

Book Review: Domestic Wastewater Treatment in Developing Countries

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D. Duncan Mara, *Domestic Waste Water Treatment in Developing Countries*. London, UK.: Earthscan, 2003. 293 pp. (paper).

Domestic Wastewater Treatment in Developing Countries is a college-level textbook that covers the topics needed for environmental engineers to design wastewater treatment works in developing and rural areas. The book is intended for upper-class undergraduate engineering students, but it would also be useful for graduate students and professional engineers who want to expand their knowledge of low-tech wastewater treatment methods for use in developing and rural areas.

The topic covered by this book is critically important since 2.4 billion people currently do not have adequate sewage treatment. For example, according to the author, less than 15% of the wastewater in Latin America is treated. The discharge of untreated or poorly treated wastewater pollutes over half of the world's rivers, lakes, and coastal waters; causes serious damage to aquatic ecological systems; and results in over 5 million deaths (10 times the number of all wars combined) per year due to water-borne disease.

The book focuses on simple, reliable, low-energy, low-cost treatment methods. According to Mara, these are the methods that must be used in developing countries. An important contribution of this book is the compelling discussion for the use of these low-tech designs in developing areas because these areas do not have the capital or technical resources to support more complex wastewater treatment methods commonly used in more developed areas. According to the author, it has been and continues to be a mistake by engineers who have been trained in developed countries to use "high-tech" designs in areas where they cannot be sustained.

Another important contribution is the discussion on the strategies needed in developing countries to prioritize wastewater treatment projects. According to Mara, because of the lack of capital, wastewater treatment projects must be prioritized to provide the greatest benefit for the investment. This is generally not the approach used in the developing countries, so design engineers and planners who have been trained in developed countries often need to develop a new mind-set when planning projects in developing areas.

The book covers all of the topics necessary for environmental engineers to plan and design wastewater treatment works in developing countries and rural areas. Topics

covered include: characteristics of wastewater, diseases and microbiology, biochemical oxygen demand (BOD) removal kinetics, treatment options and design methods, process design methods, operation and maintenance issues, and wastewater reuse for agriculture and aquaculture.

In Chapter 1, the author discusses the make-up of domestic wastewater, the reasons that it needs to be treated, and the special considerations for prioritization of wastewater treatment projects in developing countries. Chapter 2 and 3 discuss wastewater microbiology and excreta-related diseases, their causes, their impacts, and the wastewater treatment methods needed for their control. In Chapter 4, the author discusses the possibilities for proper effluent quality guidelines for developing countries. Chapter 5 describes the underlying science and kinetics of BOD removal in wastewater treatment processes. The author discusses wastewater treatment options for developing countries (as contrasted to developed countries) in Chapter 6. Chapters 7 and 8 describe wastewater flows and loads and preliminary treatment methods.

The majority of design discussions are included in Chapters 9 through 20. Chapters 9 through 12 describe the design methods for waste stabilization ponds (WSPs). Three types of WSPs (anaerobic ponds, facultative ponds, and maturation ponds) are described. According to the author, WSPs are clearly the most important wastewater treatment method for developing countries. They use natural processes, they are simple to design, build and operate, and they require very little energy and maintenance. Chapters 13 through 15 describe the physical design, operation and maintenance, and monitoring and evaluation of waste stabilization ponds. The function and design of constructed wetland treatment beds, upflow anaerobic sludge blanket reactors, biofiltration, and simple activated sludge processes are described in Chapters 17 through 20. Constructed wetland treatment beds represent a natural treatment process that is recently becoming more popular in rural and developing areas.

The rationale, public health issues, design methods, and planning options of wastewater reuse are discussed in Chapters 21 and 22. As pointed out by the author, water is becoming a very scarce and valuable resource, making wastewater with its nutrients and organic matter too valuable to waste. Wastewater reuse in agriculture is discussed in Chapter 21, while wastewater reuse in aquaculture is discussed in Chapter 22.

Coverage of each design topic is adequate and complete enough for application by design engineers. However, little supplementary and supporting material is presented to aid in the design projects in non-standard situations. How-

ever, the book includes numerous web links that have supplemental information and data to assist in the design process. Overall, this is a good and very useful text for its particular application.