Preface

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Biographical notes: Sigrid Kusch is an Environmental Engineer with key specialisation in biological process engineering. After conducting detailed laboratory experiments and applied research in bioenergy, she received a PhD from the University of Hohenheim. She has profound knowledge of biogas production through dry digestion of agricultural and municipal biomass. In addition to her research career with the University of Stuttgart, she is working as a Freelance Consultant to public institutions, farmers and engineering firms.

Martin Kranert is a Full Professor with the University of Stuttgart, Institute for Sanitary Engineering, Water Quality and Solid Waste Management. He teaches undergraduate and graduate courses in waste management and waste technology. His current research areas cover material flow and resource management, biological waste treatment processes, waste management concepts for economically emerging countries, landfill issues, decentralised recycling systems and emission reduction related to waste treatment.

Martin Reiser was educated as a Chemist and obtained his PhD with research focusing on innovative technologies for reduction of gaseous emissions by biological processes. He is head of the working group "Technologies and Analytical Methods in Air Pollution Control" at the Institute for Sanitary Engineering, Water Quality and Solid Waste Management and is an expert in analytical procedures related to air emissions, determination and characterisation of odour nuisances, process technologies for air pollution control, application and optimisation of biofilters.

Currently, the most common strategy for management of municipal solid waste is landfill. Since developing countries are moving away from open dumping to controlled landfills, the topic is of increasing interest internationally. As a result of increased environmental awareness, the impact of landfills on greenhouse gas emissions and contamination of groundwater and surface waters is being critically assessed worldwide.

This special issue brings together research findings from various working groups and addresses an international audience of both researchers and practitioners. The special

issue presents research results on a variety of topics related to the management of landfills including leachate treatment, reduction of gaseous emissions, behaviour of the waste body and the possible impact of landfills on the value of land in the surrounding area.

Chiemchaisri et al. report on the effective treatment of effluent from a membrane bioreactor in reverse osmosis membrane application and look at both fresh and partially stabilised leachate. Poznyak and Chairez present a kinetic study of toxic pollutants decomposition by ozonation of landfill leachate; the authors have developed a new numerical adaptive method based on the classical least square method. Van Nooten et al. studied removal of ammonium from landfill leachate in a column-scale multibarrier, combining nitrification and ion exchange processes, and found clinoptilolite offering potential for in-situ bioregeneration. The occurrence of persistent organic pollutants in leachates from municipal landfills is discussed by Dudzinska and Czerwinski. According to results of field studies even in rural areas, landfill leachates contain a variety of such components and general attention should be paid to the topic when managing and treating them.

When looking at methane emissions from landfills, the moisture content of landfill soil covers is a parameter of special importance, but not of simple analytical determination. Tecle and Lee have used Time Domain Reflectometry for in situ moisture content measurement and report on their findings with this application. Abichou et al. investigated the use of biofilters to reduce methane emissions from passive gas vents and found that a radial biofilter design achieved a significantly higher methane oxidation rate when compared with an alternatively designed biofilter. Lafond et al. have developed a simple indicator approach to evaluate methane oxidation in a landfill cover material. Though their approach only gives a rough estimation of the methane oxidation rate, it does allow for affordable continuous monitoring of oxidation rates in biocovers. Evaluation of actual methane oxidation in the field is one of the major challenges for researchers in this area. Quantification of methane oxidation rate is also of crucial importance for the recognition and acceptance of microbial methane oxidation as a reliable methane emission reduction method.

All emissions from landfills, whether in liquid or gaseous form, are closely related to the characteristics of landfilled materials and thus actual landfill content. Pre-treatment of wastes prior to landfilling has potential to significantly reduce emissions from landfills. In their paper, Belgiorno et al. discuss stabilisation options of a mechanically sorted organic fraction from municipal solid waste prior to landfill disposal. Techniques aiming at accelerated stabilisation of waste in landfills are of interest due to their ability to reduce overall emissions and necessary landfill after-care. Nikolaou et al. report on findings from a study on sequential aerobic–anaerobic treatment of municipal solid waste in a bioreactor landfill with leachate recirculation. The research was carried out at laboratory scale and indicated positive effects of an aerobic phase. Accelerated degradation in a bioreactor landfill influences the waste material in different aspects. The study of Hossain and Penmethsa focuses on changes in geotechnical properties of solid waste in a bioreactor landfill.

Besides environmental concerns, economic aspects are related to the presence and management of landfills. Isoto et al. studied the effect of landfills on land-prices in surrounding areas and quantified the marginal willingness to pay for extra units of distance away from the landfill. The authors stress various factors that should be taken into account in policies for location of landfills and waste recycling facilities.

Though landfills in most countries currently are key elements in the management of solid waste, it should be kept in mind that disposal is at the bottom of waste hierarchy, as framed for example in EU legislation. All sustainable waste treatment schemes request priority for waste minimisation, and special attention should be given to re-use, recycling and recovery practices. Waste destined for landfilling needs to be minimised and in particular reduction of the biodegradable fraction offers significant potential to diminish gaseous and liquid emissions originating from landfills. The necessary specific knowledge and appropriate techniques are available.

We would very much like to thank all the authors for having submitted their research results for publication in this special issue. We strongly believe that the papers compiled here demonstrate vital progress in the topic of adequate landfill management, reduction of greenhouse gas emissions and efficient leachate treatment.

The collaboration of the reviewers is also gratefully acknowledged. Their expertise and willingness to thoroughly carry out the review was of decisive influence on the final quality.

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