A CRITICAL ASSESSMENT OF THE PARADIGMS FOR SOLID WASTE MANAGEMENT IN PACIFIC ISLAND COUNTRIES

Melchior Mataki

BSc., MSc.

This thesis is presented for the degree of

Doctor of Philosophy

Murdoch University

December 2011

DECLARATION

I declare that this thesis is my own account of my research and contains as its main content work which has not previously been submitted for a degree at any tertiary education institution.

Melchior Mataki

ABSTRACT

Solid waste management (SWM) in the Pacific Islands has not progressed much over the past four decades. For example, its technical and functional aspects can be succinctly described as being primarily concerned with the collection, disposal and open burning of wastes in landfills (most of which are dumps). The current state of SWM is posited to be underpinned by the paradigms informing SWM. Paradigms model problems and rationalise the course and types of actions taken to resolve problems within any practical field. Consequently, this study critically assessed prevailing paradigms of SWM at the global and regional levels, and examined if there was a need for an alternative paradigm for SWM in Pacific Island Countries (PICs).

The two overarching paradigms of solid waste management recognised globally are public health and environmental protection. The latter is at present the core paradigm for solid waste management, and it also has a number of derivatives which are also considered by their adherents as paradigms in their own right. In PICs, both overarching paradigms underpin SWM with public health protection showing overall dominance because of the historical association of SWM and public health, and the existing legislations and institutional arrangements.

The impacts and influence of these overarching paradigms were examined in detail using a set of indicator wastes within the context of Honiara, the capital of Solomon Islands. Although prevailing paradigms were relevant, they exacerbated SWM problems, limited management

options and alienated the biophysical and socioeconomic conditions of Honiara from SWM. Consequently a systems based paradigm was proposed and tested on a set of indicator wastes in Honiara, the capital of the Solomon Islands. At the operational level, the systems paradigm advocates for the expansion of SWM interventions across its three sub-systems: (a) material system, (b) consumer system and (c) solid waste system. The systems paradigm offered a fresh perspective on SWM in PICs, and stands out as a potential paradigm for SWM in PICs.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS AND ACRONYMS

3R: Reduce-Reuse-Recycle

Al: Aluminium

ANOVA: Analysis of Variance

ASW: Average Specific Weight

AusAID: Australian Agency for International Aid

CEI: Community Effect Index

CLGF: Commonwealth Local Government Forum

CS: Consumer System

CS>SWS: materials exported from CS to SWS

D4S: Design for Sustainability

DfE: Design for Environment

DP: Dominant Paradigm

DSP: Discard Separation Paradigm

EEE: Electric and Electronic Equipment

EP/IR: Extended producer (importer) responsibility

EU: European Union

GDP: Gross Domestic Product

HCC: Honiara City Council

HCC-EHD: Environmental Health Division of Honiara City Council

HCC-WD: Works Division of Honiara City Council

HCM: Honiara Central Market

HW: Household Wastes

IE: Industrial Ecology

IPCC: Intergovernmental Panel on Climate Change

ISDF: International Sustainable Development Foundation

JICA: Japan International Cooperation Agency

LCA: Life Cycle Assessment

LHS: Left Hand Side

LP: Local Production

m^3: Cubic metre

M1: Materials accumulated in MS

M3: Materials accumulated in SWS

M2: Materials accumulated in CS

Mimp: Materials imported from overseas and locally

Mlp: Materials derived from local production

Mcs: Materials exported to consumer system

Msws: Materials exported to solid waste system

Mcsr: Materials imported from consumer system

Mswsr: Materials imported from solid waste system

MEMC-ECD: Environment and Conservation Division of Ministry of Environment, Meteorology and Conservation

Mex: materials exported outside the boundary

MFP: Material Flow Paradigm

MHMS-EHD: Environmental Health Division of Ministry of Health and Medical Services

MMR: Mixed Methods Research

MS: Material System

MSW: Municipal Solid Waste

NGOs: Non government organisations

NGOS: Ngossi housing estate

NSWMS: National Solid Waste Management Strategy

ODA: Overseas Development Aid

OR: Other Recyclers

PACAM: Panatina Campus housing estate

PAJBM: Panatina and JBM housing estate

PET: Polyethylene Terepthalate

PICs: Pacific Island Countries

PUV: Purpose, Use and Value

RHS: Right Hand Side

SD: Sustainable Development

SDP: Skills Development Programme

SICED: Solomon Islands Customs and Excise Division

SPREP: Secretariat of the Pacific Regional Environment Programme

SWM: Solid Waste Management

SWMSPR: Solid Waste Management Strategy for the Pacific Region

SWS: Solid Waste System

SWS>CS: materials exported from SWS to CS

TAS: Tasahe housing estate

TV: Television

UNEP: United Nations Environment Programme

V1S: Vura 1 towards Vura school housing estate

VEK: Vura East and Koviloko housing estate

VIUP: Value in Use Paradigm

Wd: Waste disposed

Wdiv: Waste diverted

WEEE: Waste Electric and Electronic Equipment

Wg: Waste generated

WH (1 & 2): Whiteriver housing estate (number indicate the two sampling days)

WHO: World Health Organisation

WWF: World Wildlife Fund

ZWP: Zero-Waste Paradigm

GLOSSARY OF KEY TERMS

Cleaner Production: “the continuous application of an integrated, preventive environmental strategy applied to processes, products and services in pursuit of economic, social, health, safety and environmental benefits” (Jackson 2002).

Design for Environment: “is an approach companies use to make business decisions that consider environmental impacts along with traditional business considerations of cost and performance” (US EPA 2002b).

Design for Sustainability: “is also referred to as sustainable product design, is a globally recognized method for companies to improve profit margins, product quality, market opportunities, environmental performance, and social benefits. Companies can achieve this win-win situation for shareholders, consumers, and the public by improving efficiencies in the products and services they design, produce and deliver” (UNEP Division of Technology Industry and Economics).

Dump: is a landfill which does not isolate landfilled wastes from the environment and meet the three criteria of a sanitary landfill (see definition of a sanitary landfill).

Extended Producer/Importer Responsibility: “this principle advocates for producers/importers to bear a degree of responsibility for the environmental impacts of their products. It includes upstream impacts

arising from the choice of materials and manufacturing process and downstream impacts from the use and disposal of products. The principle encourages producers and importers to consider the entire life cycle of their products. It is especially useful for products not easily recovered from the waste stream. It encourages businesses to prevent wastes at source, design products to be environmentally friendly and set up take back and recycling schemes" (Solomon Islands Environment and Conservation Division 2008).

Life Cycle Assessment: "is an environmental management tool increasingly used to understand and compare how a product or service is provided 'from cradle to grave'. The technique examines every stage of the Life Cycle, from raw materials acquisition, through manufacture, distribution, use, possible reuse/recycling and then final disposal" (Navia and Ross 2009).

Paradigm: is a set of concepts that model (a) key solid waste management problems and (b) rationalise the courses and types of action taken to resolve key problems.

Sanitary Landfill: is a landfill which the landfilled wastes are isolated from the environment until wastes are rendered innocuous through biological, chemical and physical processes of nature. To meet the above stipulation, a sanitary landfill must satisfy the following criteria: (a) compaction of wastes, (b) daily covering of wastes and (c) control and prevention of negative impacts on public health and on the environment (Diaz et al. 2005).

Solid Waste Management: the management of solid materials without immediate purpose, use or value using a variety of appropriate technical and non-technical approaches in processes prior to and after materials have lost their purpose, use or value.

Solid Waste: any solid material which has lost its original purpose, use and value to its holder.

Waste Hierarchy: The hierarchy ranks waste management options according to their environmental benefits. Waste avoidance and Waste minimization through reduction, separation at source, reuse and recycling prevents the creation of waste and reduces the quantity and the impacts of the waste that is generated. The waste hierarchy emphasizes the need to concentrate on waste avoidance and minimization and reduce the importance of final disposal (Fiji Department of Environment 2008).

ACKNOWLEDGEMENT

I am indebted to my principal supervisor Dr. Jaya Nair for taking me on board, recognising my ‘take’ on solid waste management as a research topic, and for her unfailing mentoring. For the above and in-depth discussions which charted the PhD course; thank you Jaya. I would also like to thank my co-supervisor Prof. Goen Ho for his moral support and input to the final thesis.

This PhD was made possible by the financial support from my sponsor Australian Agency for International Aid (AusAID) under its Australian Leadership Award of which I am forever grateful for the opportunity. I also acknowledge the support rendered by stakeholders of solid waste management in Honiara Solomon Islands, who willingly shared information, and helped me conduct waste audits, and directed me to further sources of information. In particular, I would like to thank officers from Honiara City Council environmental health and works divisions, and the environment and conservation division of the Ministry of Environment Meteorology and Conservation. I acknowledge the support of the local recycling industry, Solomon Islands Customs and Excise Division and the National Statistics Office. In addition, the assistance rendered by individuals who helped me conduct the household survey, and respondents of that survey is very much appreciated.

Lastly but not the least, I wish to express my gratitude to my wife Ellice Mataki and sons (Theodore, Karsten and Rungaki) for their unfailing love and forbearance in my absence. Moreover, the love and support

from my extended family in Nukufero, Honiara, and Rumahui, in particular, the Okolanis, Rangikenas, Nukufakaperes, Turavolos, and the Andersons of Adelaide and Suva are gratefully acknowledged. Thanks also to my office mates for their humour and support in various forms ranging from rebuttal and acceptance of my ideas to coffee breaks.

DEDICATION

I dedicate this thesis to my wife and sons for being there for me, and in memory of my late mother Rosina Manongifiriiteraki.