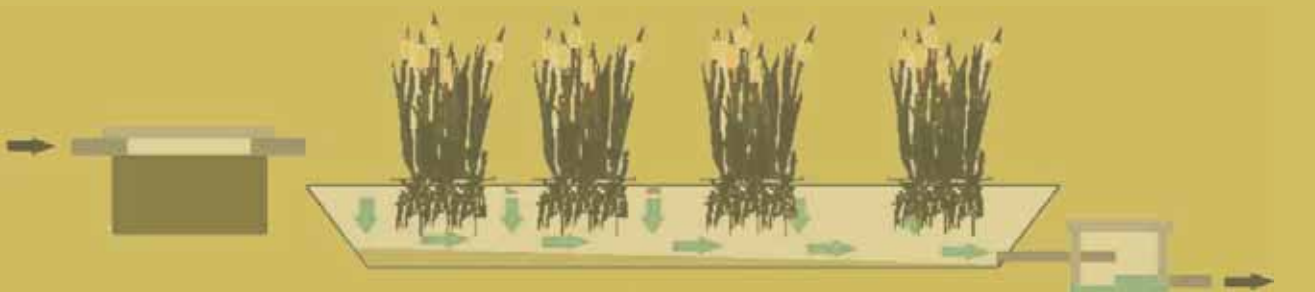




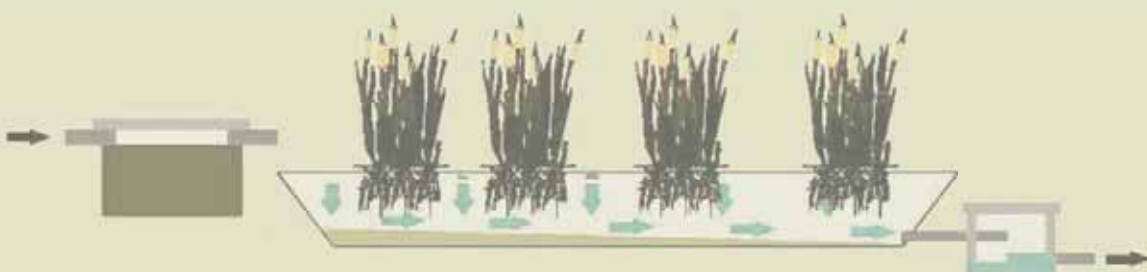
United Nations Human Settlements Programme

CONSTRUCTED WETLANDS MANUAL

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April, 2008



foreword

In a rapidly urbanizing world, poor environmental sanitation has emerged as a major challenge, threatening the health and livelihoods particularly of the poor. It is also now clear, that if business continues as usual, the sanitation related MDG to halve by 2015, the proportion of people without sustainable access to basic sanitation will not be met.

Mere provision of toilets is not enough to ensure good environmental sanitation. Excreta from toilets needs to be transported and disposed of safely without creating an environmental health hazard. While in the large cities of industrialized countries this is usually achieved through centralized wastewater management systems with advanced treatment technologies, such systems tend to be expensive and difficult to operate.

Smaller, decentralized, wastewater management and treatment systems such as constructed wetlands can be a viable alternative for many urban areas in developing countries. Constructed wetlands are relatively inexpensive to build where land is affordable and can be easily operated and maintained even by the community.

This manual, drawing upon a number of examples in Nepal, provides basic guidance on the design, construction and operation and maintenance of constructed wetlands and also indicates situations where this may not be a feasible alternative.

I believe that the experiences and the case studies described in this manual can serve as useful reference material for municipal officials and water and sanitation professionals and hope that it will stimulate local action for affordable and simple wastewater management systems and technologies.

Anna Kajumulo Tibaijuka
Executive Director, UN-HABITAT



Preface

With support from the Water and Sanitation Trust fund, UN-HABITAT is implementing the Water For Asian Cities Programme (WAC) which is currently operational in India, People's Republic of China, Nepal, Lao PDR and Vietnam and is being extended to Cambodia, Indonesia and Pakistan.

With the overarching goal of creating an enabling environment for pro-poor investments in cities, the WAC programme is demonstrating innovative approaches for improving access to water and sanitation for the poor. These pilot and demonstration projects usually aim to tackle difficult water and environmental sanitation problems through practical community based approaches. One such problem confronting the rapidly urbanizing cities in Asia is the safe treatment and disposal of wastewater. Conventional solutions using advanced technologies are simply not affordable or are too complex to maintain in most small and medium sized towns.

Under the WAC's "normative" work programme, lessons learnt through pilot projects are documented for wider dissemination. This publication on the design, construction, operation and maintenance of constructed wetlands was prepared under the WAC programme on the basis of experiences in Nepal and in recognition of the need for a viable alternative to conventional wastewater treatment and disposal technologies. It should however be noted that constructed wetlands have their limitations-the unavailability or the cost of land can make them unviable; and climatological aspects and wastewater parameters can affect their proper functioning.

The preparation of the manual was coordinated by Dr. Roshan Shrestha, Chief Technical Adviser, WAC, Nepal. The WAC programme also appreciates the contribution of Mr. Shirish Singh, Dr. Guenter Langergraber and Dr. Elif Asuman Korkusuz of the University of Natural Resources and Applied Sciences Vienna in the development of this manual.

Andre Dzikus

Chief

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Contents

iii foreword

v preface

1 chapter ONE introduction

3 chapter TWO what is a constructed wetland?

2.1 Advantages of constructed wetlands 5

2.2 Limitations of constructed wetlands 5

7 chapter THREE configurations of constructed wetland

3.1 Horizontal Flow (HF) 7

3.2 Vertical Flow (VF) 8

3.3 Hybrid 9

11 chapter FOUR construction and operation of constructed wetland

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