

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.



MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA

UNIVERSITY OF NEW ZEALAND

**Managing rivers in Ghanaian small scale
mining communities: a case study in
Amansie Central District, Ghana**

**A thesis presented in partial fulfilment of the
requirement for the degree:**

Masters in Environmental Management

Massey University, Turitea,

New Zealand

Gloria Boafo

2016

DECLARATION

I declare that this research study is my original work submitted as a requirement in partial fulfilment of a Master's degree in Environmental Management at Massey University, Turitea, New Zealand. I declare that this work is submitted for the first time at this university and has never been submitted to any other university for the purpose of obtaining a degree. I hereby authorise copyright of this product to Massey University.



GLORIA BOAFO
Student ID: 14113126

29/02/2016

DATE

DEDICATION

I dedicate this work to my family; my parents Mr. and Mrs. Addae Boafo, my siblings: Eric Boafo, Ernest Boafo, Eunice Boafo and Salome Boafo. God bless them for their prayers and support while am out of Ghana.

ABSTRACT

Water is a natural capital asset that must be preserved and sustained. In Ghana, rivers are critical and important source of water for the Ghanaian economy albeit with very poor and challenging sustainable management practices. This paper presents the findings of a study undertaken to assess mining and water pollution in Amansie Central District, Ghana. The quality of Ghana's endowed water resources is increasingly threatened as industrial activities including, small scale mining continue to expand. Small scale mining operations releases high quantities of sediments, toxic chemicals, and other contaminants into water bodies that have currently damaged most Ghanaian riverine systems. In particular, this is more alarming with the avalanche number of numerous mining operations that majority of such operations are unauthorized. In addition to sampling respondent's perceptions on small scale mining; its impacts and regulation in Amansie Central District, the study prescribes interventions that can assist in mitigating the negative impacts of small scale mining on community endowed water resources. Significant environmental performance and improved water quality can be achieved within the small scale mining sector if compulsory laws on protecting and improving water quality are adopted and adequately monitored and enforced and if government involve traditional rulers in mining regulatory frameworks to regulate unauthorized mining and to monitor community environmental performance.

ACKNOWLEDGEMENTS

I have been pleased to have Dr Jeffrey McNeill, senior lecturer in Resource and Environmental Planning, Massey University, who made this work interesting. Our discussions on crocodiles in Ghanaian rivers and peanut butter soup in Ghana played great roles in relieving study tensions and remaining focused. His kind words, 'don't panic, yet' rang through my head throughout my write-up. I express my heartfelt appreciation and gratitude to him for his professional and technical support and for choosing to work with me.

I express gratitude and appreciation to the following individuals and group of people:

Associate Professor John Holland, Head of Environmental Management, Massey University, for his guidance and assistance in my study programme.

Dr Karen Hytten, lecturer in Environmental Management, Massey University for her immeasurable advice and support on my work and for my entire period in Massey University.

Dr Kuda Dube, lecturer in Computer Science and Information Technology, Massey University and family who has been an advisor on my work and assisted my stay in Palmerston North.

All workers and staff of Amansie Central District Assembly for their immense support and cooperation throughout my research process.

All stakeholders from various agencies consulted in Ghana, for their time and cooperation during my research process.

All miners and people of Amansie Central District who participated in the research process, for their time and cooperation during my research period.

CONTENTS

DECLARATION	I
DEDICATION	II
ABSTRACT	III
ACKNOWLEDGEMENTS	IV
TABLES.....	VIII
FIGURES.....	VIII
CHAPTER ONE.....	1
1.0 Introduction.....	1
1.1 Research question	5
1.2 Research aim and objectives	5
1.3 Thesis structure.....	5
1.4 Significance of study	6
CHAPTER TWO: LITERATURE REVIEW	7
2.0 Introduction	7
2.1 Institutions and natural resource management	7
2.2 Natural resource management failure in developing countries: issues of property rights.....	8
2.2.1 Resource ownership and resource degradation	9
2.3 Natural resource management failure in developing countries: issues of government failure	11
2.3.1 Weak decentralization in resource management systems.....	11
2.3.2 Weaknesses in local level management	13
2.3.3 Effectiveness of legal framework to manage natural resources.....	14
2.3.4 Political influence in resource management systems	16
2.3.5 Conceptual framework of corruption	17
2.4 Resource management in developing countries: a way forward	19
2.4.1 Public participation in resource management.....	19
2.4.2 Policy coordination in resource management systems.....	21
2.4.3 Science-policy integration in resource management	22
2.4.4 Collaborative process in resource management	23
CHAPTER 3: RESEARCH DESIGN	26
3.0 Introduction.....	26

3.1 A framework for assessing mining operations and water management within Ghanaian mining communities	26
3.2 Research design and strategy	27
3.3 Case study method	27
3.3.1 Interview technique	28
3.3.2 Observation	29
3.3.3 Document analysis.....	29
3.3.4 Questionnaire	29
3.4 Case study selection criteria.....	29
3.5 Research population	30
3.5.1 Research sample	30
3.5.2 Research sample size.....	31
3.6 Research instruments	31
3.6.1 Research Interviews	31
3.6.2 Research observations	32
3.6.3 Document analysis.....	32
3.6.4 Research questionnaire	33
3.7 Ethical considerations	33
3.8 Limitations.....	34
CHAPTER FOUR: ARTISANAL SMALL SCALE MINING IN GHANA.....	36
4.0 Introduction.....	36
4.1 Ghana’s demography	36
4.2 Institutions.....	37
4.3 Small scale mining in Ghana	37
4.3.1 Overview of the Ghanaian mining legislative.....	38
4.3.2 Overview of mining regulations	38
4.3.3 Land ownership and use in Ghanaian small scale mining areas	40
4.3.4 Artisanal and small scale mining operations	41
4.5 Study Area: Amansie Central District.....	46
CHAPTER FIVE: RESULTS	50
5.0 Introduction.....	50
5.1. Respondents profile	50
5.2 Respondents perceptions.....	52

5.2.1 Impacts of small scale mining on the district	52
5.2.2 Causes of water pollution from mining operations	54
5.2.3 Challenges that undermine management efforts	59
5.2.4 Motivation for better management systems	62
5.2.5 Incentives for better management systems	64
CHAPTER SIX: DISCUSSION	66
6.0 Introduction	66
6.1 Conflicts of interests: Human welfare and environmental degradation	66
6.1.1 Socio-economic challenge of small scale mining	66
6.2 Local challenges with contemporary mining management systems	68
6.3 Formal challenges with contemporary mining management systems	69
6.3.1 Weak decentralization in natural resource management	69
6.3.2 Overlap of mining laws and policies	70
6.3.3 Effectiveness of legal framework in the small scale mining sector	71
6.3.4 Corruption	73
6.3.5 Political influence in the small scale mining industry	73
6.4 Motivations for better management systems	74
6.5 A focus on water quality solutions	74
6.5.1 Governance and Regulations (Formal Systems)	74
6.5.2 Local level involvement	78
CHAPTER SEVEN: CONCLUSION AND WAYS FORWARD	81
REFERENCES	85
Appendix: 1 Mineral and Mining Act, 2006 (Ghana)	97
Appendix: 2 Water use regulations, 2001 (Ghana)	100
Appendix: 3 Survey Questionnaire	105
Appendix: 4 Ethics Approval Form	106

TABLES

Table 1: Characteristics of different property rights	10
Table 2: Degrees of decentralisation.....	12
Table 3: Framework for data analysis	27
Table 4: Case study framework	35
Table 5: Local government structure in Ghana	37
Table 6: Regulatory agencies in the Ghanaian mining industry.....	40
Table 7: Survey respondents by affiliation	50
Table 8: Miners profile	51
Table 9: Incentives for better management systems	64

FIGURES

Figure 1: Ghana map	36
Figure 2: Pit under construction by an excavator	42
Figure 3: Tailing directly discharged from washing plants into water	42
Figure 4: Mercury amalgam subjected to open flame	43
Figure 5: Refined gold for the market	43
Figure 6: State of River Offin	44
Figure 7: State of River Pra	45
Figure 8: Ankobra River	45
Figure 9: Study Area: Amansie Central District	46
Figure 10: Oda River, Amansie Central District	47
Figure 11: Akaasum River, Amansie Central District.....	48
Figure 12: Gold mining impacts on the district	53
Figure 13: Causes of water pollution from mining operations.....	55
Figure 14: Perception about stakeholders responsible for mining and water pollution within the industry.....	58
Figure 15: Challenges that undermine management efforts.....	61
Figure 16: Motivation for better management systems.....	63