Faecal Sludge Management

Systems Approach for Implementation and Operation

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Editors

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About the editors

Linda Strande

Dr. Linda Strande leads the Excreta and Wastewater Management group at EAWAG (the Swiss Federal Institute of Aquatic Science and Technology) in SANDEC (the Department of Water and Sanitation in Developing Countries). The overarching goal of Dr. Strande's research is to increase scientific knowledge that will advance and increase sustainable urban faecal sludge management technologies. In engineering and development research, she believes it is always important to consider how fundamental research can translate into real-life implementations. To achieve this, she has pursued a systems based approach to faecal sludge management, including technology, management and planning, so all aspects can integrate into complete and functional systems. Currently, the research focus of Dr. Strande's group includes optimisation of treatment technologies,



innovation in resource recovery, and methods for sustainable systems level implementations. Dr. Strande has been working in the environmental sector for over 15 years and holds interdisciplinary degrees in engineering, soils science and mathematics. Her academic background, together with wide-ranging international experiences, has provided her with a global perspective, and an ability to research and apply environmental engineering fundamentals in complex, interdisciplinary situations.

Mariska Ronteltap

Dr. Mariska Ronteltap is a Senior Lecturer in Sanitary Engineering at UNESCO-IHE (Institute for Water Education), with 12 years of experience working in the field. She holds a Master's degree in Environmental Engineering from the University of Wageningen, and a PhD jointly from ETH (the Swiss Federal Institute of Technology Zurich) and EAWAG (the Swiss Federal Institute of Aquatic Science and Technology). Her PhD research involved urine separation as a novel approach in the field of wastewater technology, with a strong chemical focus including thermodynamic modelling. Her practical knowledge in the field of struvite precipitation from urine has been employed in several research pilot projects in low-income countries as well as the Netherlands. Dr. Ronteltap's main research topics include nutrient and energy recovery, water conservation and reclamation, and sustainable and



ecological sanitation. Dr. Ronteltap is supervising several PhD and master's research projects in these topics. Through connecting with international organisations and platforms, she aims to contribute to global knowledge in these fields. Dr. Ronteltap also coordinates several online and short courses at UNESCO-IHE, including the online course and the short course on Faecal Sludge Management.

Damir Brdjanovic

Prof. Damir Brdjanovic is the Head of the Environmental Engineering and Water Technology Department of UNESCO-IHE (Institute for Water Education). The professional mission of Prof. Brdianovic is to contribute to a balance of knowledge development, research and capacity building in the urban sanitation field, with a clear view of the needs of low- and middle-income countries. The unifying vision of his research activities is integrated management of the urban water cycle, which includes provision of sanitation to the urban poor, onsite decentralised sanitation, urban drainage, wastewater collection, treatment and reclamation/reuse, and residuals management. His approach includes centralised to decentralised approaches, advanced versus low-cost technologies, and engineered versus natural systems. Prof.



Brdjanovic's research group is also conducting research in emergency sanitation, resource oriented sanitation, faecal sludge management, anaerobic treatment, membrane bio-reactors and infrastructure asset management. His research is conducted through experimental work at laboratory, pilot, and field scale as well as mathematical modelling, decision support and process optimisation in municipal and industrial applications. Prof. Brdjanovic is currently leading a large research and education project for pro-poor sanitation funded by the Bill & Melinda Gates Foundation.

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Foreword

Doulaye Kone

After decades promoting sanitation in low- and middle-income countries, several countries and the global sanitation community have come to realise that it is time to rethink the approach to accelerating access to quality services. Since 2000, the Joint Monitoring Program (WHO/UNICEF) of the Millennium Development Goals (MDG) has consistently reported that the share of the population in low- and middle-income countries that use pit latrines, septic tanks, and systems termed as 'unimproved' sanitation facilities is growing. It is now estimated that between 2.1 – 2.6 billion people in low- and middle-income countries rely on onsite technologies that produce tons of untreated faecal sludge (FS) every day. When septic tanks and pit latrines become full, the sludge that is collected from them is largely discharged untreated into open drains, irrigation fields, open lands, or surface waters. The amount of untreated FS discharged into the open environment poses a serious public health risk. A 5 m³ truck load of FS dumped into the environment is the equivalent of 5,000 people practicing open defecation. Adding to this is the heavy load from open defecation of raw faeces excreted in the open by an additional 1.1 billion people who still do not have access to any toilet. The consequences of this waste entering the environment are staggering. The World Bank estimates that poor sanitation costs the world 260 billion USD annually. Poor sanitation contributes to 1.5 million child deaths from diarrhoea each year. Chronic diarrhoea can also hinder child development by impeding the absorption of essential nutrients that are critical to the development of the mind, body, and immune system. It can also impede the absorption of life-saving vaccines.

In the 1980s, under the leadership of Roland Scherteinleib and Martin Strauss, the Swiss Federal Institute of Aquatic Science and Technology (EAWAG) established the Department of Water and Sanitation for Developing Countries (SANDEC) with a strong research and development focus on FS management (FSM). Since then, SANDEC has been a research pioneer in developing, evaluating and testing sanitation solutions, complemented by a strong policy and advocacy program. It has both informed and driven a global call to action on the issue.

This book is an impressive resource that capitalises on recent scientific evidence and practical solutions tested at scale by sector professionals. It compiles lessons drawn from rigorous scientific and case study investigations to formulate operational approaches and solutions for planners, engineers, scientists, students, and researchers. I personally coordinated an intensive and very exciting part of this work while working at SANDEC as a program officer and as team leader of the FSM team, which later became the Excreta and Wastewater Management (EWM) Group. This book builds on lessons gathered from Latin America (Argentina), Africa (Benin, Burkina Faso, Cameroun, Cote d'Ivoire, Ghana, Kenya, Mali, Nigeria, Senegal, Togo, Uganda, South Africa) and Asia (Thailand, Cambodia, China, India, Indonesia, Malaysia, Philippines, Thailand, Vietnam). It fills important FSM knowledge gaps, while at the same time acknowledging persistent gaps and identifying new areas of innovation for future research. It is a valuable handbook for any sanitation professional or academic. It is solution-oriented and addresses the issues that real practitioners face (e.g. city managers, engineering companies, development organisations).

From its inception, the Bill & Melinda Gates Foundation's Water Sanitation and Hygiene (WSH) programme has emphasised the strategic importance of improving FSM globally. We have engaged new partners and supported established organisations such as EAWAG/SANDEC and UNESCO-IHE to propose and promote catalytic solutions that can positively impact the lives of billions of people in low- and middle-income countries who do not have access to FSM services. The technologies, project planning tools, and FSM business operation and management practices shared in this book will help stakeholders globally begin to build functional and viable sanitation service chains that benefit poor communities. Key insights on the potential and limitations of technologies, FSM operations, businesses, and the financial and economic value that can be recovered from FS processing will all help to transform sanitation service provision into a more sustainable and profitable business service chain. As the global community is currently looking forward to the 2015 post-MDG solutions, this paradigm will inform new public-private partnership models that promote quality and affordable sanitation services, especially in poor communities where the large majority still live with toilets that are not connected to any infrastructure or public utility services.



Doulaye Kone, PhD Bill & Melinda Gates Foundation Seattle, March 2014

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Contents

| Abou Auth | it the edito ors in alph | ors nabetical order | v vii |
|--------------|--|---|----------|
| Forev | word | | ix |
| Ackn | owledgm | ents | xi |
| | 5 | | |
| Chap | ter 1 | | 1 |
| line | | uation | |
| | | | 1 |
| 1.1 | M/bat is | CTION | 1 |
| 1.2 | Clobal | | 1 |
| 1.5 | Giobai | | 1 |
| 1.4 | Dooloo | | 4 |
| 1.5 | | | 0 |
| 1 4 | Dibling | | 0 |
| 1.0 | ыынод | гарпу | 14 |
| Chap | ter 2 | | 19 |
| Faec | al Sludge | Quantification, Characterisation and Treatment Objectives | |
| Char | les B. Niw | agaba, Mbaye Mbéguéré and Linda Strande | |
| 2.1 | Introdu | ction | 19 |
| 2.2 | Quantii | fication of faecal sludge | 20 |
| | 2.2.1 | Sludge production method | 21 |
| | 2.2.2 | Sludge collection method | 22 |
| 2.3 | Charac | terisation of faecal sludge | 23 |
| 2.4 | Operational factors that impact the variability of faecal sludge | | |
| | 2.4.1 | Toilet usage | 25 |
| | 2.4.2 | Storage duration | 25 |
| | 2.4.3 | Inflow and infiltration | 25 |
| | 2.4.4 | Collection method | 25 |
| | 2.4.5 | Climate | 27 |
| 2.5 | Treatm | ent targets | 27 |
| 2.6 | Treatm | ent objectives | 27 |
| | 2.6.1 | Dewatering | 27 |
| | 2.6.2 | Pathogens | 27 |
| | 2.6.3 | Nutrients | 28 |
| | 2.6.4 | Stabilisation | 28 |
| 2.7 | Treatm | ent concerns | 29 |
| 2.8 | Samplii | ng procedures and programmes | 29 |
| 2.9 | Physica | I-chemical constituents | 32 |
| | 2.9.1 | Nutrients | 32 |
| | 2.9.2 | рН | 34 |
| | 2.9.3 | Total solids | 34 |
| | 2.9.4 | Biochemical oxygen demand and chemical oxygen demand | 35 |
| | | | |

| | 2.9.5 | Oil and grease | 35 |
|--------|-----------|--|----------|
| | 2.9.6 | Grit and sand | 35 |
| | 2.9.7 | Municipal solid waste | 36 |
| 2.10 | Pathoge | ens in faecal sludge | 37 |
| | 2.10.1 | The use of indicators | 39 |
| | 2.10.2 | Coliform bacteria | 39 |
| 2.11 | Conclus | sion | 41 |
| 2.12 | Bibliogr | aphy | 41 |
| | Additio | nal reading material | 43 |
| Chapte | 05.2 | | 15 |
| Troate | nont Mo | chanisms | 40 |
| Magal | ie Bassar | Pierre-Henri Dodane and Linda Strande | |
| 3 1 | Introdu | ction | 15 |
| 3.1 | Physica | | 46 |
| 5.2 | 3 2 1 | Gravity separation | 40 |
| | 3.2.1 | Filtration | 40 |
| | 3.2.2 | Evaporation and evapotranspiration | 40 50 |
| | 324 | Centrifugation | 52 |
| | 3 2 5 | Heat drying | 53 |
| | 3 2 6 | Screening | 53 |
| 33 | Biologia | cal mechanisms | 54 |
| 5.5 | 3 3 1 | Metabolism | 55 |
| | 332 | | 56 |
| | 333 | Types of microorganisms | 56 |
| | 334 | Aerobic treatment | 56 |
| | 335 | Composting | 57 |
| | 3.3.6 | Anaerobic treatment | 58 |
| | 337 | Nitrogen cycling | 59 |
| | 338 | Pathogen reduction | 61 |
| 34 | Chemic | ral mechanisms | 62 |
| 5.1 | 3 4 1 | Alkaline stabilisation | 63 |
| | 342 | Ammonia treatment | 63 |
| | 3 4 3 | Coagulation and flocculation | 63 |
| | 3 4 4 | Conditioning | 64 |
| | 345 | Disinfection of liquid effluents | 64 |
| 3.5 | Biblioar | raphy | 64 |
| 0.0 | 212110g. | | 0. |
| Chapte | er 4 | | 67 |
| Metho | ods and N | Means for Collection and Transport of Faecal Sludge | |
| Geora | es Mikha | el, David M. Robbins, lames E. Ramsay and Mbaye Mbéguéré | |
| 4.1 | Introdu | ction | 67 |
| 4.2 | Typical | duties and responsibilities | 68 |
| | 4.2.1 | Interfacing with clients | 69 |
| | 4.2.2 | Locating the system to be emptied | 70 |
| | 4.2.3 | Determining accessibility | 71 |
| | 4.2.4 | Tools of the trade | 72 |
| 4.3 | Propert | ies of faecal sludge in relation to collection and transport | 73 |
| 4.4 | Manual | collection | 73 |
| | 4.4.1 | Cartridge containment devices | 73 |
| | 4.4.2 | Direct lift | 74 |

| 4.5 | Manual | ly operated mechanical collection | 74 |
|--------|----------|---|-----|
| | 4.5.1 | Sludge gulper | 74 |
| | 4.5.2 | Manually operated diaphragm pumps | 75 |
| | 4.5.3 | Nibbler | 77 |
| | 4.5.4 | MAPET | 77 |
| | 4.5.5 | Comparison of equipment | 77 |
| 4.6 | Fully me | echanised collection | 78 |
| | 4.6.1 | Motorised diaphragm pumps | 78 |
| | 4.6.2 | Trash pump | 79 |
| | 4.6.3 | Motorised pit screw auger | 79 |
| | 4.6.4 | Gobbler | 80 |
| | 4.6.5 | Vehicle-mounted vacuum equipment | 80 |
| | 4.6.6 | Delivering vehicle-mounted vacuum services | 83 |
| | 4.6.7 | Summary of fully mechanised systems | 85 |
| 4.7 | Transpo | ort of faecal sludge | 86 |
| | 4.7.1 | Manual transport | 86 |
| | 4.7.2 | Motorised transport | 87 |
| | 4.7.3 | Delivering faecal sludge to the treatment plant or transfer station | 87 |
| 4.8 | Transfe | r stations | 89 |
| | 4.8.1 | Introduction | 89 |
| | 4.8.2 | Types of transfer stations | 89 |
| | 4.8.3 | Siting of transfer stations | 90 |
| 4.9 | Occupat | tional health and safety | 93 |
| | 4.9.1 | Physical hazards | 93 |
| | 4.9.2 | Chemical hazards | 93 |
| | 4.9.3 | Biological hazards | 93 |
| | 4.9.4 | Other hazards | 93 |
| | 4.9.5 | Mitigating risks | 93 |
| 4.10 | Conclus | ion | 94 |
| 4.11 | Bibliogr | aphy | 94 |
| | Additio | nal reading material | 96 |
| Chapte | er 5 | | 97 |
| Overv | iew of T | reatment Technologies | |
| Marisk | a Rontel | tap, Pierre-Henri Dodane and Magalie Bassan | |
| 5.1 | Introduo | ction | 97 |
| 5.2 | Treatme | ent technology overview | 98 |
| 5.3 | Establis | hed faecal sludge treatment technologies | 100 |
| | 5.3.1 | Co-composting of faecal sludge | 100 |
| | 5.3.2 | Co-treatment in waste stabilisation ponds | 102 |
| | 5.3.3 | Deep row entrenchment | 104 |
| 5.4 | Transfe | rred sludge treatment technologies | 106 |
| | 5.4.1 | Anaerobic digestion | 106 |
| | 5.4.2 | Imhoff tank | 107 |
| | 5.4.3 | Sludge incineration | 108 |
| | 5.4.4 | Mechanical sludge treatment | 109 |
| | 5.4.5 | Lime addition | 110 |
| 5.5 | Innovati | ive technologies for faecal sludge treatment | 111 |
| | 5.5.1 | Vermicomposting | 111 |
| | 5.5.2 | Black Soldier flies | 112 |
| | 5.5.3 | Ammonia treatment | 113 |

| | 5.5.4 | Thermal drying and pelletising | 114 |
|---------|----------|--|-----|
| | 5.5.5 | Solar drying | 116 |
| 5.6 | Selectin | ng treatment technologies | 117 |
| 5.7 | Conclus | 120 | |
| 5.8 | Bibilogr | 120 | |
| Chapte | er 6 | | 123 |
| Settlin | ıg-Thick | ening Tanks | |
| Pierre | -Henri D | odane and Magalie Bassan | |
| 6.1 | Introduo | ction | 123 |
| 6.2 | Fundam | nental mechanisms | 125 |
| | 6.2.1 | Settling | 125 |
| | 6.2.2 | Thickening | 126 |
| | 6.2.3 | Flotation | 126 |
| | 6.2.4 | Anaerobic digestion | 127 |
| | 6.2.5 | Solids-liquid zones | 127 |
| 6.3 | Design | of settling-thickening tanks | 127 |
| | 6.3.1 | Laboratory tests and faecal sludge characteristics | |
| | | influencing the design | 127 |
| | 6.3.2 | Tank surface and length | 129 |
| | 6.3.3 | Tank volume | 129 |
| | 6.3.4 | Inlet and outlet configuration | 131 |
| 6.4 | Operati | on and maintenance of settling-thickening tanks | 132 |
| | 6.4.1 | Sludge and scum removal | 132 |
| | 6.4.2 | Start-up period and seasonal variations | 133 |
| 6.5 | Perform | nance of settling-thickening tanks | 135 |
| | 6.5.1 | Solids-liquid separation | 135 |
| | 6.5.2 | Treatment performance | 135 |
| 6.6 | Advanta | ages and constraints of settling-thickening tanks | 136 |
| 6.7 | Design l | Example for a settling-thickening tank | 136 |
| | 6.7.1 | Initial situation | 136 |
| | 6.7.2 | Assumptions and design decisions | 136 |
| | 6.7.3 | Design calculations | 137 |
| | 6.7.4 | Mass flow analysis of faecal sludge treatment | 138 |
| 6.8 | Bibliogr | aphy | 139 |
| Chapte | er 7 | | 141 |
| Unpla | nted Dry | ring Beds | |
| Pierre | -Henri D | odane and Mariska Ronteltap | |
| 7.1 | Introduo | ction | 141 |
| 7.2 | Treatme | ent principle | 141 |
| 7.3 | Unplant | ted sludge drying bed design parameters | 142 |
| | 7.3.1 | Climate factors | 142 |
| | 7.3.2 | Type of faecal sludge | 143 |
| | 7.3.3 | Sludge loading rate | 145 |
| | 7.3.4 | Thickness of the sludge layer | 145 |
| | 7.3.5 | Number of beds | 146 |
| | 7.3.6 | Summary of design parameters | 146 |
| 7.4 | Constru | iction of an unplanted sludge drying bed | 147 |
| | 7.4.1 | Gravel and sand | 147 |
| | 7.4.2 | Sludge removal | 148 |
| | | | |

| 7.6 Design example 15 7.6.1 Example 1: known drying time 15 7.6.2 Example 1: known drying time 15 7.6.2 Example 2: design for settled sludge under good climate conditions 15 7.7.1 Piping systems 15 7.7.2 Greenhouses 15 7.7.3 Wedge wire 15 7.7.4 Additives to the sludge to enhance drying 15 7.8 Conclusions 15 7.9 References 15 Chapter 8 15 Planted Drying Beds 15 8.1 Introduction 15 8.2 Macrophytes 15 8.3 Treatment mechanisms 15 8.3.1 Infiltration (percolation) 15 8.3.3 Stabilisation/mineralisation 16 8.4.1 Dewayer marker 16 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.5 Otheqon idund anittenance 16 | 7.5 | Quality | of dried sludge and leachate | 149 |
|--|--------|------------|--|-----|
| 7.6.1 Example 1: known drying time 15 7.6.2 Example 2: design for settled sludge under good climate conditions 15 7.7 Innovations and adaptations in sludge drying beds 15 7.7.1 Piping systems 15 7.7.2 Greenhouses 15 7.7.3 Wedge wire 15 7.7.4 Additives to the sludge to enhance drying 15 7.8 Conclusions 15 7.8 Conclusions 15 7.9 References 15 Planted Drying Beds Ves Magloire Kengne and Elizabeth Tilley 8.1 Introduction 15 8.2 Kacrophytes 15 8.3 Treatment mechanisms 15 8.3.1 Infiltration (percolation) 15 8.3.2 Evapotranspiration 15 8.3.3 Stabilisation/mineralisation 16 8.4.1 Dewatering 16 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 <td>7.6</td> <td>Design</td> <td>example</td> <td>151</td> | 7.6 | Design | example | 151 |
| 7.6.2 Example 2: design for settled sludge under good climate conditions 15 7.7 Innovations and adaptations in sludge drying beds 15 7.7.1 Piping systems 15 7.7.2 Greenhouses 15 7.7.3 Wedge wire 15 7.7.4 Additives to the sludge to enhance drying 15 7.7.4 Additives to the sludge to enhance drying 15 7.8 Conclusions 15 7.9 References 15 Planted Drying Beds Vises Magloire Kengne and Elizabeth Tilley 8.1 Introduction 15 8.2 Macrophytes 15 8.3 Treatment mechanisms 15 8.3.1 Infiltration (percolation) 15 8.3.2 Evapotranspiration 16 8.4.3 Fate of heavy metals 16 8.4.4 Performance indicators 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.6.4 Pathoge | | 7.6.1 | Example 1: known drying time | 151 |
| 7.7 Innovations and adaptations in sludge drying beds 15 7.7.1 Piping systems 15 7.7.2 Greenhouses 15 7.7.3 Wedge wire 15 7.7.4 Additives to the sludge to enhance drying 15 7.8 Conclusions 15 7.8 Conclusions 15 7.8 Conclusions 15 7.9 References 15 Chapter 8 15 1 Planted Drying Beds 1 1 Ives Magloire Kengne and Elizabeth Tilley 1 1 8.1 Introduction 15 5 8.3 Treatment mechanisms 15 8.3.1 Infiltration (percolation) 15 8.3.2 Evapotranspiration 16 8.4.2 Devetring 16 8.4.1 Dewatering 16 8.4.3 Fate of heavy metals 16 8.4.3 Fate of heavy metals 16 8.4.5 Other considerations 16 8.5.5 Design and construction 16 8.6.5 Deatron and maintenance 16 | | 7.6.2 | Example 2: design for settled sludge under good climate conditions | 151 |
| 7.7.1 Piping systems 15 7.7.2 Greenhouses 15 7.7.3 Wedge wire 15 7.7.4 Additives to the sludge to enhance drying 15 7.8 Conclusions 15 7.9 References 15 Chapter 8 15 Planted Drying Beds 15 Ives Magloire Kengne and Elizabeth Tilley 15 8.1 Introduction 15 8.2 Macrophytes 15 8.3 Treatment mechanisms 15 8.3.1 Infiltration (percolation) 15 8.3.3 Stabilisation/mineralisation 16 8.4.1 Dewatering 16 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.4.6 Plant harvesting and leigt excumulation 16 8.5.1 Fate of heavy metals 16 8.4.2 Nutrient removal 16 8.4.3 Gate onstruction <td>7.7</td> <td>Innovat</td> <td>ions and adaptations in sludge drying beds</td> <td>151</td> | 7.7 | Innovat | ions and adaptations in sludge drying beds | 151 |
| 7.7.2 Greenhouses 15 7.7.3 Wedge wire 15 7.7.4 Additives to the sludge to enhance drying 15 7.8 Conclusions 15 7.8 Conclusions 15 7.9 References 15 Planted Drying Beds 15 Ves Magloire Kengne and Elizabeth Tilley 8.1 8.1 Introduction 15 8.2 Macrophytes 15 8.3 Treatment mechanisms 15 8.3.1 Infiltration (percolation) 15 8.3.2 Evapotranspiration 15 8.3.3 Stabilisation/mineralisation 16 8.4.4 Oxygen transfer 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.5.1 Degration and maintenance 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bedemptying 17 | | 7.7.1 | Piping systems | 152 |
| 7.7.3 Wedge wire 15 7.7.4 Additives to the sludge to enhance drying 15 7.8 Conclusions 15 7.9 References 15 Chapter 8 15 Planted Drying Beds Ves Magloire Kengne and Elizabeth Tilley 8.1 Introduction 15 8.2 Macrophytes 15 8.3 Treatment mechanisms 15 8.3.1 Infiltration (percolation) 15 8.3.2 Evapotranspiration 16 8.3.3 Stabilisation/mineralisation 16 8.4 Performance indicators 16 8.4.1 Dewatering 16 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.5 Design and construction 16 8.6.1 Commissioning/ start-up 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 </td <td></td> <td>7.7.2</td> <td>Greenhouses</td> <td>152</td> | | 7.7.2 | Greenhouses | 152 |
| 7.7.4 Additives to the sludge to enhance drying 15 7.8 Conclusions 15 7.9 References 15 Chapter 8 15 Planted Drying Beds 15 Ves Magloire Kengne and Elizabeth Tilley 15 8.1 Introduction 15 8.2 Macrophytes 15 8.3 Treatment mechanisms 15 8.3.1 Infiltration (percolation) 15 8.3.2 Evapotranspiration 16 8.3.3 Stabilisation/mineralisation 16 8.3.4 Oxygen transfer 16 8.4.1 Dewatering 16 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.4.5 Other considerations 16 8.6.6 Design and construction 16 8.6.7 Factors affecting performance 17 8.6.6 Leading frequency and resting phase 17 8.6.7 Factors affecting performance 17 8.6.7 Factors affecting performance 17 8.6.7 Factors affecting performance | | 7.7.3 | Wedge wire | 152 |
| 7.8 Conclusions 15 7.9 References 15 Chapter 8 15 Planted Drying Beds 15 Ves Magloire Kengne and Elizabeth Tilley 15 8.1 Introduction 15 8.2 Macrophytes 15 8.3 Treatment mechanisms 15 8.3.1 Infiltration (percolation) 15 8.3.2 Evapotranspiration 16 8.3.3 Stabilisation/mineralisation 16 8.4.4 Pathogent transfer 16 8.4.1 Dewatering 16 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.6.1 Commissioning/ start-up 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.6 Leachate 17 8.7 | | 7.7.4 | Additives to the sludge to enhance drying | 153 |
| 7.9 References 15 Chapter 8 15 Planted Drying Beds 15 Ves Magloire Kengne and Elizabeth Tilley 15 8.1 Introduction 15 8.2 Macrophytes 15 8.3 Treatment mechanisms 15 8.3.1 Infiltration (percolation) 15 8.3.2 Evapotranspiration 16 8.3.3 Stabilisation/mineralisation 16 8.3.4 Oxygen transfer 16 8.4.1 Dewatering 16 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.5 Design and construction 16 8.6.1 Commissioning / start-up 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.6 Leachate 17 8.6.7 Factors affecting performance 17 8.6.7 Factors affecting performance 17 < | 7.8 | Conclus | sions | 153 |
| Chapter 8 15 Planted Drying Beds 15 Ves Magloire Kengne and Elizabeth Tilley 1 8.1 Introduction 15 8.2 Macrophytes 15 8.3 Treatment mechanisms 15 8.3.1 Infiltration (percolation) 15 8.3.3 Stabilisation/mineralisation 16 8.3.4 Oxygen transfer 16 8.4 Performance indicators 16 8.4.1 Dewatering 16 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.6.1 Commissioning/ start-up 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.7 Factors affecting performance 17 8.7 Factors affecting performance 17 | 7.9 | Referen | lices | 153 |
| Platted Drying Beds lves Magloire Kengne and Elizabeth Tilley 8.1 Introduction 15 8.2 Macrophytes 15 8.3 Treatment mechanisms 15 8.3.1 Infiltration (percolation) 15 8.3.2 Evapotranspiration 16 8.3.3 Stabilisation/mineralisation 16 8.3.4 Oxygen transfer 16 8.4 Oxygen transfer 16 8.4.1 Dewatering 16 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.6.0 Operation and maintenance 16 8.6.1 Commissioning/ start-up 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.6 Leachate 17 8.7 Costs and benefits 17 8.8 Example problem 17 8.8.1 Practice question 17 8.9 Conclusions and recommendations 17 8.9 Conclusions and recommendations 17 8.9 Conclusions and recommendations 17 8.10 Bibliography 17 9.2 Faecal Sludge in Municipal Wastewater Treatment Plants Cartos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 9.1 Introduction 17 9.2.1 Characterisation ratios 17 9.2.2 Biodegradability and fractionation 17 9.2.1 Characterisation ratios 17 9.2.2 Biodegradability and fractionation 17 | Chapt | er 8 | | 155 |
| Ives Magloire Kengne and Elizabeth Tilley 8.1 Introduction 15 8.2 Macrophytes 15 8.3 Treatment mechanisms 15 8.3.1 Infiltration (percolation) 15 8.3.2 Evapotranspiration 15 8.3.3 Stabilisation/mineralisation 16 8.3.4 Oxygen transfer 16 8.4.1 Dewatering 16 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.4.5 Other considerations 16 8.4.5 Other considerations 16 8.4.5 Other considerations 16 8.6.6 Design and construction 16 8.6.7 Commissioning/ start-up 16 8.6.8 Feeding frequency and resting phase 17 8.6.7 Factors affecting performance 17 8.6.7 Factors affecting performance 17 8.6.7 Factors affecting performance <td>Plante</td> <td>ed Drying</td> <td>y Beds</td> <td></td> | Plante | ed Drying | y Beds | |
| 8.1 Introduction 15 8.2 Macrophytes 15 8.3 Treatment mechanisms 15 8.3.1 Infiltration (percolation) 15 8.3.2 Evapotranspiration 15 8.3.3 Stabilisation/mineralisation 16 8.3.4 Oxygen transfer 16 8.4.4 Performance indicators 16 8.4.1 Dewatering 16 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.4.5 Other considerations 16 8.6 Design and construction 16 8.6 Design and construction 16 8.6.1 Commissioning/ start-up 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.6 Leachate | Ives N | 1agloire k | Kengne and Elizabeth Tilley | |
| 8.2 Macrophytes 15 8.3 Treatment mechanisms 15 8.3.1 Infiltration (percolation) 15 8.3.2 Evapotranspiration 16 8.3.3 Stabilisation/mineralisation 16 8.3.4 Oxygen transfer 16 8.4 Performance indicators 16 8.4.1 Dewatering 16 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.5.4.5 Other considerations 16 8.6.6 Design and construction 16 8.6.7 Commissioning/ start-up 16 8.6.8 Feeding frequency and resting phase 17 8.6.1 Commissioning/ start-up 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.7< | 8.1 | Introdu | ction | 155 |
| 8.3 Treatment mechanisms 8.3.1 Infiltration (percolation) 8.3.2 Evapotranspiration 8.3.3 Stabilisation/mineralisation 8.3.4 Oxygen transfer 8.4 Performance indicators 8.4.1 Dewatering 8.4.1 Dewatering 8.4.2 Nutrient removal 8.4.3 Fate of heavy metals 8.4.4 Pathogen removal 8.4.5 Other considerations 8.5 Design and construction 8.6.1 Commissioning/ start-up 8.6.2 Loading rates and sludge accumulation 8.6.3 Feeding frequency and resting phase 8.6.4 Plant harvesting and regrowth 8.6.5 Bed emptying 8.6.6 Leachate 8.6.7 Factors affecting performance 8.6.7 Factors affecting performance 8.7 Costs and benefits 8.8 Example problem 8.8.1 Practice question 8.8 Example problem 8.9 Conclusions and recommendations 8.1 Practice question 8.10 Bibliography 77 72 Character Sludge in Municipal Wastewater Treatment Plants 73 Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 9.1 Introduction 9.2.1 Characterisation ratios 74 | 8.2 | Масгор | hytes | 157 |
| 8.3.1 Infiltration (percolation) 15 8.3.2 Evapotranspiration 15 8.3.3 Stabilisation / mineralisation 16 8.3.4 Oxygen transfer 16 8.4.1 Dewatering 16 8.4.1 Dewatering 16 8.4.1 Dewatering 16 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.5 Design and construction 16 8.6 Operation and maintenance 16 8.6.1 Commissioning/ start-up 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.6 Leachate 17 8.6.7 Factors affecting performance 17 8.7 Costs and benefits 17 8.8 Practice question< | 8.3 | Treatmo | ent mechanisms | 159 |
| 8.3.2 Evapotranspiration 15 8.3.3 Stabilisation/mineralisation 16 8.3.4 Oxygen transfer 16 8.4 Performance indicators 16 8.4.1 Dewatering 16 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.4.5 Other considerations 16 8.4.6 Operation and maintenance 16 8.6.1 Commissioning/ start-up 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.6 Leachate 17 8.6.7 Factors affecting performance 17 8.7 Costs and benefits 17 8.8.1 Practice question 17 8.9 Conclusions and recommendations 17 8.9 <td< td=""><td></td><td>8.3.1</td><td>Infiltration (percolation)</td><td>159</td></td<> | | 8.3.1 | Infiltration (percolation) | 159 |
| 8.3.3 Stabilisation/mineralisation 16 8.3.4 Oxygen transfer 16 8.4 Performance indicators 16 8.4.1 Dewatering 16 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.5 Design and construction 16 8.6 Operation and maintenance 16 8.6.1 Commissioning/ start-up 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.6 Leachate 17 8.7 Costs and benefits 17 8.8 Example problem 17 8.9 Conclusions and recommendations 17 8.10 Practice question 17 8.10 Bibliography 17 Chapter 9 17 | | 8.3.2 | Evapotranspiration | 159 |
| 8.3.4 Oxygen transfer 16 8.4 Performance indicators 16 8.4.1 Dewatering 16 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.4.5 Other considerations 16 8.5 Design and construction 16 8.6 Operation and maintenance 16 8.6.1 Commissioning/ start-up 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.6 Leachate 17 8.6.7 Factors affecting performance 17 8.7 Costs and benefits 17 8.8 Example problem 17 8.9 Conclusions and recommendations 17 8.10 Bibliography 17 Introduction< | | 8.3.3 | Stabilisation/mineralisation | 160 |
| 8.4 Performance indicators 8.4.1 Dewatering 8.4.1 Dewatering 8.4.2 Nutrient removal 8.4.3 Fate of heavy metals 8.4.4 Pathogen removal 8.4.4 Pathogen removal 8.4.5 Other considerations 8.5 Design and construction 8.6 Operation and maintenance 8.6.1 Commissioning/ start-up 8.6.2 Loading rates and sludge accumulation 8.6.3 Feeding frequency and resting phase 8.6.4 Plant harvesting and regrowth 8.6.5 Bed emptying 8.6.6 Leachate 8.6.7 Factors affecting performance 8.6.8 Example problem 8.8.1 Practice question 8.8.1 Practice question 8.8.1 Practice question 77 8.8.1 Practice question 77 70 Conclusions and recommendations 77 710 Bibliography 77 72 Chapter 9 73 74 Introduction 74 75 75 Conclusions and recommendations 77 76 Co-treatment of Faecal Sludge in Municipal Wastewater Treatment Plants 77 72 Faecal sludge biodegradability and fractionation 73 74 75 75 76 76 77 76 76 77 76 76 77 77 76 76 77 77 78 76 77 76 76 77 76 76 77 76 76 77 76 77 76 77 76 77 76 76 77 76 76 77 76 77 76 76 77<!--</td--><td></td><td>8.3.4</td><td>Oxygen transfer</td><td>160</td> | | 8.3.4 | Oxygen transfer | 160 |
| 8.4.1 Dewatering 16 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.4.6 Operation and maintenance 16 8.6.1 Commissioning/start-up 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.6 Leachate 17 8.6.7 Factors affecting performance 17 8.8.1 Practice question 17 8.8.1 Practice question 17 8.9 Conclusions a | 8.4 | Perform | nance indicators | 161 |
| 8.4.2 Nutrient removal 16 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.5 Design and construction 16 8.6 Operation and maintenance 16 8.6 Operation and maintenance 16 8.6.1 Commissioning/start-up 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.6 Leachate 17 8.6.7 Factors affecting performance 17 8.7 Costs and benefits 17 8.8 Example problem 17 8.8.1 Practice question 17 8.9 Conclusions and recommendations 17 8.10 Bibliography 17 Chapter 9 17 17 Contreatment of Faecal Sludge in Municipal Wastewater Treatment Plants 17 Carlos M. | | 8.4.1 | Dewatering | 161 |
| 8.4.3 Fate of heavy metals 16 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.5 Design and construction 16 8.6 Operation and maintenance 16 8.6.1 Commissioning/ start-up 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.6 Leachate 17 8.6.7 Factors affecting performance 17 8.7 Costs and benefits 17 8.8 Example problem 17 8.8.1 Practice question 17 8.10 Bibliography 17 Chapter 9 Chapter 9 Chapter 9 Chapter Varguez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 9.1 Introduction 17 9.2 Faecal Sludge in Municipal Wastewater Treatment Plants Carlos M | | 8.4.2 | Nutrient removal | 162 |
| 8.4.4 Pathogen removal 16 8.4.5 Other considerations 16 8.5 Design and construction 16 8.6 Operation and maintenance 16 8.6.1 Commissioning/start-up 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.6 Leachate 17 8.6.7 Factors affecting performance 17 8.6.7 Factors affecting performance 17 8.7 Costs and benefits 17 8.8.1 Practice question 17 8.8.1 Practice question 17 8.9 Conclusions and recommendations 17 8.10 Bibliography 17 Chapter 9 17 17 Co-treatment of Faecal Sludge in Municipal Wastewater Treatment Plants 17 Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 17 9.1 Introduction 1 | | 8.4.3 | Fate of heavy metals | 163 |
| 8.4.5 Other considerations 16 8.5 Design and construction 16 8.6 Operation and maintenance 16 8.6.1 Commissioning/ start-up 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.6 Leachate 17 8.6.7 Factors affecting performance 17 8.7 Costs and benefits 17 8.8 Example problem 17 8.8.1 Practice question 17 8.9 Conclusions and recommendations 17 8.10 Bibliography 17 Chapter 9 Chapter 9 Chapter Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 9.1 Introduction 17 9.2.1 Characterisation ratios 17 9.2.2 Biodegradability and fractionation 17 | | 8.4.4 | Pathogen removal | 164 |
| 8.5 Design and construction 8.6 Operation and maintenance 8.6.1 Commissioning/ start-up 8.6.2 Loading rates and sludge accumulation 8.6.2 Loading rates and sludge accumulation 8.6.3 Feeding frequency and resting phase 8.6.4 Plant harvesting and regrowth 8.6.5 Bed emptying 8.6.6 Leachate 8.6.7 Factors affecting performance 8.7 Costs and benefits 8.8 Example problem 8.8.1 Practice question 8.8.1 Practice question 8.9 Conclusions and recommendations 8.10 Bibliography 77 Co-treatment of Faecal Sludge in Municipal Wastewater Treatment Plants Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 9.1 Introduction 9.2.1 Characterisation ratios 9.2.2 Biodegradability and fractionation 77 | | 8.4.5 | Other considerations | 164 |
| 8.6 Operation and maintenance 8.6.1 Commissioning/start-up 8.6.2 Loading rates and sludge accumulation 8.6.2 Loading rates and sludge accumulation 8.6.3 Feeding frequency and resting phase 8.6.4 Plant harvesting and regrowth 8.6.5 Bed emptying 8.6.6 Leachate 8.6.7 Factors affecting performance 8.7 Costs and benefits 8.8 Example problem 8.8.1 Practice question 8.8.1 Practice question 8.9 Conclusions and recommendations 8.10 Bibliography 77 Co-treatment of Faecal Sludge in Municipal Wastewater Treatment Plants Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 9.1 Introduction 9.2 Faecal sludge biodegradability and fractionation 9.2.1 Characterisation ratios 9.2.2 Biodegradability and fractionation | 8.5 | Design | and construction | 165 |
| 8.6.1 Commissioning/ start-up 16 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.6 Leachate 17 8.6.7 Factors affecting performance 17 8.7 Costs and benefits 17 8.8 Example problem 17 8.8.1 Practice question 17 8.9 Conclusions and recommendations 17 8.10 Bibliography 17 Chapter 9 17 17 Co-treatment of Faecal Sludge in Municipal Wastewater Treatment Plants 17 Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 17 9.1 Introduction 17 9.2 Faecal sludge biodegradability and fractionation 17 9.2.1 Characterisation ratios 17 9.2.2 Biodegradability and fractionation 17 | 8.6 | Operati | on and maintenance | 168 |
| 8.6.2 Loading rates and sludge accumulation 16 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.6 Leachate 17 8.6.7 Factors affecting performance 17 8.7 Costs and benefits 17 8.8 Example problem 17 8.8.1 Practice question 17 8.9 Conclusions and recommendations 17 8.10 Bibliography 17 Chapter 9 17 17 Co-treatment of Faecal Sludge in Municipal Wastewater Treatment Plants 17 Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 17 9.1 Introduction 17 9.2 Faecal sludge biodegradability and fractionation 17 9.2.1 Characterisation ratios 17 9.2.2 Biodegradability and fractionation 17 | | 8.6.1 | Commissioning/ start-up | 168 |
| 8.6.3 Feeding frequency and resting phase 17 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.6 Leachate 17 8.6.7 Factors affecting performance 17 8.7 Costs and benefits 17 8.8 Example problem 17 8.8.1 Practice question 17 8.9 Conclusions and recommendations 17 8.10 Bibliography 17 Chapter 9 17 Co-treatment of Faecal Sludge in Municipal Wastewater Treatment Plants 17 Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 17 9.1 Introduction 17 9.2 Faecal sludge biodegradability and fractionation 17 9.2.1 Characterisation ratios 17 9.2.2 Biodegradability and fractionation 17 | | 8.6.2 | Loading rates and sludge accumulation | 169 |
| 8.6.4 Plant harvesting and regrowth 17 8.6.5 Bed emptying 17 8.6.6 Leachate 17 8.6.7 Factors affecting performance 17 8.7 Costs and benefits 17 8.8 Example problem 17 8.8.1 Practice question 17 8.9 Conclusions and recommendations 17 8.10 Bibliography 17 Chapter 9 17 Co-treatment of Faecal Sludge in Municipal Wastewater Treatment Plants 17 Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 17 9.1 Introduction 17 9.2 Faecal sludge biodegradability and fractionation 17 9.2.1 Characterisation ratios 17 9.2.2 Biodegradability and fractionation 17 | | 8.6.3 | Feeding frequency and resting phase | 170 |
| 8.6.5 Bed emptying 17 8.6.6 Leachate 17 8.6.7 Factors affecting performance 17 8.7 Costs and benefits 17 8.8 Example problem 17 8.8.1 Practice question 17 8.9 Conclusions and recommendations 17 8.10 Bibliography 17 Chapter 9 17 Co-treatment of Faecal Sludge in Municipal Wastewater Treatment Plants 17 Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 17 9.1 Introduction 17 9.2 Faecal sludge biodegradability and fractionation 17 9.2.1 Characterisation ratios 17 9.2.2 Biodegradability and fractionation 17 | | 8.6.4 | Plant harvesting and regrowth | 171 |
| 8.6.6 Leachate 17 8.6.7 Factors affecting performance 17 8.7 Costs and benefits 17 8.8 Example problem 17 8.8.1 Practice question 17 8.9 Conclusions and recommendations 17 8.10 Bibliography 17 Chapter 9 17 Co-treatment of Faecal Sludge in Municipal Wastewater Treatment Plants 17 Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 17 9.1 Introduction 17 9.2 Faecal sludge biodegradability and fractionation 17 9.2.1 Characterisation ratios 17 9.2.2 Biodegradability and fractionation 17 | | 8.6.5 | Bed emptying | 171 |
| 8.6.7 Factors affecting performance 17 8.7 Costs and benefits 17 8.8 Example problem 17 8.8 Practice question 17 8.9 Conclusions and recommendations 17 8.10 Bibliography 17 Chapter 9 17 Chapter 9 17 Co-treatment of Faecal Sludge in Municipal Wastewater Treatment Plants 17 Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 17 9.1 Introduction 17 9.2 Faecal sludge biodegradability and fractionation 17 9.2.1 Characterisation ratios 17 9.2.2 Biodegradability and fractionation 17 | | 8.6.6 | Leachate | 171 |
| 8.7 Costs and benefits 17 8.8 Example problem 17 8.8.1 Practice question 17 8.9 Conclusions and recommendations 17 8.10 Bibliography 17 Chapter 9 Chapter 9 Chapter 9 Chapter 9 Co-treatment of Faecal Sludge in Municipal Wastewater Treatment Plants Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 9.1 Introduction 17 9.2 Faecal sludge biodegradability and fractionation 17 9.2.1 Characterisation ratios 17 9.2.2 Biodegradability and fractionation 17 | | 8.6.7 | Factors affecting performance | 172 |
| 8.8 Example problem 17 8.8.1 Practice question 17 8.9 Conclusions and recommendations 17 8.10 Bibliography 17 Chapter 9 17 Chapter 9 17 Chapter 9 17 Co-treatment of Faecal Sludge in Municipal Wastewater Treatment Plants Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 9.1 Introduction 17 9.2 Faecal sludge biodegradability and fractionation 17 9.2.1 Characterisation ratios 17 9.2.2 Biodegradability and fractionation 17 | 8.7 | Costs a | nd benefits | 172 |
| 8.8.1 Practice question 17 8.9 Conclusions and recommendations 17 8.10 Bibliography 17 Chapter 9 17 Chapter 9 17 Co-treatment of Faecal Sludge in Municipal Wastewater Treatment Plants Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 9.1 Introduction 17 9.2 Faecal sludge biodegradability and fractionation 17 9.2.1 Characterisation ratios 17 9.2.2 Biodegradability and fractionation 17 | 8.8 | Example | e problem | 173 |
| 8.9 Conclusions and recommendations 17. 8.10 Bibliography 17. Chapter 9 17. Co-treatment of Faecal Sludge in Municipal Wastewater Treatment Plants Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 9.1 Introduction 17 9.2 Faecal sludge biodegradability and fractionation 17 9.2.1 Characterisation ratios 17 9.2.2 Biodegradability and fractionation 17 | | 8.8.1 | Practice question | 173 |
| 8.10 Bibliography 17 Chapter 9 17 Co-treatment of Faecal Sludge in Municipal Wastewater Treatment Plants 17 Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 17 9.1 Introduction 17 9.2 Faecal sludge biodegradability and fractionation 17 9.2.1 Characterisation ratios 17 9.2.2 Biodegradability and fractionation 17 | 8.9 | Conclus | sions and recommendations | 174 |
| Chapter 9 17 Co-treatment of Faecal Sludge in Municipal Wastewater Treatment Plants 17 Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic 17 9.1 Introduction 17 9.2 Faecal sludge biodegradability and fractionation 17 9.2.1 Characterisation ratios 17 9.2.2 Biodegradability and fractionation 17 | 8.10 | Bibliog | aphy | 174 |
| Co-treatment of Faecal Sludge in Municipal Wastewater Treatment PlantsCarlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic9.1Introduction9.2Faecal sludge biodegradability and fractionation9.2.1Characterisation ratios9.2.2Biodegradability and fractionation179.2.2Biodegradability and fractionation | Chapt | er 9 | | 177 |
| Carlos M. Lopez-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdjanovic9.1Introduction179.2Faecal sludge biodegradability and fractionation179.2.1Characterisation ratios179.2.2Biodegradability and fractionation17 | Co-tr | eatment | of Faecal Sludge in Municipal Wastewater Treatment Plants | |
| 9.1Introduction179.2Faecal sludge biodegradability and fractionation179.2.1Characterisation ratios179.2.2Biodegradability and fractionation17 | Carlo | s M. Lope | z-Vazquez, Bipin Dangol, Christine M. Hooijmans and Damir Brdianovic | |
| 9.2Faecal sludge biodegradability and fractionation179.2.1Characterisation ratios179.2.2Biodegradability and fractionation17 | 9.1 | Introdu | ction | 177 |
| 9.2.1Characterisation ratios179.2.2Biodegradability and fractionation17 | 9.2 | Faecal s | ludge biodegradability and fractionation | 178 |
| 9.2.2 Biodegradability and fractionation 17 | | 9.2.1 | Characterisation ratios | 178 |
| | | 9.2.2 | Biodegradability and fractionation | 179 |
| 9.2.3 Faecal sludge strength 18 | | 9.2.3 | Faecal sludge strength | 182 |

| 9.3 | Co-treat | ment in activated sludge wastewater treatment systems | 184 |
|----------|------------|---|-----|
| | 9.3.1 | Influence on removal efficiencies and effluent quality | 184 |
| | 9.3.2 | Effects on oxygen demand | 185 |
| | 9.3.3 | Impact on sludge generation | 186 |
| | 9.3.4 | Impact on aeration requirements | 187 |
| | 9.3.5 | Impact on secondary settling tanks | 188 |
| | 9.3.6 | Effects of the dynamic discharge of faecal sludge | 189 |
| 9.4 | Practical | considerations for co-treatment of faecal sludge | |
| | in activat | ed sludge systems | 189 |
| 9.5 | Anaerob | ic co-treatment of faecal sludge | 192 |
| | 9.5.1 | COD overloading | 193 |
| | 9.5.2 | Ammonia inhibition | 195 |
| | 9.5.3 | pH variations | 195 |
| | 9.5.4 | Sulphide inhibition | 196 |
| 9.6 | Practical | considerations for co-treatment of faecal sludge in anaerobic systems | 196 |
| 9.7 | Conclusi | ons | 198 |
| 9.8 | Bibliogra | aphy | 198 |
| | 5 | , , | |
| Chapte | er 10 | | 203 |
| Enduse | e of Treat | tment Products | |
| lves Ke | ngne, Be | rta Moya Diaz-Aquado and Linda Strande | |
| 10.1 | Introduc | tion | 203 |
| 10.2 | Resource | e recovery options | 204 |
| 10.3 | General | Concerns | 204 |
| | 10.3.1 | Pathogens | 204 |
| | 10.3.2 | Heavy metals | 205 |
| | 10.3.3 | Social factors | 206 |
| 10.4 | Use of fa | ecal sludge as a soil conditioner | 206 |
| | 10.4.1 | Nutrient content | 207 |
| | 10.4.2 | Untreated faecal sludge | 208 |
| | 10.4.3 | Treated faecal sludge in land application | 209 |
| 10 5 | Use of lic | nuid streams | 211 |
| 10.5 | 10 5 1 | Untreated liquid faecal sludge in irrigation | 211 |
| | 10.5.2 | Treated effluent enduse and disposal | 212 |
| 10.6 | Addition | al forms of resource recovery | 212 |
| 10.0 | 10 6 1 | Protein | 214 |
| | 10.0.1 | Fodder and plants | 214 |
| | 10.0.2 | Fich and plants | 214 |
| | 10.0.5 | Building materials | 210 |
| | 10.0.4 | Piofuele | 210 |
| 107 | Criterro | | 21/ |
| 10.7 | | ennigs | 223 |
| 10.13 | вібнодга | ipny | 223 |
| Chapta | - 11 | | 221 |
| Chapte | in Mai | atopages and Manitoring of Fascal Sludge Treatment Plant | 231 |
| Magali | e Raccare | and David M. Robbins | |
| iviagall | | | 221 |
| 11.1 | | uuu | 231 |
| 11.2 | integrati | Ing Obivitinto the raecal sludge treatment plant planning process | 233 |
| | 11.2.1 | Location of the faecal sludge treatment plant | 233 |
| | 11.2.2 | Volumes and schedules of faecal sludge delivery | 233 |
| | 11.2.3 | Availability of local resources | 234 |

| | 11.2.4 | Degree of mechanisation of technologies | 235 |
|----------|------------|--|------|
| | 11.2.5 | Final enduse or disposal of treatment products | 235 |
| 11.3 | Receivin | g faecal sludge at the treatment plant | 235 |
| | 11.3.1 | Traffic control | 235 |
| | 11.3.2 | Approving faecal sludge for discharge | 236 |
| 11.4 | Operatio | n $\mathscr E$ maintenance plans | 237 |
| | 11.4.1 | Operational procedures | 237 |
| | 11.4.2 | Maintenance procedures | 238 |
| 11.5 | Asset ma | nagement | 238 |
| 11.6 | Monitori | ng | 240 |
| | 11.6.1 | Monitoring of physical-chemical and microbiological parameters | 240 |
| | 11.6.2 | Analysis manual | 241 |
| 11.7 | Recordk | eeping | 242 |
| | 11.7.1 | Operator's log book | 243 |
| | 11.7.2 | Reception monitoring reports | 243 |
| | 11.7.3 | Treatment unit operation sheets | 243 |
| | 11.7.4 | Interpretation and communication of technical data | 244 |
| 11.8 | Plant sec | urity and safety | 244 |
| | 11.8.1 | Health and safety | 244 |
| | 11.8.2 | Personal protective equipment | 245 |
| | 11.8.3 | Infection control | 246 |
| | 11.8.4 | Emergency contact procedures | 246 |
| | 11.8.5 | Protection against falling and drowning hazards | 246 |
| | 11.8.6 | Confined spaces | 247 |
| | 11.8.7 | Electrical safety | 247 |
| 11 9 | Administ | rative management | 247 |
| | 11 9 1 | Financial procedures | 247 |
| | 11 9 2 | | 248 |
| | 11.9.3 | Staffing, roles and responsibilities | 248 |
| 11 10 | Coordina | ation | 210 |
| 11.10 | Startup | period | 250 |
| 11 12 | Bibliogra | unhy . | 251 |
| 11.12 | Dibliogra | puy | 255 |
| Chapte | er 12 | | 255 |
| Institut | | meworks for Faecal Sludge Management | |
| Magali | e Bassan | | 0.55 |
| 12.1 | Introduc | tion - | 255 |
| 12.2 | Success | actors | 256 |
| 12.3 | Enabling | regulatory environment | 259 |
| 12.4 | Institutio | nal arrangements | 262 |
| | 12.4.1 | Overview of the service chain organisation | 262 |
| | 12.4.2 | Role distribution among the stakeholders | 264 |
| | 12.4.3 | Institutional arrangements for colection and transport | 265 |
| | 12.4.4 | Institutional arrangements for treatment of faecal sludge | 268 |
| | 12.4.5 | Institutional arrangements for enduse and disposal | 270 |
| 12.4 | Bibliogra | phy | 270 |
| Chapte | er 13 | | 273 |
| Financ | ial Trans | fers and Responsibility in Faecal Sludge Management Chains | |
| Elizabe | th Tilley | and Pierre-Henri Dodane | 0.70 |
| 13.1 | Introduc | tion | 2/3 |

| 13.2 | Financia | al models | 274 |
|--------|-----------|---|-----|
| | 13.2.1 | Stakeholders involved in financial transfers | 274 |
| | 13.2.2 | Financial transfers | 275 |
| 13.3 | Financia | al flow models | 279 |
| 13.4 | Financia | al perspective of a collection and transport enterprise | 286 |
| | 13.4.1 | Future perspectives | 287 |
| | 13.4.2 | Case study example | 288 |
| | 13.4.3 | Problem information | 289 |
| 13.5 | Bibliogr | aphy | 290 |
| Chapt | er 14 | | 295 |
| Asses | sment of | the Initial Situation | |
| Philip | pe Reymo | ond | |
| 14.1 | Introduo | ction | 295 |
| 14.2 | Tools an | nd methods for data collection | 297 |
| | 14.2.1 | Literature review | 298 |
| | 14.2.2 | Semi-structured interviews | 298 |
| | 14.2.3 | Household-level surveys | 301 |
| | 14.2.4 | Qualitative field observations | 303 |
| | 14.2.5 | Mapping | 304 |
| | 14.2.6 | Laboratory analyses | 304 |
| | 14.2.7 | Strengths, weaknesses, opportunities and threats analysis | 305 |
| 14.3 | Data to | be collected | 306 |
| | 14.3.1 | General context | 306 |
| | 14.3.2 | Sanitation sector | 306 |
| | 14.3.3 | Profile of manual and mechanical service providers | 307 |
| | 14.3.4 | Practices at household level | 308 |
| | 14.3.5 | Legal and regulatory framework | 308 |
| | 14.3.6 | Estimation of design parameters | 309 |
| | 14.3.7 | Climatic data | 309 |
| | 14.3.8 | Spatial data and city structure | 309 |
| | 14.3.9 | Enduse practices and market studies | 310 |
| 14.4 | Charact | erisation, evaluation and selection of treatment sites | 312 |
| | 14.4.1 | Identification of treatment sites | 313 |
| | 14.4.2 | Characterisation and evaluation criteria | 314 |
| | 14.4.3 | Number of sites | 315 |
| | 14.4.4 | Sludge from manual emptying | 316 |
| 14.5 | Bibliogr | aphy | 317 |
| Chapt | er 15 | | 319 |
| Stake | holder Aı | nalysis | |
| Philip | ре Кеутс | ond | |
| 15.1 | Introduo | ction | 319 |
| 15.2 | Stakeho | lder analysis: why and how | 321 |
| 15.3 | Identific | cation of stakeholders | 322 |
| | 15.3.1 | Faecal sludge management stakeholders | 322 |
| | 15.3.2 | Differences between large and medium-sized cities | 324 |
| 15.4 | Charact | erisation of stakeholders | 325 |
| | 15.4.1 | Information to be collected | 325 |
| | 15.4.2 | Influence and interest | 326 |
| | 15.4.3 | Selection criteria for key stakeholders | 327 |

| | 15.4.4 | Amalgamation of faecal sludge management stakeholders' main | |
|--------|-----------|---|-----|
| | | characteristics and involvement needs | 328 |
| | 15.4.5 | Practical problems faced by faecal sludge management stakeholders | 328 |
| 15.5 | In practi | ice: iterative selection of key stakeholders | 331 |
| | 15.5.1 | STEP 1: Identification and preliminary characterisation | |
| | | of the stakeholders | 331 |
| | 15.5.2 | STEP 2: Characterisation and selection of the key stakeholders | 334 |
| | 15.5.3 | STEP 3: Reassessment of the key stakeholders according to | |
| | | the validated options | 336 |
| | 15.5.4 | STEP 4: Reassessment according to the Action Plan | 338 |
| | 15.5.5 | STEP 5: Reassessment before the inauguration | |
| | | of the faecal sludge management plant | 339 |
| 15.6 | Bibliogr | aphy | 339 |
| Chapt | er 16 | | 341 |
| Stakel | holder Er | ngagement | |
| Philip | be Reymo | and and Magalie Bassan | |
| 16.1 | Introduo | ction | 341 |
| 16.2 | The imp | portance of engaging stakeholders | 342 |
| 16.3 | Particip | ation levels | 343 |
| | 16.3.1 | From information to delegation | 344 |
| | 16.3.2 | Determination of the participation levels based on | |
| | | the stakeholder analysis | 344 |
| | 16.3.3 | The stakeholder participation matrix | 345 |
| 16.4 | Involver | nent tools | 346 |
| | 16.4.1 | List of involvement tools | 346 |
| | 16.4.2 | Determining the most appropriate involvement tools | 349 |
| 16.5 | Milesto | nes and cross-cutting tasks | 351 |
| | 16.5.1 | Main milestones in the participatory process | 351 |
| | 16.5.2 | Raising awareness | 352 |
| | 16.5.3 | Training and capacity building | 353 |
| 16.6 | Distribu | ting and formalising roles and responsibilities | 355 |
| | 16.6.1 | Formalisation documents | 355 |
| | 16.6.2 | Diagram of relationships | 357 |
| 16.7 | Bibliogr | aphy | 362 |
| Chapt | er 17 | | 363 |
| Planni | ing Integ | rated Faecal Sludge Management Systems | |
| Philip | be Reymo | ond | |
| 17.1 | Introduo | ction | 363 |
| 17.2 | Need fo | r an integrated approach | 367 |
| | 17.2.1 | Understanding and working towards an enabling environment | 368 |
| | 17.2.2 | The importance of a participatory approach | 370 |
| 17.3 | Proposa | l of a planning approach and logical framework | 373 |
| | 17.3.1 | Exploratory and preliminary studies | 376 |
| | 17.3.2 | Feasibility study | 377 |
| | 17.3.3 | Detailed project development – Action Planning | 377 |
| | 17.3.4 | Implementation | 378 |
| | 17.3.5 | Monitoring and evaluation | 378 |
| 17.4 | Selectin | g context-appropriate technical options | 379 |
| | 17.4.1 | Combination of services | 379 |

| | 17.4.2 | Criteria for selection of treatment options | 380 |
|---------|-----------|---|-----|
| | 17.4.3 | Elimination-based approach | 380 |
| | 17.4.4 | Sanitation system proposal | 383 |
| 17.5 | Bibliogra | phy | 387 |
| Chapte | эг 18 | | 389 |
| The W | av Forwa | ırd | 307 |
| Linda S | Strande | | |
| 18.1 | Introduct | tion | 389 |
| | 18.1.1 | Acknowledging the importance of faecal sludge management | 392 |
| | 18.1.2 | Setting up frameworks and responsibilities | 393 |
| | 18.1.3 | Increasing knowledge dissemination and capacity development | 393 |
| | 18.1.4 | Creating sustainable business models and fee structures | 395 |
| | 18.1.5 | Implementingintegrated planning methodologies | 396 |
| | 18.1.6 | Developing appropriate technologies | 398 |
| 18.2 | Characte | risation of faecal sludge | 398 |
| 18.3 | Collectio | n and transport | 400 |
| 18.4 | Semi-cer | ntralised treatment technologies | 400 |
| 18.5 | Onsite tr | eatment technologies | 400 |
| 18.6 | Resource | erecovery | 401 |
| 18.7 | Final rem | narks | 401 |
| 18.8 | Bibliogra | phy | 402 |