges and there are a range of others to mention (Meadows, 2010). Rockström (2009) suggests that where we tackle the challenge, e.g. ozone layer depletion, we have a chance to succeed. This, however, is not possible without a major revision of the way we do things. The only concept presently available in sanitation, which can possibly allow mastering those challenges, is source separation and closing loops as locally as reasonable, according to the household centred approach (WSSCC, 2000). This results in the following key questions for wetlands.

THE NEXT FUTURE FOR TREATMENT WETLANDS

What would a circular, household centred sanitation, stripped of fossil fuels, look like? What would be the role of treatment wetlands and how would they have to be built? If wetlands are to fit into changing needs of future sanitation we have to work at the answers to these questions now. Recent research suggests that houses, from consumer centres, will become producers of water, energy and food. It predicts the effluent factory with more multi-disciplinarity, increasingly multi-purpose infrastructure relying on ecosystem services. Constructed wetlands seem to have a preferential place in this context. Some possibilities will be explored and conclusions drawn about needed research

and technical developments. Treatment wetlands use and provide ecosystem services, which are a two way issue. One is relying on nature to do tasks we want achieved. The second is to provide ideal conditions for the biosphere to thrive in order to best fulfil these tasks. We need to aim at biodiversity in agriculture and settlements, the substitution of chemical warfare against nature with natural equilibriums providing conducive conditions for our needs and wetlands are a powerful contribution towards that goal. Wetlands may assist in treating particular wastewaters, e.g. from hospitals. They will participate in making water immediately reusable in cycles (Mestre) or cascades, which can go downwards, e.g. greywater treatment for service water, or upwards as in the case of service water production from first flush stormwater (Vansbotter, 2001) collected from the remaining sealed surfaces. Wetlands will become part of the urban landscape for stormwater handling without sewerage. Wetlands will come in all shapes, as longitudinal swales along roads, as roof coverings, on walls for irrigation water production for localised urban farming or cooling purposes. Wetlands will also provide green comfort and treatment services inside buildings.

For certain, very particular issues wetlands will work in tandem with other technologies, e.g. selective membranes, activated sludge treatments or particular disinfection processes. Urban space being particularly scarce wetlands will have to provide an especially great number of additional benefits: fit into blue and green corridors, provide recreational value, including contact recreation, serve as water reservoirs for fire fighting and cooling during heat spells.

In a circular, sustainable water management constructed wetlands will play a key role, even more than presently. Given the predicted modifications of the entire water management some adaptations will be necessary, requesting research and development of new types and new applications of wetlands:

- as effective effluent factories,
- in urban landscaping, including plants choice,
- integration into buildings,
- hygienisation of water and breakdown of organic trace pollutants.

The new approach needs multi-disciplinary approach, i.e. the readiness for cooperation:

- reuse of nutrients needs the contribution of agronomists,
- integration in and on houses is a task with architects and interior designers,
- urban planners and traffic experts need to work at urban fabric integration,
- climatologists have to prove the benefits in terms of heat island mitigation,
- biodiversity optimisation with habitat and species biodiversity experts,
- economic feasibility and benefits,
- sociologists have to prepare the field for acceptance and provide participatory planning approaches.

Such cooperation is not going to happen on its own. It needs a common language, particular tools to be able to work together and technological adaptations on each side. Research has to prepare a smooth transition from the existing, highly unsatisfactory situation to a sustainable future. This includes teaching of the new paradigm as soon as possible and the introduction of participatory planning as the needed changes will have effects on all aspects of society. The transition will not be possible without a holistic approach to a new society. Experts will have to participate in this paradigm change lending their knowledge to decision makers, other disciplines and the general public to raise awareness and ease the necessary changes.

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