

**FORECASTING THE AMOUNT OF MSW INCINERATION IN MACAO BY
USING SYSTEM DYNAMIC METHOD**

by

Guan Yichen



Faculty of Science and Technology

University of Macau

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A thesis submitted in partial fulfillment of the
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Approved by _____

Supervisor

Date _____

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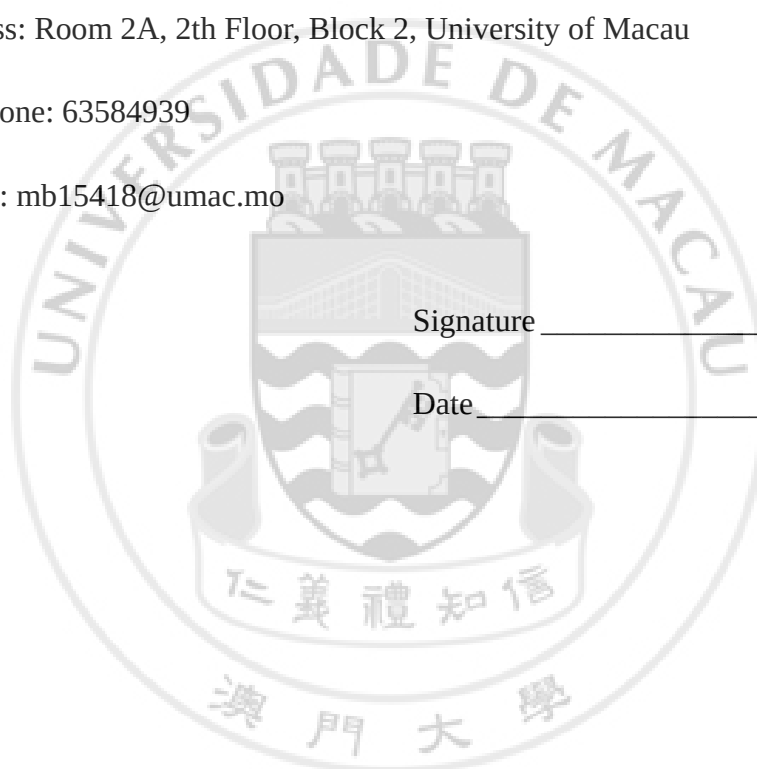
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Abstract

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by Guan Yichen

Thesis Supervisor: Professor Wang Zhishi

Department of Civil and Environmental Engineering

An understanding of the relationships between the quantity and quality of environmentally relevant outputs from human processes and regional characteristics is a prerequisite for planning and implementing ecologically sustainable strategies. Apart from process-related parameters, continuous and discontinuous socio-economic long-term trends often play a key role in the assessment of environmental impacts. This paper describes the development of a prognosis model for municipal solid waste (MSW) generation in Macao. The objective is to assess future amount of incineration and landfill in Macao, and provide an alternative solution for the issue of urban solid waste management. By the evaluation procedure of current method, there will be some better policy and regulation in generating and conducting solid waste in Macao.

Nowadays, there are many ways for management and disposal of the MSW, including air storage, landfill, incineration and compost. With the rapidly increasing of solid waste, the method and technology to manage it would be more rigorous. This paper discusses the present status and future trend of MSW management in Macao.

Macao has an area of 29.9km², length of coastline is 416.0km, mean air temperature of 21.9°C, mean relative humidity of 76.0%, population of 557,400 and GDP of 292,090 millions MOP in 2011. As it being a significant tourist city in East Asia, rapidly increasing visitors and external population give a threat in managing MSW to Macao. The status of disposal of MSW in Macao is incineration given a priority to

landfill, some low heat value solid waste and inadequacy for incineration (construction solid waste) are transported to landfill plant to dispose, and medical solid waste or hazard solid waste will be transported to hazardous management plant first, then they will be landfill eventually. To study and solve this situation, this paper will discuss the amount of incineration and landfill using system dynamic method, and forecast the future amount till 2025. Linear regression and sensitivity analysis are conducted to identify and assess the variables. In this paper's calculation, Population, GDP(Gross Domestic Product), Government Spending, Visitors, Gaming, Domestic Solid Waste(DSW), Industrial and Commercial Solid Waste(ICSW), Salary, recycle amount from 2000 to 2025 are using for statistic analysis in system dynamic model. The software used for setting model and simulation is VENSIM® PLE version

Being a small and densely populated city, Macao has a very high per capita solid waste generation in the world accounting for 1.79kg per day in 2011. And the amount of solid waste transported to incineration is 329,154t, incineration residual is 73,676t, amount of landfill eventually is 79,452t. If there is nothing changes in policy and regulations, per capita solid waste generation will increase to 2.05 kg per day in 2025, the amount of solid waste transported to incineration is 501,638t, incineration residual is 113,660t, and amount of landfill eventually is 140,000t. The daily conducted amount will reach 1536.5t per day, while the capacity of incinerator is 1700t per day. This shows Macao should pay more attention to solid waste generation and improve the technology of dispose it immediately.

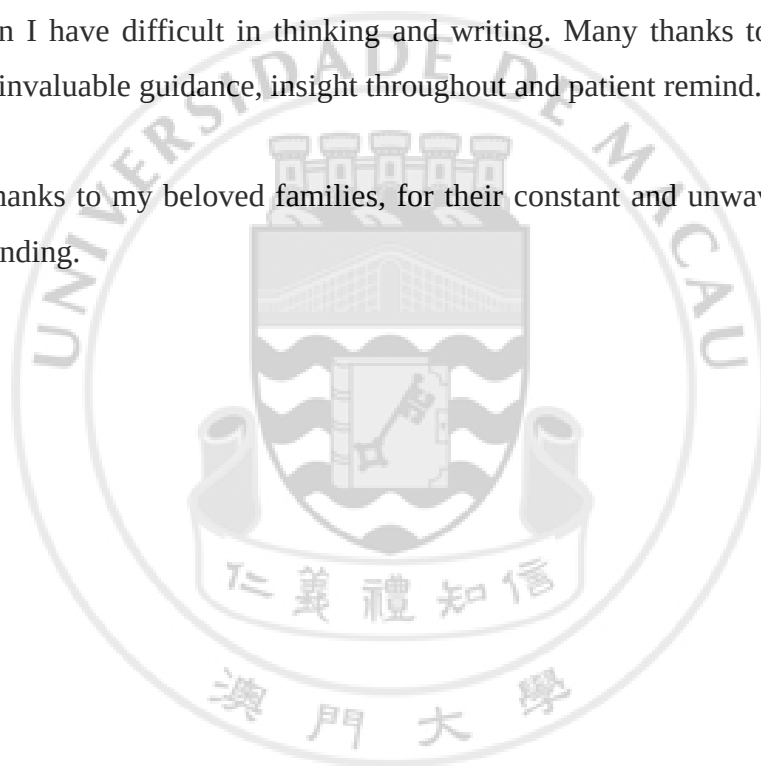
The evaluation of this historic time series and the cross-sectional data by means of multivariate statistical methods has unveiled significant relationships between the status of regional development and municipal solid waste generation. This paper identified a core set of significant indicators, which can describe a long-term development path that predetermines the level of waste generation. These findings concerning this analogy have been integrated in an econometric model for Macao.

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DEDICATION

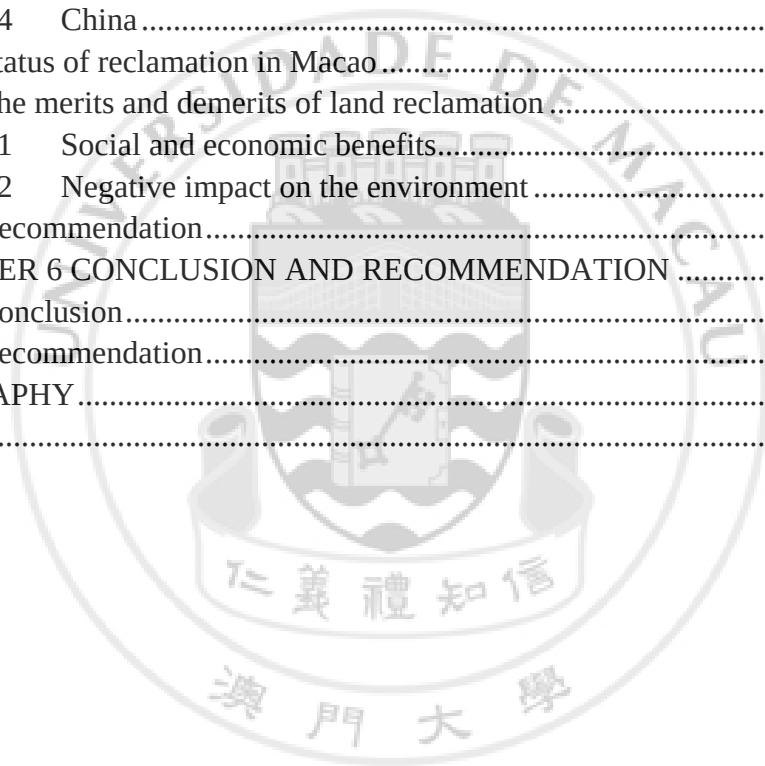
I wish to dedicate this thesis to my family especially my father, I hope he can take care of his health.



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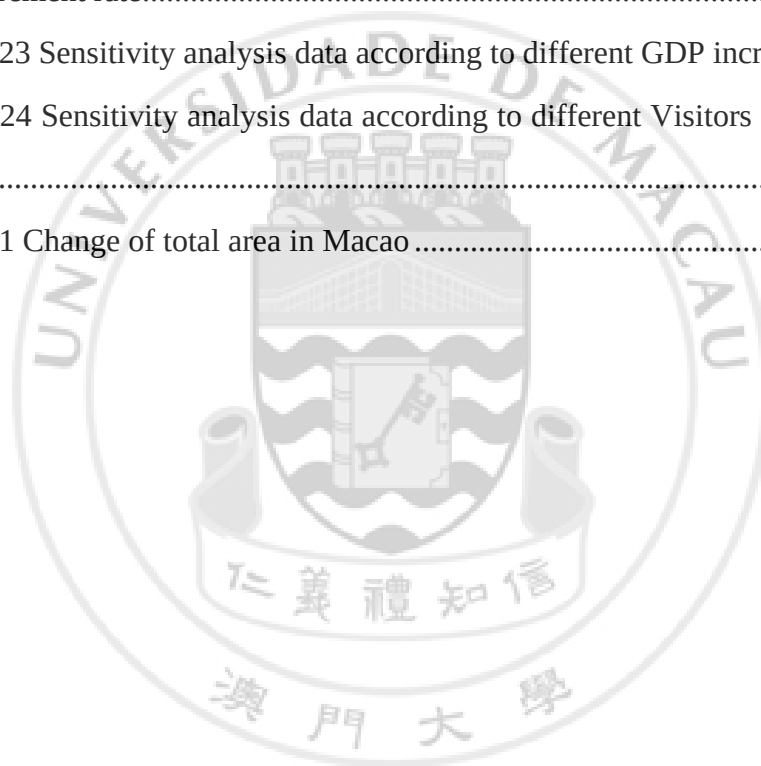
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