Thi Thuong Nguyen and Rongxuan Wang. 2026. Editors' Preface. In Thi Thuong Nguyen and Rongxuan Wang (eds.), *Perspectives on Wastewater Treatment Technology for Sustainable Pig Farming: Comparative Studies on Problem Structures in China, Japan, and Vietnam*. Osaka: Asia-Japan Research Institute, Ritsumeikan University. ISBN 978-4-910550-16-9

Editors' Preface

The rapid urbanization and industrialization of Asia, particularly in China, Japan, and Vietnam, have brought about significant transformations in agricultural practices, with pig farming intensification playing a central role. While this evolution has been crucial for food security, it has also created considerable environmental challenges. The wastewater generated by pig farming—rich in nutrients, organic matter, and potentially harmful contaminants—poses serious threats to water quality, and ecosystem health, and contributes to greenhouse gas emissions. To address these concerns, innovative technological solutions are necessary, but they must also be contextualized within the socio-economic and environmental frameworks of each country.

This book "Perspectives on Wastewater Treatment Technology for Sustainable Pig Farming: Comparative Studies on Problem Structures in China, Japan, and Vietnam," seeks to examine the shared and unique challenges faced by these three nations in managing pig farming wastewater. By analyzing the "problem structures"—the interaction of technical, economic, and policy factors that influence wastewater management—this work aims to provide a comprehensive understanding of how each country is addressing the complexities of wastewater treatment in the context of sustainable pig farming.

The chapters in this book are based on the discussions held at the Asia-Japan Research Institute International Workshop on 3 August 2024, where researchers from China, Japan, and Vietnam convened to explore wastewater treatment technologies for sustainable pig farming. The workshop presented a rich platform for sharing insights and collaborating across borders, resulting in a valuable exchange of ideas and practices.

Chapter 1, authored by Dr. Rongxuan Wang, focuses on China,

the world's largest pork producer. Dr. Wang examines the wastewater management challenges facing China's pig farming industry, reviewing both current and emerging treatment technologies, with an emphasis on nature-based solutions. He also discusses the need for policy support, farmer education, and innovation to ensure sustainable management practices. In Chapter 2, Dr. Dan A introduces constructed wetlands as an effective green technology for livestock wastewater treatment. She explores how optimizing plant-substrate combinations and bacterial reactions can improve treatment efficiency and reduce greenhouse gas emissions.

Dr. Obey Gotore addresses the challenge of antibiotic contamination in swine wastewater in Chapter 3. He reviews various treatment methods implemented in Japan and China, highlighting a promising approach that uses biochar combined with manganese oxide for antibiotic removal. In Chapter 4, Dr. Chikako Ishimoto explores the structural changes in Japan's pig farming industry and examines current waste management practices. She also presents an energy-efficient, cost-effective solution using Anammox bacteria for treating pig wastewater.

In Chapter 5, Dr. Thi Huong Giang Nguyen discusses the challenges of reusing swine wastewater in Vietnam, examining the regulatory and policy frameworks around livestock waste management. Finally, in Chapter 6, Dr. Thi Thuong Nguyen highlights the ongoing challenges in Vietnam's pig farming industry, where outdated practices and insufficient infrastructure contribute to significant wastewater management issues. She proposes a sustainable solution using constructed wetlands for effective wastewater treatment.

This book owes its creation to the contributions of the outstanding researchers who shared their valuable insights during the workshop. We extend our heartfelt gratitude to them for enriching the discussions and content of this publication. Our sincere appreciation also goes to

the Asia-Japan Research Institute for their support in organizing the workshop and facilitating this publication. A special thanks to Professor Yasushi Kosugi, Satoshi Soda, and Anthony Brewer for their invaluable guidance, advice, and editorial efforts throughout the entire process—from selecting the workshop topic to the final stages of this publication. We also wish to express our deep gratitude to our colleagues and the domestic and international participants whose encouragement and support were instrumental in bringing this work to fruition.

We hope that this book will serve as a valuable resource for researchers, policymakers, and practitioners dedicated to advancing sustainable wastewater management practices in pig farming. By addressing the critical issues surrounding pig farming wastewater treatment, we aim to contribute to global efforts toward environmental sustainability and the well-being of future generations.

Thi Thuong NGUYEN
Rongxuan WANG

6. Dr. Thi Thuong NGUYEN



Chapter 6. Swine Wastewater Treatment Management in Vietnam: A Sustainable Approach Using Constructed Wetlands

Dr. Thi Thuong Nguyen is a Senior Researcher at the Asia-Japan Research Institute, Ritsumeikan University, Japan. She completed her Ph.D. in Advanced Architectural, Environmental, and Civil Engineering at the Graduate School of Science and Engineering, Ritsumeikan University, Japan. Her current research focuses on sustainable wastewater treatment by recycling by-product waste as a substrate in constructed wetlands for livestock and mine wastewater treatment.

Contributors

1. Dr. Rongxuan WANG



Chapter 1. Insight into the Removal of Pollutants by Various Treatment Technologies from Swine Wastewater in China

Dr. Rongxuan Wang is a Senior Researcher in Water Environment Engineering at Ritsumeikan University, Japan. He earned his Ph.D. from the Graduate School of Science and Technology, Environmental Design, Kanazawa University. His research focuses on wastewater treatment technologies, particularly the use of constructed wetlands for water purification. His work also involves developing innovative technologies for antibiotic removal, virus control, and swine wastewater treatment, with the goal of enhancing the sustainability and efficiency of wastewater management systems, contributing to environmental protection and public health.