Chapter 1

Introduction

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1.1 RATIONALE

Treatment wetlands (TWs) are natural treatment technologies that efficiently treat many different types of water. They are used worldwide and have gained increasing popularity during recent decades as they require less operational effort compared with other solutions for wastewater treatment.

In the textbook volume *Treatment Wetlands* (Dotro *et al.*, 2017) the main types of treatment wetlands for domestic wastewater applications were described. Bachelor students with a basic knowledge on biological wastewater treatment, as well as practitioners seeking general information on the use of treatment wetlands were the main target audience for this work. In this new Wetland Technology STR the information already presented in the *Treatment Wetlands* textbook will not be repeated.

The "old" wetlands STR (Kadlec *et al.*, 2000) was structured like a textbook. After producing the above-mentioned textbook, the Wetlands TG did not want to simply update the previous STR and make another textbook. Thus, the focus of this new *Wetland Technology* STR is to provide **practical information on design of treatment wetlands that is simple to use**.

The main content, i.e. the technical parts, is framed in a wetland design approach considering that:

- Treatment wetlands are designed for improving water quality for a specific purpose;
- Treatment wetlands are designed within a productive system; and
- Treatment wetlands are designed as multi-purpose systems.

1.2 WHO SHOULD READ THIS STR?

The primary target audiences for this STR are **engineers focusing on wetland design** (including graduate students as future designers) as well as academics. Secondary target audiences include decision-makers and people from a non-water technical background who have an interest in wetland technology and its potential.

1.3 STRUCTURE OF THIS STR

After this *Introduction*, the STR continues with:

Chapter 2: *Why use treatment wetlands?, w*hich outlines the new approach to water management and the roles of wetlands within this new approach.

Chapter 3: *Design approach for treatment wetlands,* which outlines the treatment wetland design approach in which, as a first step, the treatment objectives are defined. In a second step, the processes that are required to reach the treatment objectives are identified. The third and final step helps to choose the TW type(s) with which the treatment objectives can be achieved. Besides selecting the right TW type, other important considerations need to be made in the design process that are summarised in this chapter.

Chapter 4: *Designing wetlands for specific applications,* which outlines the design of TWs following this approach for 15 different applications (e.g., stormwater treatment) and/or treatment objectives (e.g., removal of pathogens).

Chapter 5: *Practical information on design of specific wetland types and typical pitfalls,* which includes practical information related to treatment wetland design for 11 TW types.

Chapter 6: *Case studies,* which includes a checklist for reporting treatment wetland data (related to the information required on the TW type and reporting experimental data) and presents 10 case studies of treatment wetlands for various applications.

References: Includes the complete list of references used in the STR.

1.4 HOW TO USE THIS STR

As mentioned before, the content of the STR builds upon the content of the *Treatment Wetlands* textbook. Consequently, we also use the notation that was introduced by Dotro *et al.* (2017) for TW main types:

- **VF wetlands** (for vertical-flow wetlands),
- **French VF wetlands** (for the variant of VF wetland developed in France for treating raw wastewater),
- **HF wetlands** (for horizontal-flow wetlands), and
- **FWS wetlands** (for free water surface wetlands).

General information on treatment wetlands is not provided in this STR. For this, the user is referred to the *Treatment Wetlands* textbook. This *Wetland Technology* STR provides information on design of treatment wetlands that should be useful in practice.

If the reader is interested in using a treatment wetland for a specific application and/or treatment objective, he/she is referred to Chapter 4 in which the design of wetlands for 15 such applications and/or treatment objectives is described.

If the reader aims to get more information on a specific TW type, he/she is referred to Chapter 5. In that chapter detailed information on designing TWs in practice is presented for 11 TW types, including information on the four TW main types that is beyond the information that was presented in the *Treatment Wetlands* textbook chapter.

Last but not least, 10 case studies of full-scale treatment wetlands in Chapter 6 highlight different applications and sizes of treatment wetlands.