The adoption of Health Impact Assessments in the Mongolian mining sector: A case study of the diffusion of policy innovation

by

Tsogtbaatar Byambaa

M.Sc. (Health Administration), University of Colorado at Denver, 2005
M.D., National Medical University of Mongolia, 2002

Thesis Submitted in Partial Fulfillment of the

Requirements for the Degree of

Doctor of Philosophy

in the

Doctor of Philosophy Program

Faculty of Health Sciences

SIMON FRASER UNIVERSITY

Summer 2014

Approval

Name: **Tsogtbaatar Byambaa**

Degree: **Doctor of Philosophy**

Title: ***The adoption of Health Impact Assessments in the Mongolian mining sector: A case study of the diffusion of policy innovation***

Examining Committee: **Chair:** Kelley Lee
Professor

Craig R. Janes
Senior Supervisor
Professor

Tim Takaro
Supervisor
Professor

Kitty Corbett
Supervisor
Professor

Jeremy Snyder
Internal Examiner
Associate Professor
Faculty of Health Sciences

Julian Dierkes
External Examiner
Associate Professor
Institute of Asian Research
University of British Columbia

Date Defended: August 7, 2014

Partial Copyright Licence

Ethics Statement

The author, whose name appears on the title page of this work, has obtained, for the research described in this work, either:

a. human research ethics approval from the Simon Fraser University Office of Research Ethics,

or

b. advance approval of the animal care protocol from the University Animal Care Committee of Simon Fraser University;

or has conducted the research

c. as a co-investigator, collaborator or research assistant in a research project approved in advance,

or

d. as a member of a course approved in advance for minimal risk human research, by the Office of Research Ethics.

A copy of the approval letter has been filed at the Theses Office of the University Library at the time of submission of this thesis or project.

The original application for approval and letter of approval are filed with the relevant offices. Inquiries may be directed to those authorities.

Simon Fraser University Library
Burnaby, British Columbia, Canada

update Spring 2010

Abstract

Mongolia's rapid economic growth, propelled by rapid development of the extractives sector requires that the country be better prepared for potential negative impacts to the health of the people and the country. People are both excited for the remarkable development opportunities that mining promises and are concerned with the potential social, environmental and health risks it could bring. As a country highly dependent on the mining sector, Mongolia has realized that it needs to develop a strategy and institutional process to manage the public health impacts of mining activities. With the support of an SFU-based team of researchers and policy advocates, Mongolia is thus in the process of adopting Health Impact Assessments (HIA), a policy innovation tool that has potential to inform the decision making process through assessing underlying health problems and generating evidence-based recommendations. However, the values, principles, methods and deliverables of HIA are not easily understood in capacity-limited Low and Middle Income Country (LMIC) settings, including Mongolia, which makes full adoption and proper use of HIA a difficult process to achieve. The overall goal of the research was to evaluate the uptake and adoption rate of the HIA concepts, tools and methods in the emerging Mongolian mining sector. This evaluation process involved key informant interviews, observations, literature reviews and policy analysis as data collection methods. Participants shared their stories about how mining activities could or have influenced their lives, and how they perceive the state of current adoption of the HIA in the mining sector.

To understand the processes of HIA adoption, the theory of the Diffusion of Innovations (DOI) was used as an analytical lens. Analysis of HIA adoption processes suggested that DOI theory was a useful framework to understand and improve the rate of uptake of

new public health policy innovations such as HIA in that it assists with understanding both the attributes of innovation and the communication actions that influence adoption. The existing literature on HIA lacks analysis of how it is adopted and implemented in diverse settings. This research thus contributes to the knowledge needed to inform discussion of how to improve the rate and success of HIA adoption.

I conclude that the adoption of systematic methods to manage the public health impacts of mining in Mongolia, centered on the HIA, is generally off to a good start. However, there are many remaining challenges, including: a lack of government leadership, poor collaboration between relevant public and private institutions, low levels of capacity to conduct and evaluate HIAs, poor quality or non-existent baseline data. These challenges will need to be addressed in order to keep the momentum going. Following from the research, I offer the following recommendations: to develop HIA management system, to implement existing MoU between relevant ministries, to create HIA training center, and to enact an independent HIA law. In conclusion, the currently legislated system, which incorporates HIAs into a newly redesigned licensure system based on international standard environmental impact assessment methods, must be implemented. Ideally, the development of an independent HIA system will be required if Mongolia is to build and sustain an effective public health system in mining-affected regions.

Keywords: Health impact assessment; diffusion of innovations theory; health consequences of mining, health policy innovation; Mongolia

Dedication

I am dedicating this work to my sons, Enkhtaivan Tsogtbaatar and Erkhtaivan Tsogtbaatar. Boys, do not take it as a pressure to do the same "academic stuff" like your dad for a long time. You are entitled to embark on a journey of your own choice and do what excites you the most. Of course, your daddy will be thrilled to see you use this as an inspiration, the same way your grandpa has been impressing and inspiring me all my life, to uncover the secrets of transforming what you learn into what you do which, in fact, are what this book is all about.

Acknowledgements

It has been a 28 year-long journey of studying from the day I first walked into my grade 1 classroom till the present day of writing this acknowledgement for my PhD thesis. I would like to give a “shout out” to all the teachers, staff, fellow students and friends from Khovd, Nalaikh, Ulaanbaatar, Denver, and Vancouver, for the great memories.

First and foremost, from the bottom of my heart, I would like to thank my senior supervisor Professor Craig R. Janes for his immeasurable support, valuable guidance, extraordinary patience and being a role model in both the academic and practical world. The affirmative lessons and principles that you taught me will last my lifetime, I am sure. One could not have asked for a better mentor. I feel lucky and honored for this experience.

I am grateful to my supervisors Professor Kitty Corbett and Professor Tim Takaro for being excellent supervisors and great human beings. Kitty: Thank you. You kept me optimistic with your sincere encouragement, true professionalism and great sense of humour. Tim: Thank you for your expert knowledge, continuous support and constructive feedback.

I would also like to thank Canadian Institutes of Health Research (CIHR), the Government of Mongolia, Open Society Institute, Faculty of Health Sciences and Office of Dean of Graduate Studies of Simon Fraser University for providing the financial support that has made this journey possible. A special thanks goes to CIHR for funding the 2 research grants (PI: Craig R. Janes) that have become the integral part of this

thesis, while making feasible difference in safeguarding the population health in Mongolia.

I am indebted to Erica Corber for helping me edit and proofread hundreds of pages of my thesis. I was impressed with her humbleness and kindness, not to mention the great editing skills she has. I thank her for the meticulous work that she has done.

To those whom I promised not to mention by their names, I thank you for agreeing to be participants of this study, for your time and for sharing your rich insights.

I would like to thank the Examination Committee members, Professor Kelley Lee, Professor John Calvert, Associate Professor Julian Dierkes, and Associate Professor Jeremy Snyder for your time, encouragement, great questions and valuable comments that made my thesis better document.

To the staff at the Faculty of Health Sciences, Linda Hegland, Lynn Kumpula, Jennifer van Rassel, Bratislav Mladenovic, Jasper Stoodley, Ted Sato, Margaret van Soest, Associate Professors Lawrence McCandless and Ryan Allen, I am grateful for your friendship, administrative support, professionalism, and kindness. You are truly what moves this faculty.

I would like to thank Barsbold-Saraa, Amgaa, Norvoo, Lkhamaa, Johnny, Lisa, Wislawa, Ahmed-Zahra, Jim-Lindiwe, Jordan-Valerye, Chris-April, David-Grace, Meghan, MC, Christina and Tracy for your friendship, helpful tips, encouragement, hospitality and being great neighbours in Louis Riel House.

I must thank William and Dolores Storness-Bliss for being great friends, hosts, employers, and more than anything, the family away from family. Thanks for looking

after my wife and kids, we will surely miss you. Come to Mongolia - I will butcher a sheep for you!

To my siblings, Tsagaanaa, Tsengee, Baagii, Oogii and Tsoomoo, I know you'll always have my back. Thank you for that.

I am grateful to my 'second parents' - Bayarrintsen and Batnasan, for giving a birth to and raising someone I love. I eliminated the word 'in-laws' from my vocabulary when I first met you. Thanks for being there for us.

Dear dad and mom - Byambaa and Byambasuren: no simple words can express my gratitude toward you. Thanks for always loving me, unconditionally. I know you would be the last people on earth to stop trusting me and worrying about me. I thank you for that.

And last, but not least, to my beautiful wife Otgontugs Bayarrintsen ~ love of my life and sun of my home along with my boys, thank you for loving me, sacrificing your career for mine, and sharing the dreams.

Table of Contents

List of Tables

List of Figures

List of Acronyms

ADB	Asian Development Bank
ASGM	Artisanal and small-scale gold mining
ASM	Artisanal and Small scale Mines
CCGHR	Canadian Coalition for Global Health Research
CDC	Centre for Disease Control and Prevention
CFP	Call for Proposal
CHD	Center for Health Development
CHSSIA	Community Health Safety and Security Impact Assessment
CHSSP	Community Health, Safety and Security Plan
CIHR	Canadian Institutes of Health Research
COPD	Chronic Obstructive Pulmonary Disease
CRSD	Community Relations and Sustainable Development
CSR	Corporate Social Responsibility
DOH	Department of Health
DOI	Diffusion of Innovation
EBRD	European Bank for Reconstruction and Development
EHIA	Environmental and Health Impact Assessment
EHRD	Environmental Health Research Division
EIA	Environmental Impact Assessment
ESHIA	Environmental Social and Health Impact Assessment
ESIA	Environmental and Social Impact Assessment
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GoM	Government of Mongolia
HAP	Health Action Plan
HIA	Health Impact Assessment
HIRB	Health Impact Review Board
HNA	Health Needs Assessment
HRA	Health Risk Assessment
HSUM	Health Sciences University of Mongolia
ICMM	International Council on Mining and Metals

IDU	Injection Drug User
IFC	International Finance Corporation
IMPACT	International Health Impact Assessment Consortium
KIHASA	Institute for Health and Social Affairs of Korea
KT	Knowledge Translation
KTKK	Kukh Tenger Khugjil Consortium
LMICs	Low-and middle-income countries
MDG	Millennium Development Goal
MEGD	Ministry of Environment and Green Development
MNE	Ministry of Nature and Environment
MOH	Ministry of Health
MOM	Ministry of Mining
MOLSW	Ministry of Labour and Social Welfare
MoU	Memorandum of Understanding
MPHPA	Mongolian Public Health Professionals Association
MRAM	Mineral Resources Authority of Mongolia
NEPA	National Environmental Policy Act
NRCOD	National Research Center for Occupational Diseases
NGO	Non Government Organization
OT	Oyu Tolgoi
PD	Positive Deviance
PHI	Public Health Institute
SDH	Social Determinants of Health
SEIA	Strategic Environmental Impact Assessment
SESA	Strategic Environmental and Social Impact Assessment
SFU	Simon Fraser University
SGRDC	South Gobi Regional Development Council
sHIA	Strategic Health Impact Assessment
SIA	Social Impact Assessment
SLO	Social License to Operate
SPH	School of Public Health
SPI	Social Progressive Index
SPIA	State Professional Inspection Agency

SPS	Structural and Performance Standards
THR	Turquoise Hill Resources
TT	Tavan Tolgoi
TWG	Technical Working Group
UB	Ulaanbaatar
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USA	United States of America
WB	World Bank
WHO	World Health Organization

Chapter 1.

Introduction

"Dirt stinks more when stirred."(Latin Proverb)

1.1. Foreword

On a sweltering summer day in 2013, I met with Bayra,[1] a local herder who lived in his bedroom-sized nomadic yurt within the vicinity of a world-scale copper and gold mine site in the Gobi desert. With the majority of my countrymen, I held positive feelings that mining could lead Mongolia to increased prosperity. This was largely due to a campaign by the extractive industry and government. Through the sharing of his personal and cultural history, Bayra shaped my understanding of the mining industry's impact on human health. This man possessed a grade eight education from the *soum*[2] secondary school, and made his living as a hard-working herder, inspired by love for his homeland and the only way of life known to him and his ancestors.

> *"Our life was fine before all this mining rush happened. All of my generations have been herders and every single one of my ancestors has done the same thing on this very same land. We were just herding our animals happily on our land and everybody had clothes on their shoulders and food in their stomach. Then all of sudden, without our consent, we're being asked to leave so they can take over this land and bring in Chinese workers. My great, great grandfather did not fight for nothing against the*

[1] The true identity of an interview participant had to be changed according to the confidentiality agreement of the study ethics protocol.

[2] A small administrative unit within a province.

Chinese! Can you imagine how on earth we can continue our life as happily as before and raise three children knowing that there is no pasture land for herds, no adequate drinking water for us, no clean air to breathe, no healthy animals to butcher[3]*, no appreciation for what we do and say, and no affordable clothes to buy? Prices for things have gone up to the roof thanks to this craziness. Our herds actually had some trade value before, but now you have to sell a camel to purchase basic household needs for couple of months. With the hopes of keeping the total head count of our animals and seeking some cash income, we tried to become this mining company's milk supplier with no success. We were repeatedly turned down because of many ridiculous requirements and paperwork. Still, we ultimately stay close to this site hoping that someday an opportunity will be given to us. People in Ulaanbaatar must think that we are the lucky ones who get a living assistance and firsthand benefits from the mine. The truth is: we are bunch of neglected people whose interests are lost between a corrupt local government and an uncaring foreign company. Election candidates, soum and mining company officials keep saying that they are digging ancestors' land for our own good--so far, I am not seeing any improvement from old days; only threats."*

It was a realization moment for me as a city-based, health researcher with sophisticated technical language. I did not expect the footprints of current mining development have already been felt by the community. Despite taking part in the project to study the health consequences, I believed that most of the negative claims of mining projects were irrational and made either by resource nationalists or opposition parties. Just like the vast majority in a developing nation, I lacked practical knowledge, experience and exposure to the reality of the situation, and my vision was blurred with all the positive promises about mining and wealth. Bayra, in his own terms, spoke on behalf of all Mongolian herders and instilled in me the necessity of immediate action aimed at increased understanding and managing of mining-induced social and health impacts.

[3] He explains that some people stopped eating their herds' lung given its black and shrunken appearance.

Talking about the Health Impact Assessment (HIA)[4] to Bayra in technical terms would have created unnecessary obstacles to his understanding. I reframed this tool to talk about practical health risks in the context of particular development issues Bayra could identify with. Discussions on the effect of mining and the health of the local community and why it matters to people like Bayra were helpful. This was necessary before we were able to use the HIA as an instrument to identify the impact of the previous issues mentioned by Bayra and to address them. Although there was no mention of the necessity of additional investigation in Bayra's comments, it was clear that he was in need of additional evidence that could support the local community's claims. The HIA had the capacity to create this evidence base, and Bayra's claims needed additional support that could be achieved through application of this tool.

Managing human health impacts from mining activities can be achieved through introduction and implementation of the HIA, a tool that has potential to inform the decision making process through generating evidence-based recommendations. However, many Low and Middle Income Countries (LMICs) in the world (including Mongolia) have been struggling to fully understand and make use of the HIA properly. This is largely due to the complexity of their social agendas and differences in the perception of values within this complex and still evolving decision making instrument. Timely, yet thorough uptake of the HIA by all relevant stakeholders is still a highly recommended step in managing the negative health impacts of mining industry in Mongolia. This requires better and expanded adoption of the HIA by identifying and

[4] "HIA is a combination of procedures, methods and tools by which a policy, program or project may be judged as to its potential effects on the health of a population" (WHO, 1999). These will be explained in the Chapter 3.1 in greater detail.

overcoming current implementation barriers. This case study seeks to better understand these barriers.

1.2. Background

My PhD research has focused on an evaluation of the uptake and adoption rate of the HIA concepts, tools and methods in the emerging Mongolian mining sector. Mongolia is a country with rich natural deposits of copper, coal and gold, and it is in the middle of a mineral boom as the economy is experiencing record growths. As of 2011, the growth rate was 17% (World Bank, 2014). Recent years have seen the rapid development of the mining sector, mainly due to large investments from Canadian and Chinese mining companies. Even amid a moratorium on new mining exploration licenses set by the Mongolian government in 2010, and the consequential decline in foreign direct investment (FDI), Mongolia still maintained its world leading economic growth. Although Mongolians are mostly excited for these remarkable economic opportunities, many people are concerned with the potential social, environmental and health risks they could bring. Mongolia's emerging economic situation, triggered by mining development, requires that the health sector employ an appropriate tool to manage the potentially negative impacts to the health of the people and the country (Byambaa et al. 2012). There is a wealth of examples and lessons learned in countries that were ill prepared for the wider social and economic effects mining activities, as seen in the Netherlands with natural gas in 1959, now aptly termed the "Dutch disease[5]".

[5] The term, the "Dutch disease" – refers to the social consequences that result when resource extraction activities affect the exchange rate, drive up inflation, and reduce the competitiveness of industries outside of the resource sector.

The fundamental need for the HIA in Mongolia was confirmed by the participants of a CIHR-sponsored “Mining and Health Conference” that took place in Ulaanbaatar in 2009. HIAs, especially when incorporated within environmental and social impact assessment processes, provide an evidence-based approach that can be effectively used to manage negative impacts (Winkler et al., 2013). Although the adoption of HIA in Mongolia is still in its initial stages, a great deal of work has been done by international HIA experts and local change agents to effect policy. In the early absence of social policy and regulation to prevent potential adverse impacts of mining activities, a Simon Fraser University led, joint Canadian and Mongolian academic team, introduced the HIA to Mongolia as an approach to reduce population health risks. These activities have been supported by the World Health Organization which has provided its technical support to the Mongolian Ministry of Health in developing HIA implementation policies and in building local capacity. Major development projects have been subject to conduct the Environmental Impact Assessment (EIA) as part of the environmental protection legislation in Mongolia since 1998 (World Bank, 2006) without detailed consideration of human health impacts. Through a 2012 amendment of EIA law, the fundamental notion of the HIA was introduced and incorporated as a requirement for these major projects to consider (Janes et al., 2014).

The level of HIA capacities, perceptions, practices and policies vary from country to country. Developed countries such as Canada, USA, Australia and the UK are advancing HIA with a special focus on the capacity building, methodology refinement and promotion of informed-decision making when there is no legal mandate in doing so. However, countries such as Thailand, South Korea, New Zealand and the European Union believe that HIA practices cannot be advanced and conducted regularly in the

absence of a legal mandate at the national level. In line with this issue, a question that has emerged in the literature is whether the HIA should be formally enshrined in law and regulated through public sector institutions or be left to the "corporate social responsibility"[6] approach. Presumably and unfortunately, a significant number of the world countries could fall into the third category, for which there is no existence of even introductory level HIA practices.

In LMIC settings, ineffective and non-transparent governance, perceived weak capacity of professionals, and the potential for corruption have raised questions about whether the implementation of HIAs can be effective in reducing negative public health outcomes. Although this question could not be answered definitively in this research, with the findings of key stakeholders' interviews and the analyses of relevant documents, I utilized Mongolian environmental policy and discussed whether it was sufficiently developed to formally oversee HIA processes that could be useful in managing negative health impacts of the mining sector. In this research, I also examined potential factors that would make mandatory or voluntary HIA approaches appropriate in LMICs contexts, and why I believe attaching the HIA on the EIA may be the most appropriate approach for Mongolia.

This research also aimed at evaluating the uptake of the HIA in the mining sector, the pioneering and only sector to adopt the HIA in Mongolia. In order to evaluate HIA uptake, a case study analysis has been used on the only HIA implementation in Mongolia thus far, conducted by Oyu Tolgoi (OT) - one of the largest copper, gold ore

[6] Corporate Social Responsibility is commonly defined as: "a process with the aim to embrace responsibility for the company's actions and encourage a positive impact through its activities on the environment, consumers, employees, communities, stakeholders and all other members of the public sphere who may also be considered as stakeholders" (Lindgreen, 2010, p.2).

deposits in the world, jointly owned by Turquoise Hill Resources, the mining giant-Rio Tinto and the Mongolian Government. OT mine is in the famous Gobi Desert of Mongolia, right at the border point that connects Mongolia to China (Turquoise Hill, 2013). After almost two decades of exploration, contract negotiation and construction phases, the commercial production of open pit mining began in July 9th of 2013 and I was fortunate enough to witness this historic moment, on the site, while conducting key informant interviews. According to Mongolia's Mineral law, "the mineral resources naturally occurring on and under the earth's surface in Mongolia are the property of the State and Mongolian people" (World Bank, 2006). The investment agreement was signed between OT and the Government of Mongolia, which is valid for up to 50 years (30 years was granted, with potential for another 20 year extension). Local communities fear that mining will cause an unpleasant change on the livelihood of traditional Mongolian nomads, as it takes away land that has been used for herding. Many worry the mine will increase the prices of basic consumables, cause water shortages, and increase dust in the Southern Gobi region and beyond. In fact, affected communities claim that they have already seen the negative impacts created by the OT project, with little documented evidence to support it, as was evident with Bayra's statement. The HIA along with other assessments may provide evidence to prove or reject the claims made by various stakeholders.

This research was also intended to contribute knowledge to inform discussion about whether HIAs should be formally legalized in LMIC settings, including Mongolia. This analysis also explores definitions, forms, processes and stakeholders that should be embedded in the policy implementation of the HIA. The existing HIA literature is

sparse in the area of regulatory needs surrounding HIA practices and also lacks exploration of effectively adopting the tool into new settings.

Finally, this research is also aimed at evaluating the state of HIA uptake as a health policy innovation, which has been introduced partly by our research team, and making recommendations for the further adoption of HIA, if necessary. According to Diffusion of Innovation theory (DOI[7]), "an innovation must be widely adopted in order to be self-sustaining. Within the rate of adoption, there is a point at which an innovation reaches the 'critical mass' of targeted users" (Rogers, 2003, p.215). Correspondingly, it was the aim of this analysis to examine whether the HIA adoption effort in the mining industry has reached this "critical mass", which could result in the creation of a self-sustaining HIA capacity in Mongolia. As qualitative narrative research, this analysis has requested that people share their stories about how mining activities have influenced their lives, and how they perceive the state of current adoption of the HIA in the mining sector.

1.3. Expected research results and deliverables

It has been over four years since HIAs were first introduced in Mongolia, yet underlying issues such as whether and how HIAs can be formally and regularly implemented remain unanswered. Therefore, assessing the rate of adoption of HIAs in the Mongolian mining sector is highly beneficial work. It was not the intention of this research to study the actual impact of the HIA, rather we will examine how the HIA, as

[7] "DOI is a theory that has been developed to explain factors that affect the adoption of new ideas, the rate of such adoption, and the spread of innovations through cultures" (Rogers, 2003, p.120).

an informed decision-making instrument, has been diffused through the Mongolian policy sector, and how this process of adoption might be explained by DOI theory. Findings from the study were expected to shed light on the following questions:

- Why the HIA is crucial for the mining industry in LMICs;
- What potential challenges could arise when diffusing the HIA;
- How these challenges could be reduced or overcome through the application of DOI theory, and how this theory could help in avoiding and lessening these challenges.

Preliminary research findings and analyses of this research have been disseminated through various means including the development, translation and distribution of knowledge translation materials, submissions to and publication in relevant journals, participation in several international and local conferences and other relevant events including workshops and meetings. The products that have been disseminated include presentation slides, journal papers in Mongolian and English, and featured interviews in media, an HIA methodology manual, draft regulations and detailed HIA guidelines, and a draft curriculum for short and master level trainings. The targeted audience for these documents were those who are involved in the practices and politics of HIAs in the extractive industry within LMICs, especially Mongolia.

1.4. Significance

To my knowledge, this is the first study of HIA adoption that applies the DOI theoretical framework to HIAs in a country setting like Mongolia. Results should contribute to understanding the process through which these tools are adopted, and help identify methods of knowledge translation and exchange that facilitate HIA adoption. The study addresses some of the specific details regarding inclusion of HIAs into the EIA

regulatory and policy processes, and identifies some of the problems, issues, challenges, and concerns that potentially arise with such inclusion by using the Mongolian experience. Most importantly, this research has the potential to contribute to the growing literature concerning HIA effectiveness and uptake in LMIC settings. The anticipated academic contributions of this research are tied to the four research questions that this research seeks to answer: Which HIA processes are relevant to identifying and mitigating the potential human health impacts of mining industry, what is the current state of HIA uptake in Mongolia, what needs to be done in order to successfully adapt HIAs to the Mongolian mining sector, and whether DOI theory can be used to both explain and more efficiently diffuse a policy innovation. The practical contributions in this research include external rapid evaluation for OT Community Health, Safety and Security Plan (CHSSP), development of an organizational chart for Mongolian HIA management, and recommendations into further succession of the HIA adoption process.

1.5. Organization of the Thesis

This thesis presents the overall experiences of Mongolia and its collaborators, in both adopting and introducing the HIA as a much needed instrument for managing the negative health impacts of the extractive industry with particular focus on the process and factors of translating this knowledge successfully. This thesis consists of five chapters.

In the second chapter, I present the study research design, setting and research questions. A number of qualitative data collection techniques, including literature

reviews, policy analysis, key informant interviews, descriptive case study and observations are explained along with their respective data triangulation methods.

Chapter three, the main study findings chapter, is divided into three extended sections: the concept of HIA, implementation of the HIA in Mongolia along with the implementation challenges, and applicability of DOI theory to the HIA.

Chapter 4 includes specific analytic discussions including the Berry & Berry analysis of DOI theory to identify the intentions of HIA adoption in Mongolia, Force Field Analysis to decide on the usefulness of the intervention, and Stakeholder analysis to determine the positions of key Mongolian stakeholders in the HIA adoption process. These are helpful when evaluating the rate of the adoption of the Mongolian HIA effort. Based on the findings of the study and these discussions, a set of recommendations, including an organizational chart proposal on the overall management of HIA in Mongolia, are generated with the intention to guide and facilitate further adoption of HIA in the Mongolian mining sector and other development sectors.

In my conclusion, I summarize the overall findings of the research including its achievements, shortcomings and future deliverables as well as the evaluated state of the Mongolian HIA uptake process. Recommendations helpful for further successful application of HIA both within and beyond mining sector in LMICs including Mongolia are put forward.

Chapter 2.

Methods

This research evaluates HIA adoption, as a policy innovation, in the Mongolian mining sector, and was conducted as part of two Simon Fraser University (SFU) projects supported by the Canadian Institutes of Health Research entitled: "*Development and Implementation of a Health Equity Impact Assessment Methodology in the Mongolian Mining Sector"* (Catalyst Grant No. 21884) and "*Equity-Focused Health Impact Assessment Tools and Methodologies in Mongolia: Supporting and Scaling-Up Local Experiences" (*Knowledge Translation Supplement Grant No. 248230) which were implemented between 2010-2013. This applied research work was conducted in Mongolia in partnership with the Faculty of Health Sciences of Simon Fraser University, Ministry of Health (MOH) of Mongolia and the HIA Technical Working Group of the MOH. *Low risk* research ethics approvals were received from both SFU and the MOH of Mongolia.

2.1. Research setting:

Data collection of this research took place in Mongolia, particularly focusing on the extractive industry, the same setting where SFU's Catalyst and Knowledge Translation supplement projects were implemented. Data analyses were conducted at the Faculty of Health Sciences at SFU.

Mongolia -- situated between Russia and China, with roughly about 0.6 square kilometers of land per capita - is the world's most sparsely populated independent country (World Bank, 2006). The Gobi region is even less densely populated. The central area of Mongolia is dominated by the central Asian steppe ecosystem. The northern and western part of the country is more mountainous and forested. To the south, and along the border with China, is the great Gobi desert. Approximately 30% of the population is nomadic or semi-nomadic (Johnston 2008). The GDP per capita as of 2013 was $3673 and has grown rapidly over the past decade (World Bank 2014). Mongolia is comprised of 21 provinces (in Mongolian: "aimags"); one of these, the Umnugobi aimag, is the centre for much of the countries large scale mining operations (shown in the figure below).

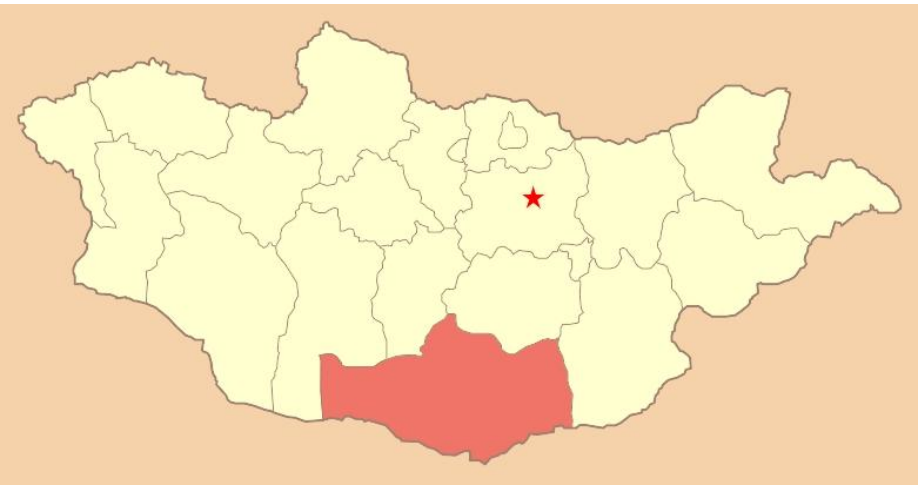

Figure 2.1. Map of Umnugobi aimag

2.2. Research design:

This is a qualitative research project uses narrative case study design. This research asked people to share their experience of HIA uptake in Mongolian, including

struggles and achievements, as well as their perception of what is still needed for the country to start considering HIA as a policy innovation.

Qualitative methods included key informant interviews, observations (direct and participant), and a literature review and policy analysis. In conjunction with key informant interviews, the case study of Oyu Tolgoi (OT) as test of theory was aimed to reveal and illustrate likely challenges, opportunities and fitting solutions for LMICs when using HIAs in the mining sector. The Oyu Tolgoi Health impact assessment (OT-HIA), the only significant HIA that has been conducted in Mongolia, was thoroughly examined with the use of all indicated research techniques. It was decided to choose OT-HIA as a case study, because first, this mining project is the largest untapped copper mine in the world (production started in July 2013, during data collection) and its project cycle perfectly overlaps with the research. Case study analysis and key informant interviews recruited participants both in the central office of OT in Ulaanbaatar and the OT mine site in Khanbogd soum of Southern Gobi province. Different sets of interview questions were prepared and used with general stakeholders and OT stakeholders to evaluate the participants' knowledge of HIA opinions and of HIA adoption process. Theoretical concepts, key elements and attributes of DOI theory have been assessed and used in the study as a way to understand the uptake of the HIA as a policy innovation. DOI was believed to be a useful lens through which to evaluate how the HIA is adopted, and how this adoption process can further evolved. Therefore, the effort to further implement HIA innovation in the Mongolian mining sector has drawn upon a contextually appropriate DOI model to derive several strategies for speeding up the adoption of the HIA. Findings and recommendations of the research will not be limited to implementing HIAs in the Mongolian mining sector, as they can be further generalizable to other development

sectors within and beyond Mongolia. The ultimate goal of this research is to provide guidance on the evaluation of the HIA adoption rate within LMICs.

2.3. Data collection:

Data collection in this multi-method qualitative research was carried out through a series of field trips to Mongolia and literature reviews based in Vancouver. This study consists of an assessment of the DOI theory, evaluation of the HIA adoption process in the Mongolian mining sector, and a descriptive analysis of a single case study utilizing the OT-HIA case. Qualitative research data collection methods were used, including semi-structured interviews with informants such as experts, opinion leaders, change agents, champions and other stakeholders. Literature reviews and policy analyses were also utilized, using observations across knowledge users and policymaking groups to provide an overall evaluation of the HIA adoption efforts, focusing on challenges and opportunities for furthering the adoption process. Literature reviews, interviews, findings of direct and participatory observations were primary sources of evidence collection. Descriptive analysis of a case study was conducted on the OT HIA, the only HIA implemented in the country. A discussion of each method follows.

2.3.1. Literature reviews/policy analysis:

A literature review is “a means of evaluating and interpreting all available research relevant to a particular research question or topic area or phenomenon of interest” (Brereton et al., 2007). According to Boote (2005), a literature review does not stop at searching for targeted information; it also specifies the availability and quality of

the materials concerning the field of research. The literature reviews on the basic concepts of HIA and DOI were used to provide a foundation for this research.

The first literature review relevant to this research was conducted in 2011 from available published and grey literatures with emphasis on low- and middle-income (LMIC) settings. This review included an online technical report with guidelines on HIA values, implementation and effectiveness, with a focus on the global resource sector. In addition, the processes and efforts to adopt HIA in the Mongolian mining sector were analyzed through a review of policy documents in both English and Mongolian. The review aimed to compare the country specific HIA environments in order to identify easily-accessible training materials that could be helpful when building HIA capacity in LMICs settings such as Mongolia. This literature also provided information to examine whether HIAs were effective in addressing public health concerns in the resource sector, and under what legal or regulatory circumstances.

The methodology used for the literature review is described as follows in Byambaa et al. 2012: 6:

> "The literature search was conducted by using three major health research databases, namely Elsevier, Pub Med and Science Direct. Searching "HIA" or "health impact assessment" along with the following key words: capacity building; training; module; manual; and competency were utilized. After scanning titles, abstracts and at times full articles, examples of HIA training materials as well as documents written about HIA training or capacity building were collected. Despite growing interest in HIAs in peer-reviewed papers, it seemed that most of the HIA literature was non-standard grey literature, including various online reports created primarily in response to emerging practical needs and interactive training purposes. An HIA-gateway website that belonged to the World Health Organization's HIA collaborating centers and other institutions with HIA capacity building as their focus, were scanned and analyzed. The database generated 104 such documents. Reference lists for all included documents were scanned for related articles, and 52 additional documents were collected using this snowballing technique. In addition,

> other papers were identified through communications with experts or researchers in the field. The total amassed literature included 156 documents, out of which 112 were unpublished and 45 were peer-reviewed articles. Only three articles found discussed HIAs in LMICs. However, a total of 39 peer-reviewed articles and 12 grey materials were chosen to be included in this review paper, as their content was most relevant to the objective of the review. The few publications about HIA and capacity building found in scientific databases described either the potential benefits of HIA training or discussion of methodological issues" (Byambaa et al. 2012, p.6).

A second review was conducted in 2012, to build knowledge of DOI theory and its possible application to HIA adoption in the Mongolian context. This was a realist review using the approach outlined by Pawson (2005). The realist review technique for examining research evidence is believed to be better suited for the study of complex social programs and helps to explain what may be related to their success or failure (Pawson, 2005). Seeking to answer a question "why" with sound reasoning is what makes realist review unique from other forms of reviews. Therefore, it was appropriate to evaluate the state and needs of Mongolian HIA adoption process through the DOI theory. This realist review was utilized to shed light on key factors for successful adoption. According to Pawson (2005), the first stage of a realist review is to develop an idea of the overall context of a problem and to search for empirical evidence of the hypothesized knowledge or theory base. The initial theoretical position could then be refined through this process. The anticipated assumption of this realist review was that use of the DOI theory could improve the success rate of HIA adoption. Applicability of DOI to HIA adoption, validated with review findings, was meant to be a result of the review exercise.

This literature review was conducted with the following research objectives:

- Compiling background knowledge of DOI theory and its main elements and attributes, identifying key systematic sources of information;

- Investigating whether there was any prior academic work bridging the areas of the DOI theory and public health interventions, specifically HIA; and most importantly,
- Understanding the usefulness of the DOI theory to the adoption of the HIA in the LMIC context.

Preparations for the realist review included a dialogue with research supervisors to clarify the review focus and prioritize its objectives (Best, 2012). Applicability of the DOI theory when adopting HIA in LMICs contexts was identified as a top priority. One of the strengths of the realist review technique is that it conducts iterative but flexible searching which begins with broad key words and to get more focused as search progresses. It is believed to make realist review advantageous than simply using fixed search protocols (Pawson, 2005). The selection process for references of the review used flow diagrams proposed by the PRISMA Group. The diagram illustrates the flow of resources at different stages of the process (Moher, 2009). It briefly describes the resources which were identified, included and excluded, and the reasons for exclusion.

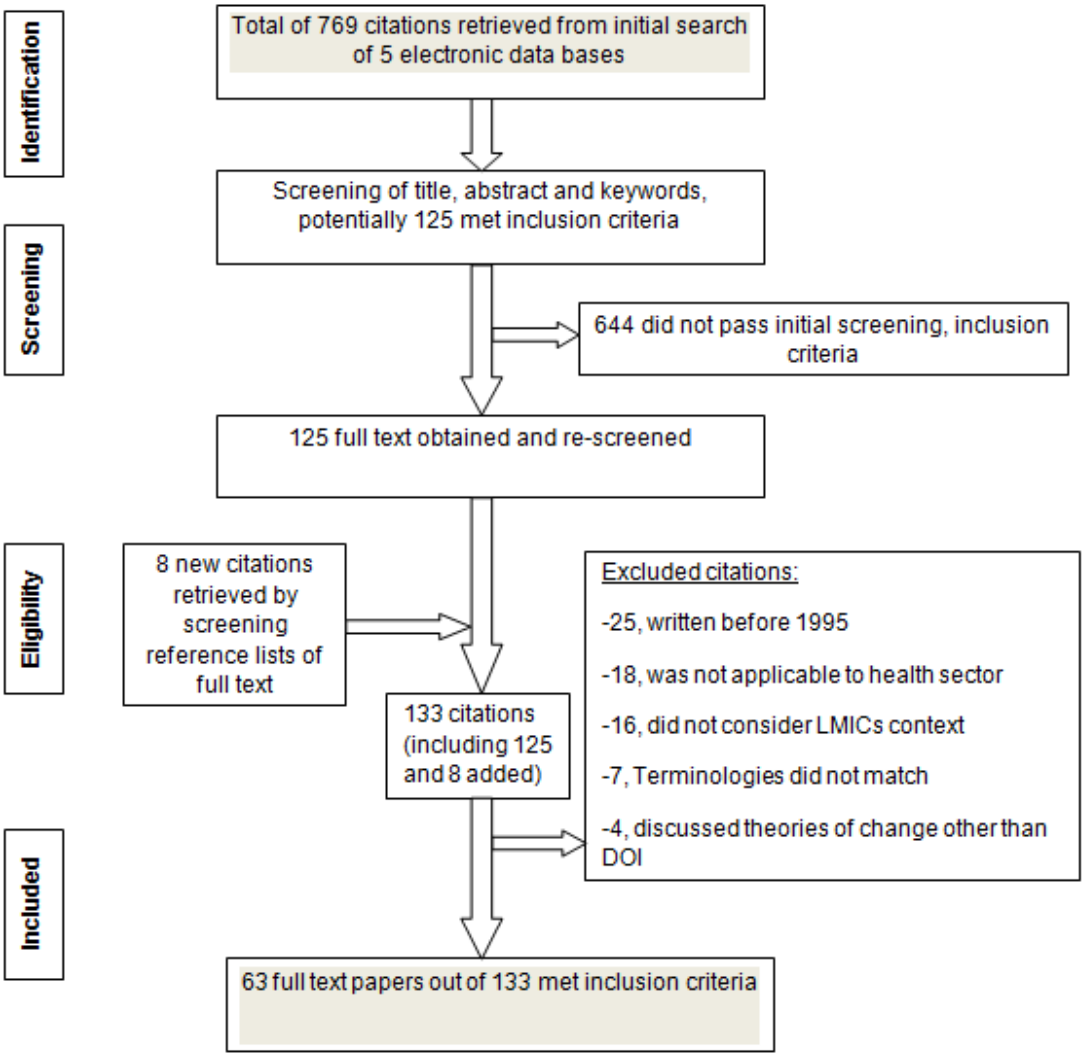

Figure 2.2. Selection process for references using Flow diagram (adapted from: PRISMA, Moher, 2009)

This particular literature review sought articles between 1995 and 2012 from the following databases: Elsevier, Science Direct, Scopus, EBSCO and Google Scholar. The search words and subject headings used included: diffusion of innovation, public health innovation, HIA and DOI, health innovation, innovation diffusion, and DOI. In line with the realist review standard, broad and iterative searches took place in major databases, returning 769 potential citations and academic papers. From the 769 references, 125

were passed the inclusion criteria and used for further review. Full texts for these papers were obtained and re-screened for close relevancy and the number of papers was, once again, reduced to 63 due to reasons depicted in the above in the flow diagram. References from each selected article were also scanned in order to make sure that no noteworthy references were excluded.

A third and relatively rapid review was conducted to assess the availability of literature on the health impacts of mining, specifically focusing on environmental factors and more broadly on the social determinants of health (SDH). A special focus was given to the health risks caused by coal-copper-gold mining activities which dominate the current Mongolian scenario. This review also utilized realist literature review search methods. In addition to these three literature reviews, a continuous regulatory environmental scan was conducted, including Mongolian HIA respective laws, regulations and policies, and challenges and progress were also analyzed for the efforts to revise these Mongolia specific documents. Because the creation of the regulatory framework was believed to be a much-needed first step of introducing HIA in Mongolia this scan was crucially important.

2.3.2. Interviews:

Upon the completion of literature reviews of the existing data, key informant interviews were also used as an important source of data collection in this study. Qualitative, in-depth interviews that used face-to-face interview technique were conducted with people who were familiar with the mining affected community and the HIA adoption process. The ultimate purpose of any key informant interviews is “to collect information from a wide range of people—including community leaders, professionals, or

residents—who have first-hand knowledge about the situations and community" (UCLA, 2004, p.2). In this study, HIA experts with knowledge and understanding of health impacts of the mining industry and the HIA adoption process and affected community members have shared their stories on the nature of problems and provided evaluations of the current HIA adoption effort. Interviews were comprised of the following stages such as planning, brainstorming, determining target populations, developing interviews, tool-testing interviews, conducting interviews, documenting interviews, and finally, transcribing and analyzing collected data. Through interviews with multiple stakeholders, including public officials, civil society and community members, private sector executives, expatriates, and professionals, the necessary information about the uptake of the HIA in the Mongolian mining sector was gathered.

Interviews were aimed primarily at analyzing the processes and efforts to adopt HIA in the Mongolian mining sector. Key informant interview participants included mostly those whose work involved assessing public health impacts of various projects (not only mining) across public, private and civil society sectors as well as those who took part in the HIA adoption effort in the mining sector, and in the OT-HIA process. The style of the interviews was semi-structured. Semi-structured interviews were used to guide key informant interviews. The interview was developed with input from supervisors and committee members to evaluate the participants' knowledge, perception and opinions, as well as to collect information on the HIA adoption process. Interview questions were tested among target participants during initial field research trips to Ulaanbaatar, Mongolia in 2012. The strength of data collection utilizing interviews is that they can be focused on the case study topic and provide insight into an issue. However, unless

questions are well constructed, there could be bias, or inaccuracies due to poor recall (Yin, 2002).

Inclusion Criteria:

Eligible subjects were those whose current or previous jobs were related to the HIA adoption process, and if verbal consent was given to participate. Twenty key informant interviews were conducted by using the pre-developed interview guide (see Appendix E). Snowball sampling techniques were utilized given the limited number of key informant interviewees. In total, 27 interviews were conducted through 3 data collection trips to Mongolia in June of 2012, January of 2013 and July of 2013.

Table 2.1. Interview participant summary

Institutions of interview participants	Count	Was involved (or familiar) with OT-HIA process	Was familiar with HIA adoption process	Constituencies
Central and local government officials, doctor	8	5	7	Government
OT staff, at the headquarter	4	3	3	Private sector
OT staff, on-site	4	1	1	Private sector
NGOs, local	4	2	2	NGO
International technical or funding agencies	4	4	4	Multilateral/Bilateral agencies
University	1	1	1	Academia
Herder	1	-	-	Local community
Media	1	1	-	Media
Total	27	17	18	

Composition of interview participants included: 8 from OT LLC (private sector), 8 representatives from the government of Mongolia and its agencies, 4 from non-government organizations (independent civil society), 4 from international (multilateral

and bilateral) agencies and NGO institutions, and one member each from the academia, media and local community. Three interviews were repeated due to initial incompletion.

Interviews were audio-recorded upon participant's consent and verbatim transcripts were transcribed and translated. All of the interviews with one exception were conducted in Mongolian and translated into English. The likelihood of encountering interviewees who use different terminology than classical HIA terms was expected to be very high. In order to address this issue, a brief HIA introduction section was included in the Mongolian version of Interview guide. In order to collect additional information that was not accessible through key informant interviews, some key participants were re-contacted and requested to provide additional clarifications. Interviews collected information on the following topics: background data, HIA knowledge, awareness, perception and challenges, HIA uptake in the Mongolian mining sector, and opinions about future directions. The duration of interviews varied between 35 minutes to over 2 hours, likely due to disparity in interviewees' experiences of HIA and the HIA adoption process.

Findings of the interviews were found to be highly beneficial to this research as a significant portion of the data were collected through this fieldwork from those who were/are the key players of Mongolian HIA adoption process. Based on research interview findings, HIA maturity and adoption rate in the Mongolian mining sector will be analyzed in the following chapters and will generate recommendations that can be used to further guide effective HIA uptake in the Mongolia context as well as in other LMIC contexts.

2.3.3. Case study:

A single, descriptive case study of the OT-HIA, alternatively called OT-Community Health Safety and Security Impact Assessment (CHSSIA), is presented here. Completed in 2011, this is the only HIA that has been conducted in the Mongolian mining sector. The impact assessment and its subsequent action plan are also presented here[8]. The OT-HIA case study analysis was conducted within various respective departments of the OT LLC, including Community Relations and Sustainable Development (CRSD), and other stakeholders to obtain in-depth data collection.

Both primary and secondary data were collected and used as sources of evidence for this case study. Primary data were also collected through semi-structured key informant interviews and direct observations, only this time questions more specific to the OT-HIA. Interviews were conducted in Ulaanbaatar where OT headquarters is located and in Khanbogd soum of the Southern Gobi province where the OT mine is located. Key OT-HIA documents such as the CHSSIA report, its annexes and the Community Health Safety and Security Plan (CHSSP) were used as secondary data collection materials. The OT-HIA Report was conducted based on the 'Good Practice Guide for Health Impact Assessment' by the International Council on Mining and Metals (ICMM, 2010) and the 'Introduction to Health Impact Assessment' guidelines by the International Finance Corporation (IFC, 2008) were also considered as secondary sources for this study.

[8]Two members of the SFU-Mongolia team, Craig R. Janes and Meghan Wagler conducted an arms-length external evaluation of the OT-HIA and resulting CHSSP. Janes provided me with some of the documents analyzed in this thesis.

During 2010-2012, separate Environmental and Social Impact Assessments (ESIA) and the HIA were conducted and contracted by OT LLC, as these were required by their major donors: the International Finance Corporation (IFC), and the European Bank for Reconstruction and Development (EBRD). These financiers required that OT conduct impact assessments in order identify and mitigate any effects – social, health, environmental -- that might comprise investment risks. The advantage of a case study is that it allows for detail to be collected that would be easily obtained by other research designs. The information collected is of greater depth than can be found in traditional observational or experimental designs. Case studies are also valuable in studying rare situations, or where large samples are simply not available (Yin, 2002). This is the case for the OT-HIA.

2.3.4. Direct and participatory observation:

Between 2010 and 2014, I attended a number of meetings, trainings, workshops, field research trips, conferences and made appearances in the news media in regards to adopting HIA in Mongolia, as well as managing the potential negative health impacts of the extractive industry. My role in these events varied from strict observation to participation as a translator, host, or facilitator. Highlights and observations of these events were documented in field notes and were re-visited in writing this thesis.

As Erlandson (1993) has described, observation gives the researcher an opportunity to illustrate the situation enriched with personal reflections and a "written photograph". In other words, an observant is able, "to check definitions of terms that participants use in interviews, observe events that informants may be unable or unwilling to share when doing so would be impolitic, impolite, or insensitive, and observe

situations informants have described in interviews, thereby making them aware of distortions or inaccuracies in description provided by those informants" (Kawulich, 2005, p.8). The same notebook was kept throughout the study for keeping field notes. Fieldwork involved, "active looking, improving memory, informal interviewing, writing detailed field notes, and perhaps most importantly, patience" (Dewalt, 2002, p 7). A brief list was developed for the things that could potentially be observed. Findings of direct and participant observations were not used as standalone statements, as this research method is believed only to complement other data collection methods. Instead, these notes were used to cross-validate and further describe previous findings.

2.4. Research questions:

This research aimed to address how the use of a particular theoretical framework (the DOI theory) can illuminate the process of adoption and use of the HIA. It was hypothesized that using a compatible theoretical framework (the DOI theory) when introducing a new policy innovation might result in better success rate as it offers many explanatory elements and attributions that could be applicable to HIA adoption. Within the framework of this PhD research at the Faculty of Health Sciences of Simon Fraser University and the implementation of two HIA projects in Mongolia, I spent four years seeking to answer the following research questions with the use of literature review findings, key informant interviews and analysis of the chosen case study:

What are the main features and characteristics of the HIA as it has been implemented in Mongolia as perceived by stakeholders?

Specific research questions included:

- What is a useful definition of HIA in practical and theoretical terms?
- Do definitions and understandings change over time?
- What are the indicators of HIA adoption?
- When can we say that HIA is adopted?
- Do indicators vary over time (e.g., initial planning, uptake, policy adoption, use, actual impacts)?
- How is HIA implementation manifested; does it have phases?
- How do stakeholders perceive the HIA?
- Define and operationalize what adoption of HIA looks like (discussed in Chapter 3.1 titled: HIA as a promising process)

What policy-related, political, organizational, and economic factors in the HIA process are most relevant to managing the potential health impacts of mining industry in Mongolia, and by extension, would be useful in other low-to-middle income country (LMIC) settings?

Answering this latter question involved synthesizing the global literature on HIA applications in the resource sector, focusing in particular on evaluations of the utility of the approach to implementing healthy public policies in resource constrained settings. This set of research questions will be addressed through Chapter 3.1 and Chapter 3.2 with the discussion of HIA adoption process based on the conceptual framework that the DOI theory provides.

What is the trajectory [process over time] of HIA uptake in Mongolia, particularly in the mining sector?

Answering this question involved evaluating the overall HIA adoption process in the Mongolian mining sector by exploring the development of a common understanding and terminology, including “HIA” and factors in adoption among relevant stakeholder

groups, including catalyst, change agent, champions, opinion leaders and coaches who could help jump-start the diffusion process, the resolution of challenges, etc. Data for this research question is generated both inductively and deductively. In addition to the use of five attributes, more features of DOI theory such as four main elements (idea, social system, time and communication channel) and five steps of decision making are used to draw conclusions on the current state of HIA adoption. The OT-HIA case study analysis was conducted within OT departments and other stakeholders as chances of obtaining data of greater in-depth information were believed to be improved through this focused case study research. Chapter 3.2 will provide a thorough discussion of this research question.

Why and how could DOI be used effectively when diffusing a policy innovation such as HIA?

Diffusion is an inevitable event (natural or social). Although diffusion itself could be inevitable, the rate and effectiveness of diffusion is not. Therefore, a theory to explain different rates of diffusion success is very important from a policy perspective. The DOI provides the body of knowledge and tools to examine values of innovations, needs of different adopters and effectiveness of various communication channels. This theory also provides a set of well-established analytical tools to understand and elucidate the mechanisms of HIA uptake and adoption. The descriptive force field analyses of five DOI attributes and perceptions toward each attribute were utilized to clarify whether HIA is an effective method in LMICs including Mongolia. The rationalization and planning as an essential feature of DOI theory could help to improve the sustainable implementation of a social policy. More stable social policies are more likely to bring more positive impact in society.

Through this study we aimed to reveal findings for the question of whether using DOI theory for health policy innovation made sense theoretically. Can this route be a shortcut in policy advocacy? Answering these questions involves first, summarizing the main concepts and features of Rogers' DOI theory, applying its concepts into the actual process of HIA adoption in Mongolia, and also how this theory could be improved and better applied to health policy innovation in LMICs. In the Chapter 3.3, I will focus on several concepts, including attributes, elements, distinctions between innovations, societal sectors, political factors and stakeholders while reviewing diffusion theory and its proper application to HIA adoption.

2.5. Data Analysis:

Combining various methodologies to study one question, generally termed triangulation, provides an opportunity to verify responses or observations, and ensures that results are accurate and not simply the result of methodological artefact or error (Jonsen et al. 2009). In general, triangulation follows processes of data transcription-coding-analysis-presentation. When translating verbatim transcripts of key informant interviews from the Mongolian language to English, I made an effort to use literal expressions.

Analysis of literature followed procedures established for reviews. After the publications were collected through literature searches, I made critical judgements about the quality of data. A set of inclusion criteria were developed and applied to both identified citations and the full texts obtained to choose the most relevant and accurate sources possible. A flow diagram was used to demonstrate the processes of selection for included references. Each data point was examined to determine whether there was

direct relevancy to the problem under consideration. During analysis of literature, I summarized and synthesized the individual points gathered during the data collection process.

Analysis of data from qualitative interviews normally follows three steps: data reduction, data display, and data conclusion. Miles et al. (1994) further explain that data selecting, focusing, simplifying, abstracting, transforming are the actions can be taken during data reduction step while data organization and compression happen during the data display step. Comprehensive field notes were kept during or after the interviews. Taped interviews were translated, preliminarily coded and analyzed at Simon Fraser University. Analysis of interview findings was guided in part by the posed research questions; however, the complex nature of HIA and the inconsistent level of knowledge and perception of interview participants required me to take a more holistic and flexible approach.

Analysis of the case study was the most complex part of this research. According to Yin (2002), the assessment of evidence is the most challenging part of the conducting qualitative research involving case study. A descriptive analytic strategy was selected for organizing the case study for the following reasons. A mix of *Explanation-building* ("analyzing case study data by building an explanation about the case and identifying a set of causal links") and *Time-series* ("How- and why- questions about relationships & changes of events over time") analytic techniques was utilized as part of the general strategy (Yin, 2002, p.67). Time-series analysis helps to identify originally planned set of events and their expected outcomes (Yin, 2002). In the OT case, sequences of learning and conducting processes of HIA pioneering led to the outcome of introducing HIA in the Mongolian mining sector as an informed decision making tool.

Overarching themes and chapters emerged from the data. These themes and chapters were distributed to the members of the Supervisory Committee, electronically, and were critically discussed to assess the accuracy in coding and analyzing. Findings related to the HIA adoption process in the Mongolian mining sector of this study were drawn largely from the data collected through the semi-structured, key informant interviews whereas concepts of overall HIA and DOI theory base were accumulated through a series of literature reviews. Use of multiple qualitative research data collection methods and data triangulation increases the validity of the study findings.

2.6. Ethical considerations:

I was aware of the obligation to respect the rights, needs, values, and desires of the participants, throughout the study, and took respective measures as a result. Low risk ethics approval was obtained from the Office of Research Ethics of Simon Fraser University and the Medical Ethics Approval Committee of Ministry of Health of Mongolia. Obtaining the approval from Mongolian side had to overcome a barrier of HIA being the new concept that required further clarification for the review board. The issue of informed consent and confidentiality was carefully integrated into the study design from the beginning. I obtained consents prior to entering a participant into the study. All interview participants, other than those who work for OT, gave verbal informed consents whereas written consents were obtained from all OT participants as it was assumed to suit their need for confidentiality better in accordance with the company policy. Two cases of refusals for the consents were registered and excluded from the interview as a result.

2.7. Role of the researcher: Researcher as advocate

Based on my personal observations, I believe that applying research findings and intellectual realizations in real practice is a tough, oftentimes heavily politicized, task**,** as the two main communities, researchers and action takers appears to be bit disconnected, underappreciated and alienated by one another. What Rogers discusses in his widely cited "Diffusion of Innovations" book (2003, p.282) supports this notion of a 'chasm' between knowledge and practice as he argues that innovators tend to sit on a periphery of influential social networks, while opinion leaders tend to lack evidence required to make decisions yet stay closely connected to the community. If we take innovators as scholars who generate evidence, and opinion leaders as those who take action based on evidence, then there is a need these two group of players be connected through their work. As Diffusion of Innovations theory suggests, a change agent or advocate can be that force to connect and coordinate innovators with opinion leaders so the informed decisions can be made. Putting on the shoes of both evidence builder and user, I am in a unique, possibly privileged position of being able to bridge this 'chasm'. After earning my MD, MSc and in process of earning PhD from three different countries and working for the government, university and a few research projects, I may have become more or less literate with philosophical views, tools and concepts of both the natural and social sciences. I see potential and demand in myself to be the advocate/change agent necessary for the promotion of full adoption of HIA and improved practice of informed-decision making in health and social sectors of Mongolia. What I describe in this thesis is a project of trying to understand but at the same time be an effective agent of change.

Chapter 3.

Results

3.1. HIA as a promising intersectoral process: How stakeholders understand the HIA

Description of context: This sub-chapter discusses literature review findings on HIA being an intersectoral and informed decision making tool. These conceptual ideas are complimented by findings from key informant interviews.

3.1.1. What is HIA?

Although the term HIA started to appear in the international literature around 1995, it is still very much an evolving concept (Byambaa et al., 2012). According to the World Health Organization (WHO), HIA is “a combination of procedures, methods and tools by which a policy, program or project may be judged as to its potential effects on the health of a population (positive or negative, direct or indirect), and the distribution of those effects within the population. HIA identifies appropriate actions to manage those effects” (WHO, 1999, p.10; also: Birley, 2011, p. 2-3).

The HIA can be seen as originating from three distinct but related areas of public health, including: “environmental health, the wider determinants of health, and health equity activities” (Harris-Roxas et al., 2012, p.46). The ‘wider determinants of health’ is significant in that it acknowledges the factors that determine health outcomes can include environmental, social, economic and/or institutional. Alternatively, social

determinants of health (SDH) are often termed “the causes of the causes” because they are often the underlying causes of health conditions (Harris-Roxas et al., 2012, p.47).

HIA is primarily concerned with health across multiple sectors that have influence on the overall wellbeing of a population (Birley, 2011). Over time, the idea of health is largely determined by non-health sector factors have been increasingly recognized by those within and beyond health sector. Development sectors that have significant roles on human health, including mining, agriculture, transport, water supply, and housing are particularly important in developing countries (Birley, 2011). Although the HIA can be used as a prospective, concurrent, or retrospective tool, a prospective approach is the most preferred form because it fulfills the main goal of preventing the identified health impacts. In order to be worthwhile within a preventive decision making process, the HIA needs to be conducted prior to the commencement of the projects so that its findings and recommendations can be reflected in key mitigation plans. Being interdisciplinary, inclusive and equity-based are central principles of HIA (Mindell, 2003). It should consider cumulative effects when possible and aim to identify positive impacts in addition to focusing on potentially negative impacts. Sets of mitigation acts must follow identified consequences.

Different forms of impact assessments (discussed in section 3.1.5, in detail) including the Environmental Impact Assessment (EIA), Strategic Environmental Impact Assessment (SEIA) and Social Impact Assessment (SIA) are often carried out without detailed consideration of human health impacts (Harris-Roxas et al., 2012). The HIA uses a broad definition of health, as defined by WHO, which considers complete state of physical, mental and social wellbeing. “The formal evaluation of the impact of a proposal or policy is done for economic, environmental, political and social reasons, with health

being a recent addition" (Byambaa, et al., 2012, p.4). The HIA has been gaining ground across countries mainly in two different areas: 1) those few that build HIA into the mandatory legislative system and; 2) in the majority of cases, those countries that encourage or permit a voluntary system of HIA use.

This chapter and the research related to HIA as a whole focus on values, politics, promotion and adoption of HIA as a tool that enables decision-making across sectors rather than its meticulous process and methodology. Given its interdisciplinary nature and holistic approach toward human health, understanding the HIA is not an easy task even for public health professionals. It was hypothesized that awareness, perception and literacy of the HIA are critical to the successful uptake and application of HIA. However, this can vary greatly among potential adopters and stakeholders. Therefore, using key informant interviews to understand stakeholders' knowledge and beliefs about HIA concepts was believed to provide an opportunity to further efforts in cementing HIA practice in the Mongolian mining sector.

Theoretical aspects of HIA:

In agreement with the WHO definition, similar theoretical and technical definitions of HIA emerged through key informant interviews. The following are examples that represent this trend:

> *"HIA is an emerging approach that assesses and measures the health impacts of mining based on scientific methodology. It also requires the process to be inclusive." (Local HIA practitioner)*
>
> *"Different entities perceive HIA differently. For instance: government thinks it is kind of interesting as the concepts coming up a lot in the context of big global health issues of importance such as communicable disease, social determinants of health. So government starts understanding that somehow HIA should be done but not really knowing what it is or how to do it. Industry thinks it is expensive. They do not want*

to do it unless they are required to do it. The ones that do it regularly do it as an internal risk management exercise. They do not likely do it for the communities or the governments." (International HIA expert)

"HIA identifies all health impacts that could be caused by particular project AND come up with a plan to minimize, if not mitigate, these likely impacts. Key to successful implementation of this plan would be all accountable parties mutually agree to who will be responsible for carrying out and fund what activities." (MOH official)

Practical aspects of HIA:

Key informants were also asked about a useful definition of HIA in practical terms. There were multiple notable responses:

"All I and my community need is correct information. We are entitled to know the truth regarding the significant event and its seriousness that is taking place on our turf. How they do it or label it-is up to those "who have been to school"[9]. To us it (HIA) sounds like just another way of seeking the truth... ...Do you know that they say? When there is a smoke usually there is a fire, so we want to make sure that fire is put out. If this thing that you explained (HIA) can help to put out fire- that would be great!" (Community member)

"HIA is a both a risk identifying and community building exercise. While ensuring thorough and active involvement of local community members, the project proponent is able to gain their acceptance (social license to operate[10]) through achievement of collaborative goals and consensus. Community members cannot be receptive to complex HIA methods and steps that are very technical. Instead, explaining them why they have to do HIA, how we identify and quantify particular health risks, how health action plan could help us in keeping the concerned parties accountable would make more sense". (International HIA expert)

"An effort to try to predict what could happen if do not engage in good operation. It then makes recommendations. However, there could be unforeseen impacts or impacts that cannot be avoided with HIA." (Ministry of Mining official)

[9] A phrase that refers to school graduates or "educated people."

[10] Social License to Operate (SLO) is the acquiring of, "free, prior and informed consent of local communities and stakeholders" (World Bank, 2004). According to Pike (2012), SLO consists of both the acquisition and on-going maintenance of the consent of the local stakeholders. The maintenance of consent is especially important as the criteria by which local stakeholders give their consent may change over time.

"HIA is not an ordinary process that we used to know. It requires everybody to be on board. Throughout every step, including planning, initial call, selection of assessors, actual conduct of HIA, acceptance and implementation of consequent plan, HIA requires efficient collaboration from all those concerned parties as it often assesses health impacts of non-health sectors' activities at the population level". (OT headquarter level staff)

"Everybody has different perceptions toward things. Mining impact is one of them. Taking all negative approach and blaming someone irrationally, is not preferred way. HIA can be used in order to address this potential heat by public and helps identify both negative and positive health impacts of any projects and programs. Everybody has to understand HIA at their varying levels whether they are general public, HIA practitioners, decision makers who use HIA, private sector who orders HIA or local communities who are affected by the impacts". (OT staff at the mine)

"Mongolia had no prior knowledge and perception about HIA. We basically adopted this based on IFC and ICMM definition with the inclusion of some practical elements. I assume the practical terms will be created once HIA becomes regular practice in Mongolia. Until then, we will be using the theoretical definition we have". (Local HIA practitioner)

The first observation we can draw from these statements is that there is a clear distinction between different stakeholders' perceptions, interpretations and knowledge of the HIA. It was evident that key informants used basic language to explain the HIA if they were not privy to more technical terms. It appears that when discussing the HIA, key stakeholders may benefit from utilizing commonly understood language to address the HIA.

The second observation that can be drawn from these interviews is that even between HIA practitioners there can be varying degrees of HIA expertise. Individuals who were actually involved in the utilization of the HIA spoke out of their practical experience and lessons learned, whereas those who did not have previous HIA exposure spoke imprecisely and hypothetically. This also implies that more experienced HIA personnel may provide more effective illustrations of HIA when explaining the tool and processes to others.

Although defining and differentiating the practical application and formal definition of HIA was not one of the objectives of this study, it is worth mentioning as these noticeable differences in the perceptions of HIA across stakeholders has potential to present challenges in the full adoption process of HIA. In summary, respondents provided more insights using practical definitions of HIA, rather than using theoretical terms. The Centers for Disease Control (CDC) provide an interesting analogy on the definition of HIA that is simplistic for sharing with non-health sector audiences and community members.

> *"Doctors advise their patients on how they can stay healthy. In many ways, HIA provides the same advice to communities. This advice helps communities make informed choices about improving public health through community design" (CDC, 2014).*

3.1.2. HIA as a public health policy innovation that factors health considerations into policy

> "An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. If an idea seems new to the individual, it is an innovation" (Rogers, 2003 p. 12).

Because Mongolia does not have a history of prior use of the HIA it can be viewed as a public health policy innovation. In order to implement the HIA as a normative process globally, innovators and advocates may need to look specifically at how HIA is diffused in different contexts. New policy innovations in health, such as the HIA, face challenges of translating policy into practice. According to Nilunger (2009, p. 18), making "policy change or policy innovation" is about how social issues are represented and positioned among political agendas and how respective policy ideas are suggested and perceived.

Innovations in public health services are thought to promote improvements in the health status of the population (Garcıa-Goni, 2007). There are many examples of applying DOI theory to health innovations, including understanding how physicians adopt new treatment regimens, health decision makers employ new of evidence, or hospitals adopt new information technology-based medical records and admission systems (Green, 2008). However, the use of DOI theory is particularly challenged for dealing with slow moving public health innovations that largely tend to be preventive, with long-term impacts being very difficult to link methodologically to prevention interventions or the unfolding of undirected innovation processes (Hahma et al., 2011, Rogers, 1995).

The HIA is an example of a prevention innovation and a tool that helps to inform policy makers when making health-related decisions (The National Academies, 2011). The objective of the HIA is to consider population health issues both in health and non-health sectors' policies. The HIA is a promising way for policy makers and other adopters to assist in decision-making as a result of the generally holistic approach and highly inclusive process that it applies. Nilunger (2009) notes that it is also a highly rational process that is attractive to policymakers. The overall deliberative steps of HIA include: consideration of both positive and negative impacts, creation of primary and secondary evidence and baseline datasets, development of rational recommendations aimed at improving health and, most importantly, empowering and engaging the affected community members in the decision-making process (The National Academies, 2011).

The goal of most HIAs is to develop evidence-based findings intended to inform decision-making. These recommendations are usually ways to remove or minimize any negative impacts on health, while at the same time enhancing the positive aspects of a project proposal (Byambaa, et al. 2012). Examples of some successful public health

innovations that include a drinking ban for people who are underage (Blocker, 2006), a syringe-needle exchange program among IDUs (Jarlais, 2006), family planning program and immunization campaigns (Sharma, 2008), use of vitamin D in cancer prevention (Garland, 2006), clean indoor air legislation (Abrams, 2006), and conducting the HIA in the industrial sector (Dannenberg et al., 2006).

3.1.3. Values and benefits of the HIA

A key informant interviewee who happens to be an internationally recognized HIA expert best summarized the values of HIA:

> *"The way I see the main values of HIA are: (1) inform policy, (2) facilitates stakeholders engagement, and (3) adds to accountability. An important issue is- how we can use HIA as a catalyst, a process to facilitate the necessary stakeholders' engagement that is needed to do inclusive decision making that is inclusive of health. HIA also can be an important tool of accountability if concerned parties determine credible baselines and set targets in terms of maintaining and improving the population health. The results of an HIA can be used to monitor net social benefit or net social loss of a particular mining company".*

The HIA applies four values considered central to public health, including democracy, equity, inclusiveness and accountability (Nilunger, 2009; Western Australia, 2007). Potential benefits of the HIA include but are not limited to safeguarding population health and its healthy living environment, saving immense resources by avoiding unnecessary costs of treating ill workers and community members, strengthening intersectoral collaboration, empowering affected communities, and improving their chances of being involved in the decision making concerning their own issues (Mindell, 2008). Promising performance on these indicators can indicate the success of a HIA. The HIA provides great learning and collaborating opportunities for stakeholders across different sectors. This is especially true for those who are from non-health sectors who can increase their

awareness and appreciation for the health impacts of their industry, by getting involved in a HIA related process. “The important advantages conferred by HIA seem to have been the strengthening of understanding by policymakers of interactions between health and other policy areas with associated improvement in intersectoral relations. Engagement of other sectors in HIA workshops widens the perspective, increases understanding of public health issues, and creates shared agendas for future policy negotiations” (Lock and McKee, 2005, p.358). In a recent report, the National Research Council (2011: p.9) noted that, “significant improvements in American's health will only occur if health impacts are considered when developing policies, programs, plans, and projects, particularly in sectors that historically have been viewed as unrelated to health, such as transportation, education, agriculture, and housing”.

The HIA can be a mutually beneficial process to all concerned parties including the private sector. The HIA is a potential revenue-generating tool insofar as it maximizes production potential through promotion of positive impacts and mitigation of negative impacts. “The necessity of conducting HIAs as well as addressing whether or not HIAs are worthwhile cannot be explained by simply providing quantitative data since HIAs’ benefits and impacts are largely qualitative and may differ from case to case. Economic analysis seeks to quantify the costs and benefits of HIAs in order to ensure that the resources involved in an HIA are effectively deployed to achieve maximum health benefits” (Byambaa et al., 2012, p.8). Although this could help to compare the HIA to similar assessment tools, there could be number of challenges when it comes to presenting HIA values in a quantifiable and measureable way (Cunningham, 2011).

Veerman (2006) has argued that predicting impacts may often involve using weak evidence or speculation. However, he notes that this information can still inform

the decision-making process and may serve as a foundation for later, more rigorous analyses. HIAs may be conducted retrospectively as well as concurrently, and evidence is mostly generated through epidemiologic and policy analysis (Mindell, 2003).

Why does HIA stand out as a must-do tool?

Over the years, there have been several key international events, commitments and drivers that triggered the onset, recognition and development of the HIA concept as a promising intersectoral, informed decision making tool. Those sequences of activities that facilitated the actual conduct of the HIA include the Ottawa Charter[11] for Health Promotion, The Rio Declaration[12], The Gothenburg Consensus[13], The Equator principles[14], WHO Commission on Social Determinants of Health (CSDH)'s promotion of health inequity concept[15] and the Adelaide Statement[16]. According to Birley (2011), such principles are labeled as "external drivers". However, there are also "Internal drivers", which can be referred to as the "business case". This includes private sector actors who

[11] The Ottawa Charter situates health as, "a product of daily life, proposes core values and principles for public health action, and outlines three strategies and five action areas reaching beyond the boundaries of the health care sector" (WHO, 1986).

[12] The Rio Declaration, developed at the U.N. Conference on Environment and Development that was held in Rio de Janeiro, Brazil in 1992 declared that, "Human beings are at the centre of concern for sustainable development. They are entitled to a healthy and productive life in harmony with nature" (Wirth, 1995).

[13] The Gothenburg Consensus Paper - published by the WHO in 1999, emphasized that the main values of HIA to include democracy, equity and sustainability (WHO, 1999).

[14] The Equator Principles are set benchmarks for managing environmental and social issues in development projects. The Equator Principles are followed by the International Finance Corporation (IFC) and European Bank of Reconstruction and Development (EBRD), as well as many other large investment banks, as a funding requirement (i.e., loan covenant). In its 2006 Performance Standard 4, IFC required conduct of HIA for all its clients prior to seeking a financial support" (Birley, 2011, p.14;150).

[15] "CSDH advised its member states to institutionalize Health Equity Impact Assessment of major economic projects and policies and build capacity for Health Equity Impact Assessment among policy-makers across government departments" (Lee et al., 2013, p.3).

[16] "The Adelaide Statement on "Health in All Policies" underscores the fact that "government objectives are best achieved when all sectors include health and well-being as a key component of policy development. HIA is a useful tool to achieve this" (Lee, 2013, p. 5).

consider conducting the HIA tool from within their company, as it is meant to serve as a risk management tool so they can achieve their goals without community or political interference. There are slightly different terms and concepts that illustrate this "business case"; reputation, SLO, risk management[17] and corporate social responsibility[18] (CSR) are prominent ones. "Damage to a community's health that can be attributed to the activities of a corporation represents an important risk, to both their reputation and SLO. A corporation may wish to be on good terms with its neighbours and obtains their consent to operate, despite having formal permission to carry out its operations from the government" (Birley, 2011, p.9).

As suggested from multiple international experiences, six guiding principles are crucial for HIA to be successful (Lock and Mckee, 2005). These include: "intersectoral communication and collaboration; comprehensive stakeholder participation; scientific and conditional scoping; using a holistic concept of health for HIA practitioners; emphasizing the positive and negative outcomes; and adequate HIA process training" (Byambaa et al., 2012, p.5).

3.1.4. Global HIA practices

Although the HIA is supported by public health practitioners globally, it still has not become standard or mandatory in most countries, with the exception of New Zealand, Thailand, South Korea and some countries in the EU (Kemm, 2004). Developed countries such as Canada, USA, Australia and the UK are advancing HIA

[17] A corporation carries out routine risk management practices and tries to control the ones that could interfere with their normal operation (Birley, 2011).

[18] CSR is, "a balanced approach for organizations to address economic, social and environmental issues in a way that aims to benefit people, communities and society" (ISO, 2002, p. 5).

with a particular focus on capacity building, methodology refinement, and promotion of informed-decision making when there is no legal mandate in doing so. “So far, HIA has largely been undertaken by practitioners, with varying levels of experience, usually working in public health departments or local authorities; those who have usually found the necessary resources from within their own organizations to advocate for, and undertake an HIA. Clearly this is not a sustainable pattern. Despite growing interest towards peer-reviewed papers, it seems that most of the HIA literature is non-standard, grey literature, including various reports available online created primarily in response to emerging practical needs and interactive training purposes” (Byambaa et al., 2012, p.5-6). Generally, the HIA literature tends to be focused heavily on strengthening methodology and practices largely within developed countries, and fails to address important issues such as awareness targeted towards decision makers, capacity building of local practitioners, and evaluation of national HIA adoption processes.

The literature was reviewed from select high-income and select low-to-middle-income country (LMIC) settings. Content analyses were completed in order to determine whether there were any special issues related to HIA practices or capacity across country contexts (see Byambaa et al., 2012). This summary focuses on the state of HIA to the best extent possible from the collected literature, and provides a brief assessment of HIA capacity building as it is relevant to these different contexts, especially LMICs. Based on the research findings, it can be concluded that HIA adoption activities in Mongolia have been steadily progressing (see Evaluation of Mongolian HIA adoption in Chapter 3.2). In Denmark, health is a formal component in the assessment of development projects and mining activities (Kørnøv, 2009). Application of HIA was

introduced to the Ghanaian mining sector through a WHO pilot project and is believed to have been a successful initiative (Kemm, 2013).

It is important to know how HIA has been evolving across countries within contextual challenges, in order to understand the Mongolian situation and rate of HIA adoption. Drawing on this review (see, especially, the National Academies 2011 report) Canada, the UK and Australia were selected as illustrative examples of how HIAs can be successfully promoted by academic and professional institutions without government mandates. The HIA experience in Thailand is discussed as a potential best practice in a middle-income setting. Thailand has successfully streamlined HIA-related regulations into respective laws and acts with strict enforcement powers granted by the country's constitution (Byambaa et al., 2012, p.6).

High-Income Country Settings

Canada

Canada's immense natural resources have promoted its role responding to domestic and global industrial demands, mainly to an emerging Asian market (Kwiatkowski, 2009). Within Canada, ultimate environmental or health impact assessment decision on whether a project should proceed or not is most often made by the responsible ministerial office at the provincial or territorial level. Many decisions, however, are made beyond health sector's involvement. The province of British Columbia, which in the mid-1990s attempted to legislate HIAs, largely abandoned these efforts following a change in government. By contrast, HIA seems to be well incorporated in government decision-making and planning in Quebec, and is used as a cornerstone of a "Health in All Policies" approach (Banken 2001; Byambaa et al. 2012).

In Canada's far north, where the majority of populations are of First Nation, Inuit or Metis origin, and which is rich with natural resources HIAs have not been used consistently. More exploration of HIAs in Canada's North is needed (Banken, 2001). Kwiatkowski, once of Canada's HIA leaders, and main author of Canadian HIA tools has emphasized the importance of empowering and involving affected communities in the decision making process regarding the project, program or policy (2009). Moreover, being able to capture Indigenous peoples' holistic relationships with the earth and demonstrate how these relationships inform environmental action is fundamental to Canadian HIA practice (The Palenque Declaration, 2006). Affected community members are the best group of people who can identify the range and magnitude of problems they face due to development activities. "Historically, concerns raised by Indigenous peoples about development projects in Canada have included not only those of the physical environment, but also a wide range of social, economic, cultural, spiritual and health matters" (Kwiatkowski, 2009, 58). The empowerment of local communities, capacity-building and the promotion of cross-cultural understanding could be an essential part of health services (Byambaa et al., 2012). Davison (2005) acknowledged a need for further research work in regards to addressing basic social needs of aboriginal communities affected by mining development.

Health Canada, along with local health and environment ministries, developed the four-volume Canadian Handbook on Health Impact Assessment. This document is based on determinants of health model applied within an EIA framework; it is freely available on the internet (http://www.who.int/hia/tools/toolkit/whohia063/en/). Kwiatkowski, noted above, then director of the Environmental Health Research Division (EHRD) at the Federal Government level, has developed web-courses and university

training workshops as a means to build HIA capacity across the country. Based on the HIA handbook, the EHRD, in consultation with the WHO, has established an online course on HIA (see Kwiatkowski 2009).

United Kingdom

The value of the HIA has been recognized in the United Kingdom over the last decade. Both regional and national institutions have encouraged the health impact assessment as part of planning and policymaking (Byambaa, et al. 2012; Mindell, 2005). Although there is no legal mandate that requires HIA in UK, its values have been increasingly recognized as a social policy tool with the potential to support health consideration in the decision making process. The importance of the idea of the SDH has also been acknowledged and supported by the government along with the strengthening of HIA related regulations.

In order to address the need to build HIA capacity in the UK, and with the support of the WHO, a number of professional centres have established to train both local and international participants. "In addition to these specialist academic centres, there are a growing number of HIA specialist practitioner posts at both regional and local levels. There are also a number of independent HIA practitioners, some of whom are attached to academic institutions and other organizations who are supporting and carrying out assessments" (Quigley and Taylor, 2003, p.415). Among the many academic and training institutions now specializing in HIA, the International Health Impact Assessment Consortium (IMPACT) at Liverpool University; the Health Impact Assessment Research Unit (HIARU) at Birmingham University; and the London Health Observatory, stand out as leaders.

Australia

HIA has developed rapidly in Australia over the past decade, and Australia is now considered to be a world leader in considering equity within the HIA and in fostering the Health in All Policy movement, especially in South Australia. The states of Tasmania and Victoria have now incorporated and legislated HIA into the EIA (Harris et al. 2011). In many of the other states and territories, HIA has been accepted by both policy makers and private industry as a tool to ensure that new initiatives protect and sustain health and well-being while at the same time supporting economic development and prosperity (Byambaa, et al., 2012). Indeed, in its 2008 report, the CSDH applauded Australia as one of the leaders in addressing health equity within the practice and methods development of HIA (WHO, 2008). Drawing on the Australian experience, Cole (2008), for example, has emphasized the importance of 'HIA-supportive system or environment.' This environment is argued to comprise political will and support along with the leadership of the health sector and training institutions. Cole (2008) also writes that the one lesson from HIA practice in Australia is that HIA can only develop if and when it is supported by systems that have the capacity to undertake and evaluate HIAs (Cole, 2008).

The United States of America

The adoption of HIA has been relatively slower in the United States (U.S.) in comparison to other high-income countries (Cole, 2004). However, increases in the demand for HIAs, especially at the local level where communities organize in the face of concerning development, has facilitated the development of HIA within public health institutions. The number of HIAs conducted in the United States has increased

dramatically. The U.S. Department of Health and Human Services currently recommends HIA, “as a planning resource for implementing Healthy People 2020, science-based 10-year national objectives for improving the health of all Americans” (The Pew Trusts, 2014, para 2). Cole (2008, p. 9) observes that, “To date, most HIAs in the U.S. have been conducted on a voluntary basis. But some efforts, at different levels of government, are underway to institutionalize the HIA into government decision-making, especially by incorporating it into existing environmental assessment and planning processes.” The Pew Charitable Trusts along with Robert Wood Johnson Foundation began the Health Impact Project in 2004, a national initiative designed to promote the use of HIA as a decision making tool for policymakers. The Health Impact Project “works with government agencies and policymakers to help them implement HIAs; partners with foundations to fund HIAs; provides training and technical assistance; conducts research and policy analysis to support the field; and convenes the National HIA Meeting. The project also partners with foundations to guide and support regional HIA initiatives and collaborates with government agencies and nonprofits around the United States to find practical ways to build health into decisions” (The Pew Trusts, 2014).

Low- and Middle-Income Settings

Health impact assessments undertaken in resource-poor settings are particularly challenged by limited baseline population health data (Winkler, 2010) and limited information about existing health, social, and environmental vulnerabilities (Kværner, 2006; Harris-Roxas et al., 2012). Because of sub-standard operations in various development fields in LMICs, there is a particular need in the literature for the inclusion of documentation challenges around HIA. It is in these settings, after all, where HIA is

needed the most. Literature pertaining to HIA and HIA capacity building within low- and middle-income countries (LMICs) is very limited (Byambaa, et al., 2012). We include here information that was found relating to Thailand, China and South Korea. According to the HIA expert Martin Birley, a few other countries such as Lao PDR, Cambodia, Vietnam and Lithuania are now making efforts to create mandatory HIA policy by revising their existing laws (Birley, 2011).

Thailand

Thailand's case of institutionalizing HIA and building the national capacity may be seen as a best practice within and beyond LMICs. What is remarkable in Thailand is that the provision concerning HIA has not only been inscribed in law through the current national health act, it is also included in the national Constitution (Byambaa et al. 2012). These laws spell out the conditions that trigger an HIA. Parallel to formal legislation, Thailand has also developed a parallel plan to develop HIA capacity among researchers and academics. Chiang Mai University was the first to initiate a capacity building project for healthy public policy researchers at the graduate level. The Health Assembly Development Initiative has organized a series of training workshops on HIA. In these workshops, HIA is considered a tool for a health assembly to analyze and assess available options for the development of healthy public policy. Despite considerable progress in HIA development, there are many future challenges of HIA development in Thailand. This includes lack of a mechanism for exercising HIA rights by affected communities, capacity building of organizations working on HIA, development of new applications both in terms of issues and areas, teaching and learning development, and expanding and strengthening of international networks of HIA experts (Sukkumnoed, 2009).

China

Relevant literature related to HIAs in China is scarce: It appears that HIA is still in the early stages of development. “Very few government health officials or academics are familiar with it as a concept and even fewer advocate for its application in the country" (Wu et al. 2011, p. 421). Current efforts in China are currently focused on environmental factors, with much less on social and population-level factors that affect community health (Wu et al. 2011). Wu et al. (2011) argues that the country urgently needs to develop HIA as a tool to consider health in all decision-making processes so decision makers can make informed policy. This process essentially needs to happen prior to the commencement of projects in order to prevent unwanted consequences. Additional requirements for China to apply HIA successfully are: to build national HIA capacity, adopt internationally-recognized methodology, and develop a system to support multisectoral collaboration as well as to formally engage stakeholders (Wu et al. 2011).

South Korea

HIAs in South Korea have been gaining great deal of attention as a result of two events. First, the Ministry of Environment has now agreed to integrate HIA within the existing EIA framework. Secondly, a HIA training program has recently been initiated by the Institute for Health and Social Affairs in conjunction with the popular Healthy Cities program. These two parallel developments have come together to form the basis of HIA legislation within the revision of the EIA law. Kang et al. observe that:

> “South Korea intends to strengthen the HIA system through capacity building, raising public awareness, and encouraging international collaboration. The Institute for Health and Social Affairs (KIHASA), a government-funded research institute, has set out a long-term plan for HIA development. First, KIHASA will implement HIA at the local

> level during the first six years (2008–2013). In the first three years, the 'learning period,' will be dedicated to HIA development in alliance with 'Healthy Cities' in South Korea. During the latter years, in the 'diffusion period,' the HIA will be implemented with a broader range of stakeholders at local levels. In the learning period, implementation efforts are focused on developing tools and training health practitioners on HIA" (Kang et al., 2011, p.439).

3.1.5. Forms of health assessment and HIA

It is important to understand how the HIA differs from other forms of health assessments and health impact assessments. It is also essential to discuss if it incorporates occupational health issues, if it should be conducted in a standalone form or integrated to other forms of assessment, if there are relative advantages or disadvantages of integrating HIA with either or both environmental impact and social impact assessments, and so on. In order to discuss contextual preferential forms of health assessments and impact assessments, it is necessary to understand differences among these tools and strengths and weaknesses within them.

Along with HIA, there are two other health assessment tools: Health Risk Assessment (HRA) and the Health Needs Assessment (HNA).

Table 3.1. Summary of three different kinds of health assessment

Types of health assessment	Community	Management plan
Health risk assessment	Future worker community and part of peripheral workers community	Occupational health and safety plan, hazard management plan
Health needs assessment	Current community	Social or health investment plan, health enhancement plan
Health impact assessment	Future community, often excluding occupational health and safety	Mitigation and enhancement plan

Source: Birley, 2011

The HRA considers the potential occupational health and safety of the workers in regards to a proposal whereas HNA considers the current health status of a community,

independently of any development proposal. HIA, by contrast, considers the future consequences of a proposal on an affected community (Birley, 2011). In other words, HRA would be concerned with the health issues of those who are inside the fence of a mining company, whereas the HIA and HNA deal with issues outside the fence. Depending on context, all three assessments can overlap in focus.

One of the debates about the use of HIA is whether it can or should be used as a standalone form of assessment, or whether it should be combined with EIAs or SIAs (ICMM, 2010). The perceived advantages and disadvantages of the different forms of assessment, and the strengths and weakness of integration, are discussed below.

Kemm (2004) notes that in many of the European countries, HIA developed independently of the other forms of assessment (Kemm, 2004). HIA is also applied to a number of projects and policies where EIAs and SIAs are not generally applicable. In contrast, countries such as Canada and Australia have developed formal guidelines for integrating the HIA into the EIA. Current HIA approaches and practices may be categorized into two groups: the voluntary HIA independent of the EIA, and the regulatory HIA formally integrated with the EIA (Dannenberg et al., 2006).

Systematically assessing potential impacts and recommending strategies to mitigate negative impacts of a project and policy makes HIA parallel to EIA and SIA. The overall difference of these three types of impact assessments is “where they look for effects. EIA examines effects on the environment, SIA on the social and economic wellbeing of affected communities, and HIA on the health of human populations” (Habitat Corp, 2014).

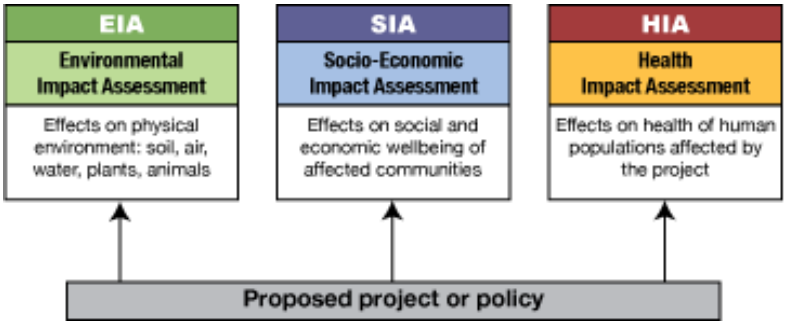

Figure 3.1. Forms of Impact Assessment by Habitat Corp (Habitat Corporation, 2014).

In terms of the policy context, the EIA is often required by in-country legislation, while the HIA and SIA are mainly recommended by the social sector. In addition, the HIA is recommended by multiple international and investment institutions such as the WHO, World Bank and International Finance Corporation (see: ICMM, 2010, table 7). When the HIA is integrated with the EIA it tends to become part of the regulatory process. Below, I compare the four common forms of Impact Assessments, the Environmental, Health Impact Assessment, Social, Health Impact Assessment, Environmental, Social, Health Impact Assessment and stand-alone Health Impact Assessment.

Integrated HIA/EIA (EHIA)

Relative advantages:

Although EIA considers some impacts on health, it it often comes up short in addressing the full range of health impacts because of the EIA's lack of a holistic, population-based approach to health (Steinemann, 2000). Integrating the HIA into the EIA – the EHIA -- has the potential to include a much broader assessment of health determinants (Spickett et al., 2012). The EHIA requires all project proponents to conduct HIA integrated with an EIA, as is the case with National Environmental Policy Act (NEPA) of the United States. NEPA explicitly recognizes the interdependence of

environmental quality and human health. According to NEPA, “the federal government is supposed to assure for all Americans safe, healthful, productive and aesthetically and culturally pleasing surroundings” (NEPA, p.57). That pleasing surrounding is defined as, “the natural and physical environment and the relationship of people with that environment” (Bhatia and Wernham, 2008). Similarly, the Mongolian Constitution provides its citizens the right to live in a safe and healthy environment, and mandated the conduct of the EIA in 1998 with passage of the first EIA law.

Some would think that the likelihood of HIA uptake would greatly increase if integrated within the EIA. Oftentimes the HIA can piggy-back on the existing system that has been built around EIA which will be helpful to overcome resistance from project proponents and other participating stakeholders (Bhatia and Wernham, 2008). In addition, utilizing the EIA regularly may urge assessors to build and maintain an adequate capacity in HIA methods, something currently lacking in practice. An integrated HIA/EIA can also, “effectively promote the consideration of health impacts, health determinants, and the needs of affected and vulnerable populations by policy makers in a broad spectrum of activity subject to EIA” (Bhatia and Wernham, 2008, p. 996). Therefore, integrating health in an EIA framework may positively affect healthy public policy.

Disadvantages:

A downside of using integrated HIA/EIA is that it tends to demand and employ quantitative analytic methods, and as a result limiting the implications of a broader health focus (Bhatia and Wernham, 2008). More qualitative analytic methods, which are often better suited to study indirect health outcomes with socio-economic causes, may be

neglected. The HIA may also get lost within a rather complex EIA, if integration efforts take place without addressing major flaws of the EIA such as, “procedural rigidity, narrow definition of health, strict rules of evidence, an adversarial environment, and over focus on the physical environment” (Bhatia and Wernham, 2008, p.994). There is also the issue of competing agendas and lack of efficient collaboration between health and environmental sectors, which has the potential to diminish findings and practical implications of the EHIA.

An important consideration for the marriage of the HIA and EIA is that EIA practitioners lack HIA capacity and HIA practitioners lack EIA capacity. This causes mutual challenges in bridging cross-discipline perspectives. Hence, all HIA and EIA professions require training on the methodologies and implications of potential health and environmental impacts (Birley, 2011).

Several observers (Steinemann, 2000; Cole et al. 2004; and Bhatia and Wernham, 2008) have suggested that attention to health within an EIA may provoke resistance on the part of project proponents. Health may arouse community opposition to a project, and regulators may wish to avoid legal consequences that may stem from the identification of potential health consequences. As a result, both regulators and project proponents may want to opt for an EIA instead of an EHIA.

In the absence of an HIA management system in Mongolia, policymakers decided to build on the EIA framework by integrating HIA into the well-established existing EIA regulatory system by respective Ministries. Through a series of advocacy efforts, this integration process was initiated in 2012, when the EIA Law revision formally

included HIA as part of the approvals process for issuing new licences to mining concerns.

Integrated HIA/SIA (SHIA)

Advantages:

Using a Social Determinants of Health (SDH) approach enables the HIA to identify many more health risks caused by a project and to better elaborate on the potential burden of diseases that an integrated EHIA cannot. In order to improve health outcomes sustainably, essential social determinants of health such as employment, transportation, social capital, housing, food, and economics need to be improved. SHIA provides the opportunity to assess the state of these determinants (Spickett et al., 2012).

Disadvantages:

Determining causal pathways between social factors that lead to health risks and its health outcomes could be a tricky process unless assessors have tremendous capacity in both quantitative and qualitative analytic methods. An SDH-focused HIA tends to exclude specific occupational health and safety issues and instead focuses on the effects of project activities on surrounding communities. It is assumed that occupational health and safety matters will be covered by separate regulatory requirements and a set of guidelines imposed by federal and provincial/state governments. However, in the absence of strong occupational health and safety regulations, the HIA Technical Working Group comprised from multisectoral representatives in Mongolia identified mining occupational health and safety as a major

concern, and wanted to ensure that the health of the miners themselves is maintained as a priority in the HIA process (Janes et al. 2011).

Environmental, Social, and Health Impact Assessment (ESHIA)

Relative advantages:

The ESHIA is perceived as an ideal and comprehensive form of IA, and very likely the future trend of IAs. The ESHIA developed from the inclusion of HIA needs within the EIA and SIA to create the ESHIA. The ESHIA is cumulative and accounts for the indirect impact of multiple events. According to the ICMM (2010), the cumulative impacts of projects results from the combined effects of multiple health impacts, from multiple project sites, over time. When a HIA is conducted within an ESHIA, it allows us to examine both environmental and social health determinants that influence health and wellbeing, directly and indirectly. The comprehensive ESHIA likely has greater potential to consider health risks from cumulative or synergistic effects of multiple projects, and across the entire life cycle of a project or projects.

Disadvantages:

The ESHIA process requires defining roles for practitioners, avoiding duplication of efforts by different teams, integrating risk assessment and mitigation/planning proposals, and integrating executive summaries. This requires consensus building, and a need to coordinate and integrate multiple disciplines, which can be time consuming. The ESHIA also requires a high level of expertise and collaboration from every discipline involved which can create challenges. Often, the ESHIA may seem too broad,

unfocused and ambiguous, as it can be difficult to understand the impacts of a project on the determinants of health, and health outcomes (ICMM, 2010).

Stand-Alone HIA

If the HIA is implemented independently, it will not lose its focus in the presence of built awareness, capacity and a supportive environment. The priorities of the health agenda will remain high, as there are no other competing priorities. In addition, a sense of ownership and collaboration among HIA practitioners will be relatively high. It could be implemented relatively easily and quickly as it uses existing knowledge and evidence to develop recommendations that policy makers can trust and use.

The HIA strives to examine health outcomes by bringing together attention to the social and environmental determinants of health within a health equity framework (Harris-Roxas and Harris 2011). “These three distinct areas of public health activity are linked by an overarching theme of broader, though at times incremental engagement by the public health sector with non-health sector activities. It analyzes not only the causes of illness but also the conditions that affect health that are referred to as the causes of the causes” (Harris-Roxas et al., 2012, p.44). Health equity-related HIA activity often involves more explicit discussions about the values and goals that underpin planning and decision-making (Harris-Roxas and Harris 2011).

The HIA can be prospective and wide-ranging. It should be completed prior to making decisions whether to approve or reject the proposed project. In doing so, the HIA aims to give special consideration to vulnerable populations (National Academies of Science, 2011). The HIA uses a participatory approach when assessing impacts, as affected community members are invited to share their perspectives on the potentially

negative risks and impacts through various communication channels (National Academies of Science, 2011).

Regardless of whether an HIA is integrated or not into other IA activities, it is critical that the terms of reference and scope of the HIA is clear (Janes et al., 2011). Considering the complexity of these approaches, it is critical that more research focus needs to be given on comparative implementation of HIAs in different contexts. This could be a limiting factor in more resource poor settings, like Mongolia. In the initial analysis it appears an HIA integrated into an EIA (or EHIA) maintains an advantage over the other forms as this well regulated practice presents opportunities for public health professionals to participate in an intersectoral decision making and to include health into public policy, without creating great a burden on local technical capacity.

3.2. Implementing an informed decision making tool: The trajectory of the Health Impact Assessment in Mongolian Mining Sector

Description of context: Content of this section is based on the key informant interview findings. It presents the chronology of the HIA implementation process of the Mongolian mining sector, including elaborate background information of the practical need for HIA, mining sector-specific health impacts that are relevant to Mongolia, current health status analysis of the affected community and case study analysis of the Oyu Tolgoi project.

3.2.1. Mining and the Mongolian Economy

Mongolia is a country with a land mass almost the size of Western Europe and has population size of only 2.9 million people. What makes this least densely populated country even more distinctive is that it contains rich natural resources. The Gobi desert used to be the least populated area of the country, but this is no longer true as,

"Investors, government officials, mining specialists, contractors, miners, truck drivers, small business owners and even commercial sex workers are allegedly making routine trips to the Gobi desert with hopes to get their fair share" (according to an NGO executive).

Mongolia is one of the richest countries in Asia in terms of the volume and variety of its untapped mineral resources. It is at the threshold of a bigger transformation driven by the exploitation of its vast mineral resources. According to the Mineral Resources Authority of Mongolia (MRAM), the mining sector accounts for over 30% of the Mongolian GDP, three times the ratio of what it was less than ten years ago. There are 1,295 valid licenses for extraction of mineral deposits along with 1,755 exploration licenses in Mongolia which take up 9.4 percent of Mongolian land.

Year	Exploration licenses	Extraction licenses	Total number of licenses	Percentage of the land subjected to mining in the country
2013	1755	1295	3050	**9.4%**
2012	2323	1236	3559	14.2%
2011	-	-	2684	14.6%
2010	-	-	3188	16.6%
2009	-	-	3659	**25.2%**
2008	-	-	4111	-
2007	-	-	3416	-
2000	100	-	-	-
1997	75	-	-	-

Figure 3.2. Total number of mining and mineral licenses, by year (Source: Mineral Resources Authority of Mongolia (MRAM), 2012; 2013 and IBP[19], 2003)

As of 2013, mining accounted for 87.5% of exports from the country (MRAM, 2013). The economic growth rate set a record in 2011 with a 17.3% increase in GDP and was estimated at 12.5% in 2013, compared to 6.4% GDP growth in 2010. The GDP is expected to grow at an impressive double digit rate up until 2017 (World Bank, 2014). Experts have predicted that GDP may double in the next five years and even quadruple in a decade. The bulk of Foreign Direct Investment (FDI) goes into the mining sector (World Bank, 2014). The government targets a number of so-called 'strategic deposits' to be the engine of the country's economic development (Asia Pacific Investment Partners, 2011). Mongolia has 54 such strategic deposits that require extra requirements, including a mandate to obtain a license and to sign a long-term stability agreement with Mongolian Government. Strategic deposits are defined as a deposit that

[19] Data for the years of 1997 and 2000 were obtained from an International Business Publications (IBP), 2003, document titled: Mongolia: Mineral, Mining Sector Investment and Business Guide, Volume 1: Strategic Information and Regulations.

is economically influential to both the local and national development or a deposit that can produce more than 5% of the nation's GDP. According to the MRAM (2013), out of the 54 strategic deposits, 43% were in thermal coal, 25% coking coal, 11% copper and 19% oil deposits.

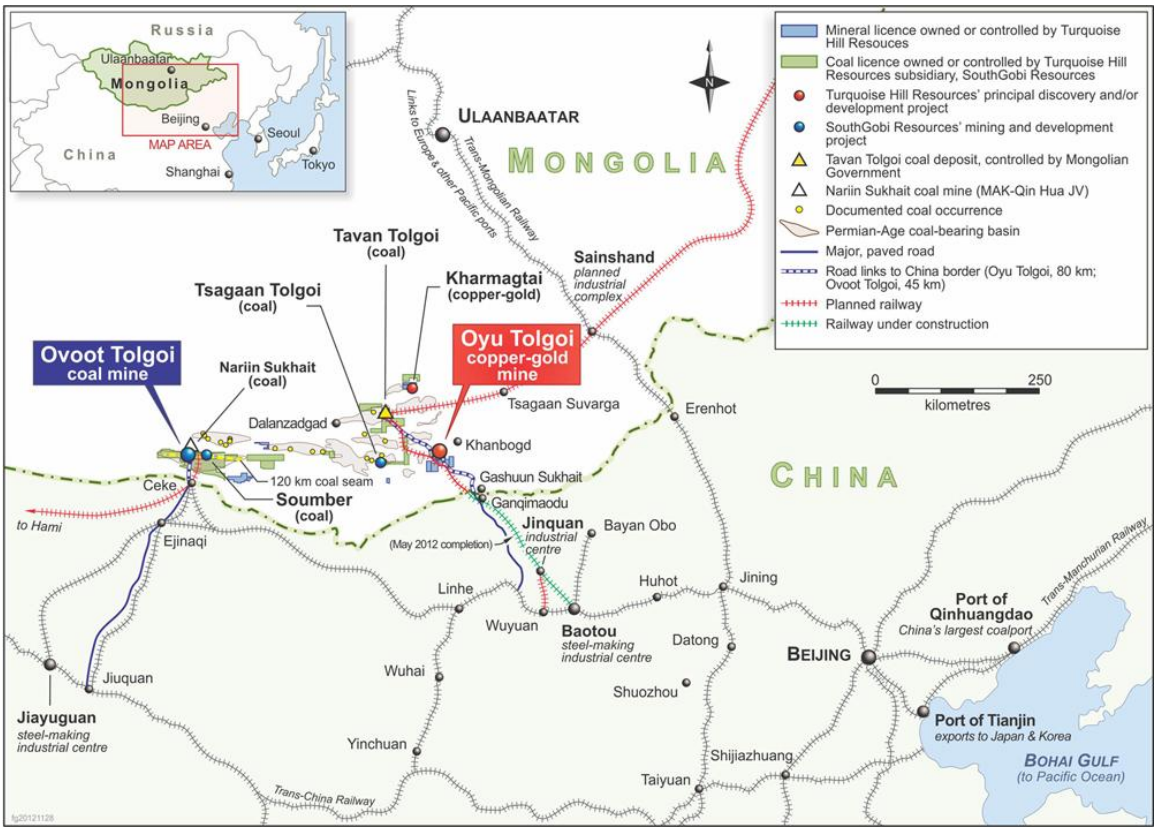

Figure 3.3. Mongolian mineral resources (Source: Turquoise Hill Resources, http:// http://www.turquoisehill.com/s/Oyu_Tolgoi.asp, accessed May 23, 2014).

Major export-related minerals in Mongolia include copper, gold and coal. In addition to a reputation as a gold-rich country, Mongolia has 10% of the world's known coal reserves, and is the world's 12th-largest source of copper with known reserves of between 12m and 14m tonnes (Oxford Business Group, 2012). "In 2006, 4% of all exploration dollars spent globally were invested in Mongolia which made Mongolia one of the top ten exploration destinations in the world and the only Asian country in that list"

(Francis, 2007, para 10). About 45,000 Mongolians or about 5% of the workforce are formally employed in mining. Mongolia hosts one of the largest copper-gold mines in the world, known as the Oyu Tolgoi (OT) mine. The OT mine and its HIA are discussed as a case study in the chapter 3.2.6. Other large mines have followed, and more will soon follow, especially in and around the major high-grade coal deposits at Tavan Tolgoi (TT). These coal deposits are also in the southern Gobi region. Smaller mines, often Mongolian-Chinese or Mongolian-Russian joint ventures, are increasing everywhere. As a result of mining revenues, Mongolian economic growth still maintains its fastest growing pace, in spite of recent contract dispute with the THR. However, this blistering pace of growth has not necessarily translated into wealth for Mongolians. Poverty rates remain high for over one-third of the population, and rates of severe poverty have actually intensified. Inflation is now running at about 10% per year. Much of the resource wealth tends to flow to elites, both Mongolian and international, positioned to take advantage of the mining industry. Those living in Mongolia's rural areas, where the main impacts of mining are felt, are especially disadvantaged (Janes et al., 2014).

During the peak gold mining rush around 2007, an estimated number of more than 100,000 people were believed to be working at artisanal and small scale mines (ASM). This is largely due to unregulated informal mining activities (Grayson, 2004, p.1; World Bank, 2006). The Uyanga soum of Uvurkhangai province, home to 3,000 locals, experienced the influx of as many as 35,000 'ninja'[20] miners who engage in unregulated mining activities. This soum was considered the capital of ASM activities. These 'ninjas' included former miners, local herders, students, civil servants and unemployed city

[20]Artisanal miners have been given the name "ninjas" because they carry green gold panning basis on their backs which, from a distance, makes them look like "Ninja Turtles" cartoon characters that were popular on children's television in Mongolia.

dwellers. Local ‘ninjas’ feared that “they were trading their land and their way of life for these tiny specks of gold” (Lim, 2009, last para). Mining is believed to be a major contributing factor to 850 rivers and more than 1,000 lakes to go dry (High, 2013). In order to extract their gold, these miners use chemicals like cyanide and mercury, causing devastating effects to health and the environment. I had an opportunity to observe many of these impacts during field research trips to Uyanga soum of Uvurkhangai province in 2007 and to Bornuur soum of Tuv province in 2012.

3.2.2. Managing the Potential Negative Public Health Impacts of the Mining Industry

Van der Ploeg (2011) argued that although some resource rich countries benefit from natural wealth, others do not. In the popular theory of ‘the curse of natural resources’, Sachs and Warner write that, “countries with great natural resource wealth tend to grow more slowly than resource-poor countries. One of the explanations is that natural resource intensive economies tend to have higher price levels that force other businesses to try to compete with higher than normal price levels” (Sachs and Warner, 2001, p.834). This forces businesses to give up or increase their prices significantly. Non-mining sectors are therefore suppressed, and an uneven distribution of wealth can lead to an increased burden of financial hardship for the general population which decreases overall social well-being.

In Mongolia, complaints are made by the public, who argue that an increase in GDP and mining opportunities are not felt for non-elites. The public is “confronted with the intense pollution that attaches to gold miners’ money, shopkeepers change the face value of the money and effectively set higher prices in a region with increasing numbers of dependent customers. Rather than challenging or subverting money's national

indexicality, this redenomination of state currency reflects people's critical position within a troubled economy of pollution" (High, 2013, p.676). This causes social inequity, a consequence that might have been foreseen if using an equity-focused HIA as argued by Harris-Roxas and Harris (2011).

The HIA can help harness the benefits promised by the mining industry and minimize its impacts and health risks. Establishing a mandatory HIA system holds promise for addressing the frustrating situation felt by the public and the mining industry. The HIA, if backed up by a strong in-country regulatory structure, could be an effective tool for assessing both the negative and positive impacts of mining projects which establishes accountability to the mining industry to take responsibility for their health and social footprint. "Given the recent growth in industrial development and increased interest from international mining companies, it was important for Mongolia to have HIA tools in place to take advantage of economic growth while improving health and well-being outcomes for the population (Spickett, 2012, p.2)."

As discussed in the previous chapter, the OT mining operation completed a socio-economic impact assessment (SEIA) and HIA in 2010, through Kukh Tenger Khugjil Consortium (KTKK). Though there were no formal requirements for HIA in Mongolia at the time, this use of the HIA was influential in furthering the mandate of HIA use in the country. This was in addition to the compulsory EIA which is required by Mongolian Law. The EIA was amended in 2012 to include the HIA in brief and formal language for every investment project and program before it is approved. However, actual HIA practice is nowhere near a normative process. This is largely due to the absence of current awareness, capacity, detailed regulation and governance of HIA in Mongolia.

3.2.3. The Health Impacts of Mining

> *"Particular health risks related to the mining industry include: population influx and associated changes to local demographic structures; potential disruption of indigenous regimes of land use, which may in turn affect traditional patterns of economic subsistence; disturbance of normal community activities and social relationships; emergence of an informal sector of activity, ranging from small scale and artisanal mining, with its considerable suite of social and health risks; to drug and alcohol manufacture, distribution and use; violence and other social ills; and, very common worldwide, increases in commercial sex work which are associated with increasing rates of sexually-transmitted infections, including HIV/AIDS" (WHO, 2010, p.16-19).*

Health risks can occur at any time during the mining lifecycle from the exploration phase through to construction, operation, and finally, closure. Mining specific risks and impacts can be classified into direct health outcomes and indirect health outcomes (ICMM, 2010). The majority of direct health risks and outcomes can be explained through environmental and occupational health perspectives within a particular community or workplace setting. Socio-economic perspectives, such as the social determinants of health (SDH) approach can offer a better explanation of indirect health outcomes at the community and population level.

Environmental epidemiology is focused on measuring the number of people who are exposed involuntarily to environmental health issues such as infectious agents in the water supply or second-hand smoking. Behaviour based voluntary exposures such as alcohol; cigarette and medications are excluded from this. Occupational epidemiology is the study of health outcomes associated with workplace exposures (Frumkin, 2010). Identifying vulnerable groups that are likely to bear the impact of any risk is an important priority, as they likely to differ from groups expected to benefit from a project. According to the WHO (2013), the traditional environmental assessment used to focus narrowly on changes to the biophysical environment and on potential health risks associated with

pollution and degradation of water, soil and air. This differs from currently evolving HIA practices, which emphasize a wide range of determinants of health as potential risks for negative human health outcomes. According to the ICMM (2010), health outcomes are defined as follows:

> "Measurable changes in the health status of an individual, group or population which are attributable to an intervention or series of interventions. Health outcomes may be intended or unintended, and may not become apparent for many years" (ICMM, 2010, p.8).

In the widely referenced, "Good Practice Guidance on Health Impact Assessment" (2010), the International Council on Mining and Metals (ICMM) categorizes mining specific health outcomes into *infectious diseases* (malaria, HIV and influenza), *chronic diseases* (heart disease, cancer, bronchitis and asthma), *nutritional disorders* (malnutrition, vitamin deficiencies and obesity), *physical injuries* (accidents, heavy metal and chemical poisoning and community violence) and *mental health and well being* (suicide, depression, stress and anxiety).

According to the HIA framework developed by the ICMM, the likelihood and severity of risks are evaluated based on the following metrics: magnitude, duration, frequency, and geographic significance (distribution across the landscape) (ICMM, 2010). Further, the ICMM links these risks to several categories of health determinants:

> *"*Health determinants are the social, economic, environmental and cultural factors – the living conditions - that influence health and wellbeing. They include what we eat and drink, where we live and work, and the social relationships and connections we have with other people and organizations. Some determinants of health, including gender, age, and family history of illness, are un-modifiable, while others are modifiable through community interventions. It is the modifiable determinants that are the focus of the HIA" (ICMM, 2010, p.11).

Lock and McKee (2005, p. 359) note, though that, “the most common approach to the HIA, other than the EHIA, has been one based on the broad health determinants. This means that HIAs will confront considerable uncertainty about potential health impacts while researchers try to develop stronger tools to study these determinants and uncover associations and causal relationships with particular outcomes. In many cases, especially those implemented at a supranational and cross sector level, the immediate effects are often unclear, and the causal pathways are complex” (Lock and McKee, 2005, p.359). This places a particular challenge on both interpreting HIAs and applying results to policy.

Below, and following from the ICMM framework, I summarize what is known about the different health outcomes and how these are linked to mining activities with an emphasis on Mongolia. I contextualize these outcomes by referring to comments made by some of my key informants.

Infectious Diseases:

The many changes to the social, economic, and demographic conditions in communities that large-scale mining may bring can have considerable effects on infectious disease risk and patterns of transmission. For example, HIV and other sexually-transmitted infections may increase with the influx of new people, especially men living away from their families, increases in alcohol use, and prevalence of sex work in mining camps.

> *“STI is very prevalent and people are treating themselves with medicines from pharmacy, out of embarrassment. Because they skip doctors, it’s really hard to see the actual trend. Many international projects supply*

rapid tests for STIs like syphilis make people self-diagnose, too. They go see pharmacist or get consulted by each other." (From the interview with intersoum hospital doctor)

According to the ICMM (2010), other infectious diseases like tuberculosis can also be a problem. An influx of new mining communities can cause overcrowding that will increase the risk of air borne diseases such as influenza or TB. Overcrowding may also bring emerging or re-emerging infections to the local community. The creation of pits for storing wastewater may become a breeding ground for some insect vectors, such as malaria carrying mosquitoes. In addition to insect breading, water borne diseases such as typhoid, cholera, and hepatitis A could be spread due to water shortages and the low quality of drinking water resources. Population increases may also place stress on food systems, increasing the risk of food-borne disease.

Chronic diseases, malnutrition and obesity:

Over time mining has potential to lead to chronic health conditions by affecting people's lifestyle including changes in diet, sedentary lifestyles, increased consumption of alcohol, and increases in tobacco use. This in turn may increase the risk of chronic health conditions, cancer, obesity and heart disease (ICMM, 2010):

"Mining projects can increase the range, quality and amount of food available, leading to improved nutrition and positive health and wellbeing. However, projects can also reduce access to traditional food sources by, for example, using agricultural land for other purposes or increasing the demand, and therefore prices, of locally grown foods. There may also be risks associated with the increased availability and affordability of manufactured food products that are high in fat, salt and sugar. Obesity and micronutrient deficiencies can co-occur when calorie intake is high and the food eaten is low in essential vitamins and minerals. This is a particular risk in regions of rapid economic development, where the influx of cash income into a subsistence economy can disrupt traditional

patterns of food production, food distribution, land access and water use". (ICMM, 2010, p.10).

The OT-HIA participants interviewed by KTKK identified alcohol use as a growing problem linked to pressures from both family and work. In addition, it was found that workers often consume alcohol excessively during their off days (KTKK, 2011).

Exposure to Hazardous Materials, Noise, and Dust:

Many health conditions such as skin diseases, respiratory diseases, cardiovascular diseases, neurological disorders and other organ disorders may be related to mining activities through exposure to hazardous materials and heavy metals, though the background levels of exposure may vary from community to community. Certain highly toxic materials and chemicals remain in the air, water and soil (ICMM, 2010). Dust, caused by ore crushing activities and motorized transportation, is one of the more common hazardous exposures, contributing to respiratory problems. The magnitudes of exposure to health hazards can be especially high in underground mine settings where there is limited air supply and circulation. Outcomes under these conditions include fibrotic lung disease, silicosis and tuberculosis (Ogola et al., 2002).

Artisanal and small-scale gold mining (ASGM), on the other hand, presents more serious health challenges insofar as there is unlikely to be any or only weak enforcement of workplace safety regulations. Heavy metals such as mercury and lead are released to the environment upon initial exposure to oxygen and water, and become especially hazardous. Due to lack of access to to more sophisticated ore processing equipment, artisanal miners commonly use mercury as an amalgam – mercury will bind with gold. As a result, they do not only expose themselves and their coworkers to this highly

hazardous substance but may contaminate the air, soil and water (Ogola et al., 2002). In spite of worldwide efforts to control mercury use, and in spite of a recent ban on mercury import and use in Mongolia, the practice is still common in Mongolia and is a threat to the health of artisanal miners and surrounding community.

Accidents and Injuries:

Project-related accidents, equipment failures, and heavy transportation-related accidents are the leading causes of physical injuries in mining. In addition, population influx, the likely predominance of young male workers, and the presence of alcohol, can contribute to higher rates of violence and sexual assault. Because Mongolia is relatively inexperienced with implementing world-scale mega-mining projects, the incidence of workplace injuries may well be higher in the absence of well-developed occupational health safety and security regulations and enforcement protocols. But all effects are not necessarily negative. Mining-related employment of young men may increase the social well-being of a community and reduce the risk for violence.

> *"Due to mining, accidents and trauma are on the rise, especially among OT sub-contractors. There are several small sub-contracting companies that bring laborers in with no health insurance to work long hours with no proper safety trainings and protective gear. This issue isn't a big problem among "real" OT workers. Prostitution, fights, burns and cardiovascular diseases are other common health issues that we often see, in addition to accidents. We also get lot of emergency calls come from Tsagaan Khad, the central hub for coal transportation to China" (from the interview with intersoum hospital doctor).*

Mental Health:

Normally, being employed by an international mining company that pays more than what a university professor makes can reduce the level of stress and enhance the

state of mental health in miners. This has a domino effect on their families' well being, too. However, constant worry of 'what if I lose this job ', 'what if I get injured.' and 'what if the mine gets shut down,' may cause stress as their family's economic status largely depends on what they make. In the Mongolian case the pressure could be even more acute because recruitment for mining jobs can be very competitive, not to mention the pressures of the cultural norm that the head of household is obliged to feed the rest of the family. The overall state of mining job security in Mongolia is not so great these days as big mining companies frequently lay-off employees due to contractual disputes with the Government and project shut-downs caused by changing mining regulations in the country.

Mining specific health risks can be divided into those related to occupational, environmental, and socio-economic factors. Such risks such as heavy metal and chemical poisoning, work place accidents, exposure to other potentially hazardous factors like noise and dust could be considered to be occupational health risks, while soil-water-waste-related diseases and related malnutrition and vitamin deficiencies could fall under environmental health risks. Indirect and cumulative health risks such as those leading to obesity, chronic diseases, and mental conditions can be analyzed through a socio-economic lens. However, certain health risks can be related to more than one category insofar as the definitions and examples of environmental and occupational epidemiology are sometimes bit arbitrary and could overlap with one another or other areas of epidemiology (Frumkin, 2010). Complex and severe health outcomes such as HIV/AIDS and TB can be influenced by more than one group of risks.

Determining the Determinants: Making Sense of Causal Pathways

> *"Good quality data on health impacts may be unavailable, or valid quantification of the size of effects may not be possible. However, by constructing causal pathways between effects and outcomes, it may be possible at least to indicate the overall direction of effects. Often there is insufficient information to define or quantify the causal pathway but some evidence exists" (Mindell, 2001, p.175).*

In the case of the mining activities in the Umnugobi, local community members are expecting the mining rush to increase economic hardships affecting their quality of life and mental health.

> *"...Our life was fine before all this mining rush happened. All of my generations have been herders and every single one of my ancestors has done the same thing on this very same land. We were just herding our animals happily on our land and everybody had clothes on their shoulders and food in their stomach. Then all of sudden, without our consent, we're being asked to leave so they can mine...*
>
> *... Can you imagine how on earth we can continue our life as happily as before and raise three children knowing that there is no pasture land for herds, no adequate drinking water for us, no clean air to breathe, no healthy animals to butcher, no appreciation for what we do and say, and no affordable clothes to buy? Prices for things have gone up to the roof thanks to this craziness. Our herds actually had some trade value before, but now you have to sell a camel to purchase basic household needs for couple of months" (a local herder)*

Many community members do not understand how mining is linked to economic hardship. They do not possess the knowledge and experience of how social determinants of health can indirectly affect their health and well being. Mapping the causal pathways explains how suspected project impacts may directly or indirectly influence health outcomes. A good example is explained in the 'HIA toolkit for the Mongolian mining sector'. It describes how a pathway can link social determinants of health to a health outcome (Janes et al., 2011). It uses the example of how reduced

family support caused by relocation due to a new mining job has the potential to cause several negative health outcomes.

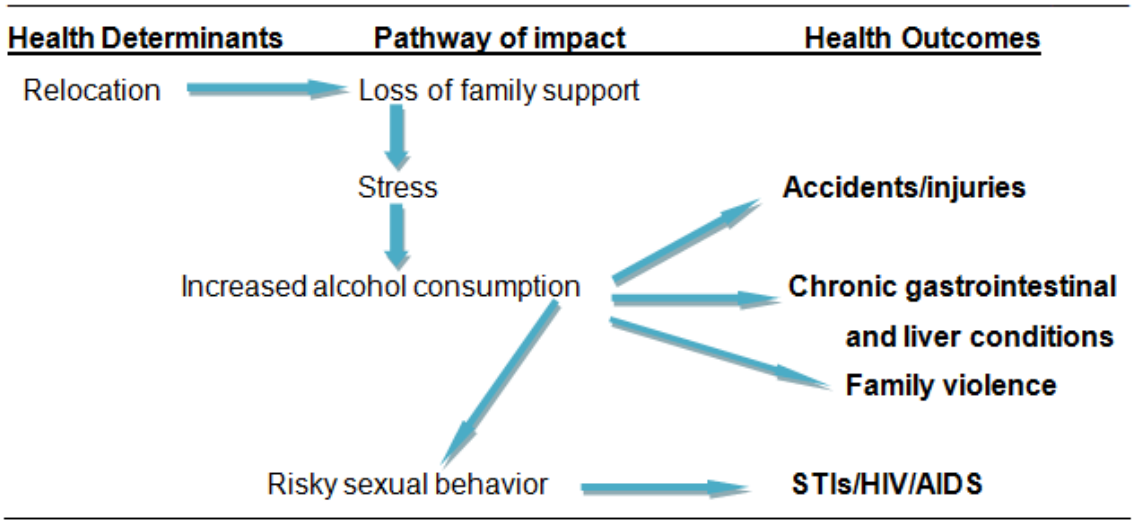

Figure 3.4. Sample Causal Pathway

"Where elements of the causal pathway are unknown, it is important to be explicit about this rather than relying upon common sense assumptions" (Mindell, 2001, p.175). Understanding the magnitude of the cause and effect correlation of health risks and outcomes would help in identifying appropriate policies. Given the possibility of cumulative effects, it would be irrational to blame a company for anything and everything that happens in the area in which their project is located in the absence of sound justification or hard evidence. All communities have existing public health issues. Development projects impact human health in a positive or negative ways. It is within the wider social and environmental context that both occupational and community health impacts must be assessed. The HIA assesses both physical health impacts of a community and a workplace. The actual pathways of health risks induced by social determinants but triggered through mining are a profoundly understudied area. Mining is thus a population health need that requires government attention.

Health Impacts in Mongolia

The potential health impacts of coal, copper and gold mining have been examined in detail in several research projects, as these projects occupy 84% of the land that are subjected to extraction in Mongolia (MRAM, 2013). This highly coal-copper-gold-dependent trend will have important policy implications for at least for another 50 years as contracts between the government and industry stipulate. To understand claims of the potential health risks of copper, coal and gold mines, international and Mongolia specific literatures on the human health impacts of these minerals are briefly reviewed. These literatures are further supported by the findings of the OT-HIA in the OT case study section 3.2.6. Although KTKK has conducted the OT-HIA prospectively, they were able to identify a few particular, if not many, occupational and community health risks as result of field study and analysis of routine health data, whenever available.

Coal mining has produced a high incidence of industrial bronchitis and pneumoconiosis in the Mongolian mining sector (Oyunbileg et al., 2011). As a result of a high level dust exposure in mines, dust-induced chronic bronchitis and pneumoconiosis accounts for 67.8% of occupational disease in Mongolia. Air sampling data shows concentrations of total silica in coal mines was about 15.3–17.5 mg/m3, far surpassing the maximum allowable limits in Mongolia (Oyuntogos, 2007).

> *"Upper respiratory infections are not getting successfully treated with the commonly used antibiotics. Perhaps, mining-induced issues like dust could be one of the reasons. Certainly, I am aware of this issue because I see the dust everyday in the air. OT was supposed to pave 10.5 km road within the soum center but instead built a so-called "improved dirt road". Outside the soum center, there is a custom point called "Tsagaan Khad" not very far from here that leads to "Gashuun Sukhait" border crossing to Chinese "Hua Fan" customs. Everyday hundreds of 100 tonnes trucks come and dump and reload their coal outside for customs purposes, which makes the surroundings impossible to see. As far as roads are concerned in the soum center, it's foolish to relate that to mining.*

> *However, dust around Tsagaan Khad is a different story. It is directly caused by transportation of several companies mining products to China including OT. I would suggest you go to Tsagaan Khad, if you have not been there, yet. It'll remind you of a bomb-wrecked war zone as there is black smoke (not even gray!), everywhere, caused by coal trucks. On a busy day, trucks stretch as long as for 4-5 km" (from the interview with intersoum hospital doctor).*

According to Weston (2011), 60% of all occupational diseases and 70% of all occupational deaths across all industrial sectors were associated with work-related respiratory diseases. These occupational respiratory diseases are divided into two types: interstitial lung diseases (pneumoconiosis) and airways diseases including asthma and chronic obstructive pulmonary disease (COPD) (Weston, 2011). Depending on their specific exposing agents, pneumoconiosis is further divided into: asbestosis, chronic beryllium disease, coal workers' pneumoconiosis (CWP), silicosis and more. Inhaling high concentrations of coal mine dust causes CWP and COPD (GAO, 2012). "Common factors in the development of these diseases are exposures to dusts, metals, allergens and other toxins, which frequently cause oxidative damage" (Weston, 2011, p.387). Many major coal mines in Southern Gobi region of Mongolia including the well-known Tavan Tolgoi (TT) mine owned by Energy Resources Company have "highly ranked"[21] coking coal which carries a higher risk of causing CWP (GAO, 2012). The chronic effects of dust-related lung disease can be related to single high-level exposure or chronic low-level exposures. Although, there could be times that coal mine dust exposure takes up to 15 years to cause CWP, it sometimes takes much less time to cause the same outcome if there is high-level exposure (GAO, 2012).

[21] "Coal rank is a classification of the amount of carbon in the coal. Coal with high rank has high carbon content (GAO, 2012, p.11)."

The permissible exposure limit (PEL) for respirable coal mine dust, the standard set out by the Mine Safety and Health Administration (MSHA) is 1.0 mg of dust per m3 of air (GAO, 2012). However, according to Lkhasuren et al. (2007), PEL in Mongolia stands at whopping 10 mg/m3 which puts miners at incredibly high risk of developing pneumoconiosis. In line with the rapid industrialization in the country, the morbidity and mortality associated with occupational respiratory diseases as well as lung cancer rate have been on the rise in Mongolia. 82% of the pneumoconiosis cases were diagnosed among miners from coal mines and workers from power plants (Oyunbileg et al., 2011). Diseases associated with a high-level of dust exposure commonly lead to such outcomes as pulmonary parenchymal fibrosis, functional impairments, respiratory symptoms, disability and early death (Wang et al., 2000. In Mongolia, the total of economic losses and the human capital losses resulting from pneumoconiosis appears to be significant as 15% of the economic losses (4.8 millions USD for 8,539 workers) from temporary disability, rehabilitation and workers' compensation in 2004 were attributed to the disability caused by pneumoconiosis (Oyunbileg et al., 2011). Therefore, trying to prevent pneumoconiosis is a critical aspect of its management, considering the irreversible and progressive effects of this disease.

Occupational asthma and COPD are the most common obstructive airway diseases (Baur et al., 2012). "A number of airborne substances in the workplace can cause diseases and irritation of the respiratory system. Health effects of inhaled irritants include rhinitis, vocal cord dysfunction, asthma, emphysema, chronic bronchitis, and reactive airways dysfunction syndrome (Langley and Lipton, 2013, p.219)." Irritant agents alter the respiratory tract and lung in the forms of solid, liquid and gas (Langley and Lipton, 2013, p.220). The smaller the size of the inhaled particle, the greater the

potential hazard, as fine particles, those with the aerodynamic diameter of less than 2.5 micrometers, penetrate deep into the bronchioles, alveoli of the lung and are deposited in the regions of the lung's airway exchange (Langley and Lipton, 2013). Such things such as source of origin of the exposure, transportation routes in the atmosphere and its targeted destination could preliminarily be determined based on the size of the particles (Frumkin, 2010). "Inhalable particulate matter (IPM) is hazardous when deposited anywhere in the respiratory tract. IPM replaces the term total dust (Langley and Lipton, 2013, p.221)."

A study comparing Appalachian rural communities, one with mining and one without, controlling for known behavioural risk factors, found that "self-reported cancer rates were twice as high in mining areas…. rates of lung, bladder, kidney, colon cancer and leukemia were all higher in mining areas." (Hendryx et al., 2012, p.324). In the same study, the researchers link COPD and high blood pressure to coal mining. Modeling hospitalization rates from various diseases, the Hendryx et al. (2012) find that the odds of hospitalization for lung disease (COPD) increased about one percent for every 1,462 tons of coal mined in an area during any one year. They also found that the odds of hospitalization for high blood pressure were found to increase about one percent for every 1,873 tons of coal mined (Hendryx et al., 2012).

According to a study conducted by Ahern et al (2011, p.843), "the risk of birth defects is significantly higher in mining areas than in non-mining areas". The study evaluated birth outcomes at two points 1996 and 1999. This comparison showed that the risk of birth defects was 13% higher in areas with coal mining. They also looked at rates from 2000 to 2003, and found that the risk was 42% higher. The study also attempted to explain the root causes of birth defects in the mining area through the social

determinants of health model by noting that, “this disparity is partly accounted for by socioeconomic disadvantage and associated risks…. pregnant mothers in the mountaintop mining area are more likely to smoke and to have a lower level of education, reflecting the chronically disadvantaged nature of mining-dependent economies and the associated burden of poor health for Appalachian residents in coal mining areas” (M. Ahern et al. 2011, p.843). Both underground and open pit coal mining and its transportation are blamed for various dust-induced health outcomes. Underground mining is more closely associated with silicosis and TB.

The documented health effects of **gold** mining are mainly linked to artisanal and small-scale gold mining (ASGM). ASGM practice in Mongolia has been noticeably reduced since 2008 with the introduction of a law that has banned mercury use in gold processing. However, it has not completely halted as there are many mine sites occupied by ‘ninja’ miners (see footnote #19). The health risks caused by this type of mining remain a large concern. These include mercury and cyanide poisoning in ASGM communities, unsanitary crowded living conditions in ASGM camps, inadequate local medical services, increased risks of water-and-air-borne diseases, including tuberculosis and cholera, as well as reported increases in sexually transmitted diseases (Grayson et al. 2004).

Mercury (Hg) is used in ASGM for gold processing as it amalgamates with gold. Mercury accumulates in the body and specifically targets the vital functions of central nervous and immune systems (Ogola et al., 2002). Harada (1999) stressed that identifying signs and symptoms of poisoning caused by background level exposure of heavy metals is not an easy task as they are compounded by other health conditions

and complications. Common routes to mercury exposure are inhalation, ingestion and skin contact depending on its forms (Frumkin, 2010).

In Khongor soum in 2007 mining was found to have contaminated 44790^3 meters of soil and 1192 tons of tailings with mercury. Studies by health personnel at the time showed that nearly half of the community showed signs of mercury intoxication. As a result of this widely publicized incident, the use of mercury was banned, and hundreds of artisanal mine sites were shut down (UNEP, 2012). However, it cannot be assumed that mercury-using practices have been fully eliminated because country lacks the inspection capacity to monitor illegal mercury smuggling activities into the country from China. However, it is likely that prohibitions on mercury importation have increased the prices for mercury and perhaps reduced its use. Currently there are several projects in Mongolia to introduce ASGM to alternate forms of ore processing that do not use mercury.

Lead (Pb), when exposed to water, air and sunlight, changes its affinity for other minerals, and becomes a potent toxin. "No human organ is immune to the toxic effects of lead as it damages nervous, cardiovascular, reproductive, hematological and renal systems (Frumkin, 2010, p.368)." Sub-populations with compromised immune systems are especially prone to these effects. Lead is accumulated in the bones and is measured in the blood. In the absence of an external exposure, lead can still be detected in the blood and results in the lowered functions of the organ systems as the accumulated lead in the bone, which has half-life of 10 years, continues to function as an internal source of exposure (Frumkin, 2010, p.368; 408). Similar to mercury, lead accumulates in the water, food, soil, and air and influences human health adversely. Lead can be very toxic

even at a low level of exposure. Particular health outcomes of lead intoxication affect the central nervous and immune systems (Ogola et al., 2002).

"The major part of lead compounds are characterized by low mobility and high accumulating capacity, which leads to its accumulation in a depositing environmental compartments and a negative effect on human health (Sorokina and Enkh-Amgalan, 2012, p.61)." As a result of many scientific discoveries on lead toxicity, Centers for Disease and Control has continually lowered limits for body lead level (BLL) down to 10 micrograms per deciliter of blood (Frumkin, 2010). Contaminated soil and air with lead are the main sources of lead exposure in artisanal mining communities (Lo et al., 2012). Abundance of law enforcement toward artisanal mining activities and lack of regular lead monitoring by the Mongolian government puts its population at danger of lead exposure not to mention weak infrastructure (unpaved roads) and dry landscaping (lack of vegetative cover) of the Gobi desert, where Mongolian mines are centralized. Mongolia has very weak capacity to monitor and control the contamination of the environment with either lead or mercury. Considering the fact that gold extraction and processing still is main source of livelihood in many rural communities across Mongolia, the government should focus on improving its capacity to regularly monitor quality of soil and air against lead exposure.

Lead exposure is slightly better studied area in and around Ulaanbaatar than mining affected regions. According to Batjargal et al. (2010), the soil lead content of capital city Ulaanbaatar was higher than the guideline value. The elevated lead level in the soil was believed to be associated with significant increase of second-hand vehicles from Japan as well as an increase in the use of leaded fuel in recent years. The Joint Russian and Mongolian Academies of Sciences' study revealed that "lead

concentrations in the air of Ulaanbaatar were 3 to 26 times higher (Sorokina and Enkh-Amgalan, 2012, p.67)" than the statutory level of average daily concentration. The air pollution was the highest in the city center where traffic congestion is the worst (Sorokina and Enkh-Amgalan, 2012),

There is some evidence linking **copper** mining to several health outcomes. The most commonly cited evidence regarding copper mining notes the adverse consequences of waste, gases, particulate matter (PM) and heavy metals toxicity. Newhook et al (2003) state that the health impacts of copper mining occur when toxins are released into the surrounding environment and affect the skin, respiratory, cardiovascular, central nervous and reproductive systems. Copper mines tend to produce more tailings than other types of mines, and this increases the risk of communities' exposure to this potentially toxic waste (Dudka, 1997). Copper mines also likely generate health risks common to any mining site, as result of mining activities such as digging, moving, crushing and concentrating of ores. These activities will increase exposure to dust, and yield higher risks for asphyxia, fall injuries, burns and machinery accidents.

In addition, Newhook et al. (2003) suggest that copper refining facilities are much more likely than regular extraction facilities to release many highly toxic and carcinogenic metals and particulate matters into the environment. Except for moderate sized Mongolia-Russian joint copper mining venture at Erdenet, there is at present no refinery in Mongolia. However, given the rapid increase in copper mining activities, and the desire to enhance the value of the industry to Mongolia, the addition of more and larger copper refining facilities in Mongolia is likely. Greater risks for environmental contamination and related increases in risks to health will be a result.

Outside of the effects of heavy metal contamination, which can often be linked directly to mining (e.g., mercury use in ASGM), much of the evidence linking specific mining activities to particular health outcomes, especially through complex causal links, is not definitive. As a result, some question the validity of mining-ill health links that might be generated in a health impact assessment. The main argument used to advocate this position is that mining cannot be blamed as a single risk factor that leads to increases in morbidity, mortality, and the wellbeing of a community (Borak, 2012).

The IFC has developed what they call an "environmental health areas (EHA)" framework which defines types of potential health impacts in relation to specific pathways and key environmental health areas. Using this framework could help HIA practitioners in pinning down the actual linkages and causal pathways between the suspected project activities and potential environmental impacts at the community level. It also helps to identify subpopulations that are more susceptible to particular EHAs and mining impacts (IFC, 2009, p. 20-22). Understanding how various issues (population influx, waste management, change in the earning, etc.) could impact key environmental health areas (soil, water and sanitation, STIs, non-communicable diseases, etc.) is key to this environmental health exercise. Relevance and importance of these environmental health areas could vary project to project (IFC, 2009). In the figure below I provide some examples of Gobi-specific mining impacts on Environmental Health Areas. For illustration purposes, our team (Craig Janes, Meghan Wagler, and Tsogtbaatar

Byambaa) in 2010 constructed a sample EHA table showing some of the potential health impacts along the coal transportation road in Umnugobi province.[22]

[22]With AgriTeam Canada, our team in 2010 submitted a bid to conduct the OT-HIA. This bid was unsuccessful.

Table 3.2. Illustrative Examples of Health Impacts by Environmental Health Areas (EHAs) adapted from the IFC (2009) and Winkler et al. (2010) and applied to the southern Gobi.

Environmental Health Areas (EHAs)	Potential Health Impacts					
	Pathways of impact					
	Via- Influx: *camp followers, service workers, families, job seekers*	Via- Water management	Via- Linear features: *roadways, transmission corridors, border crossings*	Via- Hazardous materials control and disposal	Via- Changes in income, expenditure, and consumption	Via- Infrastructure, facilities: *on-site housing, sewage treatment, management of water*
Communicable diseases	Crowding, mixing and interaction of different groups, potential introduction of epidemic disease	Safety of community water supply	Facilitates mixing/interaction of different groups, potential impact on transmission		Housing inflation triggered crowding, impact on transmission (TB, acute respiratory disease)	Quality and availability of on-site housing and on-site water and sanitation infrastructure may affect communicable disease transmission
Sexually-transmitted infections	STI/HIV risks associated with sex work; mixing of high and low-prevalence groups		Facilitating movement of high risk groups into rural, low-risk setting, potential entry of HIV		Men with money, mixing with vulnerable, poor women	Access to worker housing by community members, high-risk sexual activity by workers
Soil-water-and waste-related diseases	Overburdening existing services/systems, food safety, food-borne epidemics	Changes in water quality, groundwater drawdown		Long-term impacts to groundwater		Potential groundwater drawdown, changes in water quality
Food and nutrition	Increased demand for food, impacts on food prices and dietary quality	Availability for local gardening, dietary supplementation	Changes in access to markets		Food cost inflation, further marginalizing vulnerable groups	Food cost inflation, food-related illnesses, changes in dietary habits

Environmental Health Areas (EHAs)	**Potential Health Impacts**					
	Pathways of impact					
	Via- Influx: *camp followers, service workers, families, job seekers*	Via- Water management	Via- Linear features: *roadways, transmission corridors, border crossings*	Via- Hazardous materials control and disposal	Via- Changes in income, expenditure, and consumption	Via- Infrastructure, facilities: *on-site housing, sewage treatment, management of water*
Non-communicable diseases	Changes in diet				Shift from high physical -activity to sedentary lifestyle	Changes in diet
Accidents and injuries	Crowding, road traffic		Road traffic, dust, increased pedestrian activity, risks to livestock	Unplanned releases/emissions, dust		Road traffic, increased pedestrian activity
Veterinary medicine and zoonotic issues	Movement, migration of livestock, potential for overgrazing, enhanced livestock-human interaction (brucellosis)	Creation and/or movement of livestock watering locations		Inadvertent water-source contamination		
Exposure to potentially hazardous materials, noise, and dust	Squatter developments adjacent to project facilities with unplanned releases, local air pollution		Movement via trucks of hazardous materials across communities in project area	Inadequate disposal, incinerator design		Release of contaminants into water sources

Environmental Health Areas (EHAs)	**Potential Health Impacts**					
	Pathways of impact					
	Via- Influx: *camp followers, service workers, families, job seekers*	Via- Water management	Via- Linear features: *roadways, transmission corridors, border crossings*	Via- Hazardous materials control and disposal	Via- Changes in income, expenditure, and consumption	Via- Infrastructure, facilities: *on-site housing, sewage treatment, management of water*
Social determinants of health; psychosocial; gender issues	Rapid social change and stress, transformation of rural lifestyles		Mixing of different social and ethnic groups, ethnic conflict, rapid social change, transformation of rural lifestyles, availability of illegal drugs, sex work, risks for cross-border human trafficking.		Transformation of local economy, impacts of vulnerable groups (women, children, poor), greater availability of alcohol, tobacco, illegal drugs, domestic violence	Mixing of different social/ethnic groups, access to alcohol, tobacco, illegal drugs, domestic violence
Cultural health practices	Introduction of new practices, elimination of old practices		Introduction of new medicines, traditions of healing		Availability of and access to medical care	Introduction of new medicines, traditions of healing
Health services infrastructure and capacity	Increased visits for outpatient and inpatient services		Changes in access and availability of services		Attraction of private providers, increased insurance enrolment	Changes in access and availability of services
Security and safety systems	Mixing of different groups (residents, in-migrants), potential for conflict, risk for crime	Safety and security of community water supply; policing of wells	Human trafficking issues, smuggling, crime	Security of transport routes	Emerging social inequality and potential for increasing crime	Security of project site

There are a number of other risk factors that cumulatively and gradually cause negative health consequences. However, if we can apply some of the general evidence from public health that has documented the importance of environmental, social and economics to population health – factors that overlap with the consequences of mining -- the evidence clearly suggests that coal-copper-gold mining, if not managed properly, can certainly lead to significant adverse health impacts.

3.2.4. Chronicles of HIA adoption in Mongolia: The process and how it unfolded

As is the case with other former communist members of the European Union, the public health community in Mongolia has yet to move from the old system of environmental health and hygiene-focused approaches. As a result, the HIA is often perceived as a health risk assessment (HRA), a narrow technical risk analysis tool. Before the HIA, there were some efforts to try to assess and mitigate direct health impacts of significant activities in Mongolia. In 1968, the 'State Institute of Hygiene, Infection and Bacteriology' was established under the Ministry of Health. This new institution was tasked with developing hygienic and occupational health laws, establishing various health standards, coordinating infection control at the national level, conducting health research and assessing health impacts (Оюунбилэг, 2008). Though this institution was a step forward, it lacked a holistic population health focus needed to assess the health impacts of other sectors, rather than implementing traditional Soviet style hygienic concepts. "Mongolia, as a former Soviet satellite state, has struggled to accept the new public health approach linked to Western countries. This perspective views population health as a product of interacting determinants, including a social model of health. This remains a challenge with many stakeholders who continue to focus

narrowly on environmental and occupational health, leading to the exclusion of community and population health" (Janes et al., 2014).

The Public Health Institute (PHI) was created in 1997 and has been carrying out similar activities as its predecessor had done with the addition of a more modern concept of public health. The Center of Toxicology and Environmental Health were created in 2009 within the PHI, and has taken part in the conduct of some activities, similar to HIA. The Health Department of State Professional Inspection Agency and its district and provincial branches are the ultimate authority in Mongolia, with the power to inspect and enforce against binding laws, regulations and standards.

Although Mongolia's mining sector is currently resting more on potential than actual production, the potential negative impacts of mining are not resting. Each and every phase of mining activities, whether it is exploration, development, production or reclamation, could pose serious threat to human health that requires particular attention from health sector and others, in order to meet the above mentioned expectations by population. Amid realizing and documenting this need, an abstract concept of HIA, as an evidence building tool that has great potential to inform decision making processes, was first introduced to Mongolian mining sector, during 2009 Mining and Health Conference. By building on the earlier sections' discussion of why HIA was introduced, this section will tell a story of how HIA was introduced in the mining sector, what were the main activities that took place and what factors led to accomplishments and challenges with the case study analysis of OT HIA, the only HIA that has actually been conducted in the country up to date. The lengthy milestones outlined below have evolved the HIA adoption in Mongolia and are depicted in Figure 3.4.

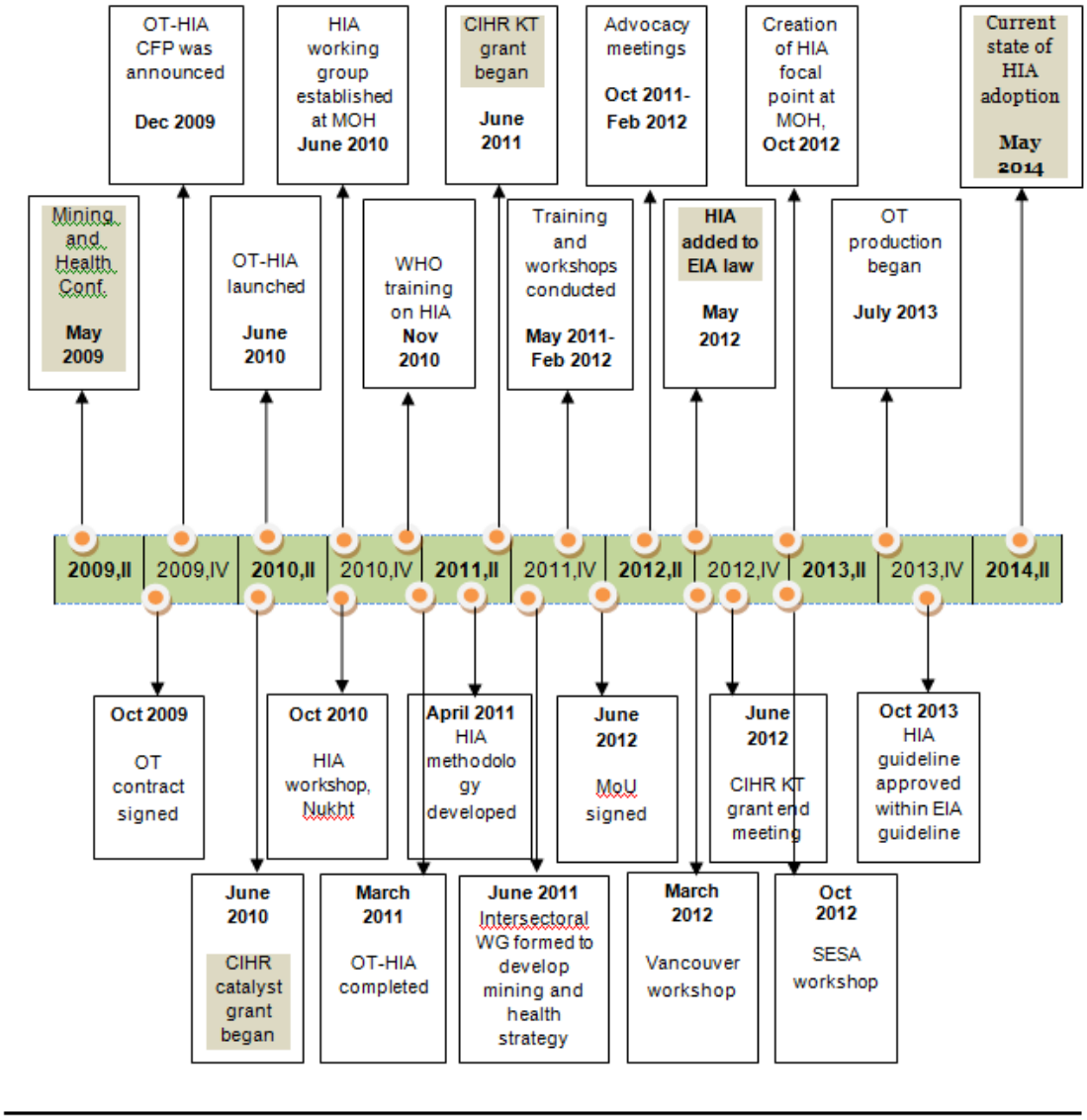

Figure 3.5. Timeline of Adoption

***Mining and Health Conference*, May 2009**: Following a growing interest in mining in Mongolia, were concerns about the environment and human health. An abstract concept of the social factors related to mining was first discussed during a Mining and Health Conference. This conference was co-organized by SFU and the Government Implementing Agency- Department of Health (DOH). Basic concepts of

SDH and how to determine the causal pathways between health risks and outcomes were introduced during this conference as participants urged the government to focus on the emerging mining sector and its potential negative social and health impacts. Conference participants included a wide range of stakeholders including policy makers from three concerned ministries (Ministries of Health, Mining and Nature and Environment) and their respective agencies (DOH, PHI, and MRAM), researchers from academic institutions and representatives from NGOs, affected communities, media and the private sector. The main outcomes of the conference were that "the current Mongolian government lacked the necessary capacity to insist that SIA and HIA be completed and, that there was no formal way for affected communities to participate in the EIA or mine licensure processes" (Snyder et al., 2011, p.85).

As Rogers states (2003), "the decision to begin diffusing an innovation to potential adopters is one of the most crucial choices in the entire innovation-development process. There is usually pressure to approve an innovation for diffusion as soon as possible, especially when the social problem or need that it seeks to solve has a high priority" (Rogers, 2003, p.177). This event was a significant development at the time as participants of the conference made it clear that an adequate public health tool that could assess negative health risks of mining was missing in the country. Participants clearly acknowledged that public health risk assessments of mining are not currently implemented, that little effective community consultation or participation is actually sought by mining companies, and little if any attention is paid to public health. Participants at the conference came to a consensus to adopt a public health tool that could assess health impacts of mining sector, and to seek technical support from external experts. The growing need for HIA was expressed in practical ways by the

participants, and this in turn became an important foundation for the future of the HIA in Mongolia. There was an initial endorsement of the need to undertake evidence-based reviews of HIAs and consider how these might be implemented in the social and political context of Mongolia.

***Signing of "the agreement"*, Oct 2009**: In October 2009, Turquoise Hill Resources (formerly known as Ivanhoe Mines) finally came to an agreement that they could not previously resolve with the Mongolian government in regards to extracting copper and gold ore deposits located in Khanbogd soum of Umnugobi province, called-Oyu Tolgoi ("Turquoise Hill")[23] The long-awaited stability agreement was signed for a 30 year period with the renewal option of 20 more years. It was a historic milestone for Mongolia, noted by Robert Friedland, past chairman of Ivanhoe Mines, who stated that, "This is the godfather of new beginnings for Mongolia, whose revered founding leader helped shape the history of the world. Today, there is a new, outward-looking determination rising among Mongolians, who have resolved to draw on the country's remarkable and largely untapped mineral wealth to help build an independent nation for the millennium" (MMJ 2012, para.8). The signing of the investment agreement woke the mining world and investors believed that the agreement paved the road for many more projects bringing with them social and economic development. However, it also increased the opportunity for threats to health and well being with substandard mining operations. Moving forward with this agreement, the OT HIA was begun in December 2009 and concluded in March 2011. With the initiative of Rio Tinto, then a co-owner and now the majority owner of the OT project, the HIA was conducted by Khukh Tenger

[23]Oyu Tolgoi takes its name from an exposed copper ore deposit near Khanbodg soum. When exposed to oxygen, high-grade copper ore takes on a tourquoise blue cast. Local people had for a long time identified this exposed ore site as "tourquoise hill".

Khugjil Consortium (KTKK). As noted above, this consortium was a collaboration of international and local NGOs and government agencies. We began talks with OT after the mining conference about their plans to do an HIA. This discussion in part led to the project described below.

***Implementation of CIHR catalyst grant*, June 2010-June 2011:** Building on the findings of the 2009 conference, a CIHR catalyst grant was implemented in June, 2010. This catalyst grant funded an evidence-based, policy-level intervention study titled: "Development and Implementation of a Health Equity Impact Assessment Methodology in the Mongolian Mining Sector". This project was undertaken to catalyze stakeholder support in Mongolia for the development and feasibility testing of a HIA methodology. It was also designed to facilitate efforts to make HIA a mandatory process by advocating its importance and utility to a number of high-level decision makers. The intervention also aimed to raise awareness amongst relevant stakeholders, such as central and local government officials and mining executives. The concept of HIA and its importance for large development projects, with the aim to improve and expand HIA practice was discussed. Creation of an effective and long-term working collaboration between international and local HIA practitioners to diffuse HIA was another objective of this project. The workshop consisted of a series of integrated knowledge translation (KT) workshops to develop an HIA approach in the Mongolia mining sector and to design appropriate policy level interventions. Other relevant topics of the workshop included discussing key conceptual and theoretical dimensions of HIA, how HIA could work in the Mongolian context, appropriate players for conducting HIAs, and occupational health as a potential component of the HIA. The workshop was informed by KT principles

developed by CIHR and the IDRC (Campbell, 2008) and applied strategies to establish effective multisectoral partnerships.

HIA training, Nukht **Oct 2010:** In October 2010, the CIHR catalyst project team facilitated an in-depth, hands-on training on HIA concepts and methods. The first of several planned KT workshops was conducted within the framework of the CIHR catalyst grant with technical assistance from a project implementing team that consisted of researchers from SFU and other Canadian academic institutions. Participants of the workshop were from various sectors including government, NGOs, the private sector, academic institutions and mining affected communities. The format of the workshop utilized a hands-on exercise as participants were asked to conduct a trial, rapid health impact assessment on the Umnugobi case. The growing need for country specific and contextually appropriate training materials and content were identified during the workshop. In addition to providing a foundation for understanding HIA, the workshop helped develop a brief HIA methodology tailored to the Mongolian context (Snyder et al. 2011).

WHO Training**, Nov 2010**: These activities were followed by an additional introductory workshop on HIA organized by the Western Pacific Regional Office of WHO (WPRO), led by WHO consultant Spickett in November of 2010. Based on the fact that Mongolia lacked introductory-level HIA capacity, the objective of the workshop was to lay down basic concepts of HIA and promote the potential value to development that HIA could bring. During the workshop, existing EIA regulatory structures and practices in the country were examined as a potential system to be integrated with the newly proposed HIA structure. Around 50 participants representing all key sectors (government, private sector, affected community and academia) were involved in the workshop. Underlying

questions of identifying potential stakeholders to order, conduct, manage and implement HIAs as well as how to effectively integrate HIA into the EIA were the main focus of the workshop. Some participants had basic knowledge of HIA concepts and its benefits and expressed their strong interest to consider HIA when issuing licenses for mining projects (Spickett, 2012). This event, concurrent with the CIHR catalyst project, was helpful in building the momentum of HIA awareness as well as promoting the integration of HIA into the existing EIA system.

"***The joint HIA Technical Working Group (TWG)*** **created at MOH, Feb 2011***:* In the following year after the WHO workshop, two working groups on HIA joined forces. "Following the recommendation of the East Asian Ministerial Conference in 2010, the multisectoral working group[24] for HIA was created by joining groups from the Ministry of Health and Ministry of Nature and Environment" (Byambaa, et al., 2012, p.6). In addition, a TWG was established by the CIHR catalyst grant as part of the Mongolian-Canadian partnership. This TWG then merged with the multisectoral working group from the two ministries to form an enhanced TWG. This integrated TWG was co-chaired by the deputy directors from their respective departments at the relevant ministries and were supported by the catalyst grant team. The TWG[25] included stakeholders from three relevant ministries, the NGO sector, the private sector, and the public health research

[24] The HIA Working Group in Mongolia was established in June, 2010 to consider applying HIA tools to the Mongolia mining sector. It is comprised of stakeholders from government, the private mining sector, civil society and academic institutions.

[25] TWG was co-chaired by Baigalmaa (MOH), Saran (MGED) and members included: Enkhbold, Tugsdelger, Tsetsegsaikhan (MOH), Gangerel, Bayartsetseg (MEGD), Sodnompil, Oyun (DOH), Altanzagas, Oyuntogos (WHO), Gansukh (SPIA), Odnoo, Unursaikhan, Saijaa (PHI), Erdenechimeg, Naransukh (HSUM), Dolgormaa, Udenbor, Davaatseren (NGOs), Khuldorj (MSU), Batbileg (MMA), Bolormaa (MPHPA), Ariunaa (OT), Tserenkhand (Energy Resources).

sector. Based on a misconception of HIA being a "narrow technical risk analysis"[26], the HIA TWG had decided to include members who were trained with the traditional approach and knowledge of environmental health/hygiene services. These people had identified mining occupational health and safety as a major concern, and wanted to ensure that the health of the miners themselves was maintained as a priority in the HIA process. While considering occupational health within HIA is potentially important point to consider (Janes et al. 2014), it could be an overly ambitious plan in Mongolia right now because the tool for assessing occupational health and safety is distinct from those used for HIA. Both tools need to be significantly strengthened in Mongolia. Normally HIAs are undertaken to determine the effects of project activities on surrounding communities. For that reason HIAs tend to exclude occupational health and safety under the assumption that these matters should be covered by separate regulatory requirements imposed by federal and provincial/state governments.

The outcome of the working group was the awareness of the need to move beyond the mining sector to consider the impacts of other types of development, such as railway lines and roads in Mongolia. A main task for the multisectoral TWG as it moved forward was to review international best practices and adopt HIA methodology for the Mongolian context. They were also tasked to explore ways to integrate the HIA into the EIA, and to build national HIA capacity. With partial technical and financial support from the CIHR catalyst grant, these tasks were carried out until operation of the working group was discontinued as a result of the 2012 parliamentary election and subsequent changes to government.

[26] Due to the traditional focus in Mongolia on industrial and environmental hygiene, HIA often gets confused with health risk assessment. As a result, the opportunities it could bring are limited by focusing mainly on exposures to toxins; i.e., other factors influencing health are not considered.

***Development of a simplified HIA guide & tool for use in Mongolian context*, April 2011:** In April of 2011, a draft HIA tool was developed as part of the deliverables from two CIHR grants implemented by the SFU team. The development of this simplified HIA tool and guide was adapted from the respective HIA documents developed by the IFC and ICMM, and built in an equity tool developed in the Nukth workshop by Snyder et al. (2011). The tool was also developed in consultation with members of the integrated TWG, with careful consideration of their applicability to the Mongolian context. Although not an extensive document, it covered key technical concepts. The final product was translated to Mongolian, and 200 copies were printed for dissemination at a meeting hosted by the Ministry of Health. This was followed by stakeholders' extended meeting where the HIA process was introduced to the mining sector. This meeting involved potential users of the tool as well as major media outlets to raise awareness for policy makers and the private sector. This simplified HIA tool and guide has become the main source for the 2013 HIA guidelines that were approved by the government in Mongolia.

***Intersectoral working group to develop Mining and Health strategy*, May 2011-June 2012:** The Strategic Planning department of the MOH was tasked to develop a policy framework for addressing the health impacts of mining. To address mining and health at the policy level the Strategic Planning department in the Minister of Health worked with the intersectoral working group (WG) chaired by the state secretary of the MOH. The CIHR project team was asked to assist this intersectoral WG and agreed to develop an appropriate strategic plan. Significant progress was made as result of several activities including meetings, providing of technical expertise by the project team, sending four members on a best practice study tour in Vancouver, British

Columbia and drafting a large portion of the strategic document. “The need to build capacity and maintain an HIA system was identified as top priority items in the strategy development process” (Byambaa et al., 2012). The HIA was proposed as an intersectoral tool to keep everyone focused on potential health risks and social determinants. However, the assignment to develop a 5-year national health strategy for the mining industry was cut short when Parliamentary elections resulted in a leadership change in the summer of 2012. The development of such a strategy is still relevant and remains a top priority to manage the health impacts of the mining industry in Mongolia, but the elections and changes in key personnel have impeded progress.

***Implementation of CIHR KT grant*, June 2011-June 2012:** Based on the promising results of the catalyst grant, additional funding was obtained from the CIHR to continue knowledge translation efforts. It was necessary to further disseminate HIA tools and methodologies to all those concerned (both within and beyond the health sector and mining industry) and to develop a system and supportive environment for HIA. The main KT activities that were carried out included a systematic review of relevant literature (published and unpublished) on HIA training and capacity development, provision of consistent support for the TWG, an international best practice study tour, organization of training workshops, and an evaluation of cumulative impacts of up-to-date HIA KT activities. A number of workshops and meetings were organized among TWG members, potential HIA practitioners and representatives from the government and private sector. Benefits of these meetings and workshops increased HIA practitioners in the country by identifying and recruiting new participants and re-enforced existing HIA knowledge for those who had taken part in the previous HIA events. It also provided opportunities for key national stakeholders to engage in dialogue to move forward with HIAs. Momentum

gained through these activities led to the creation of the very first HIA legislation in the country. This achievement was acknowledged at the grant-end dissemination meeting that was held in June of 2012 involving all key stakeholders.

***Advocacy -- the Memorandum of Understanding (MoU) between MOH and MNE*, Oct 2011- June 2012:** Given the newness of HIA in Mongolia, a significant share of research resources were dedicated to advocacy and basic awareness raising activities among senior government officials and mining executives to facilitate further development of HIA. A number of advocacy meetings were held to present the project and solicit policy-level support in streamlining HIA into the regulatory process. Extensive effort was put into building the sustainable outcomes that would not be affected by leadership changes in the country. Having a MoU signed between two key ministries (Ministry of Health and Ministry of Environment and Nature) was believed to be sufficient in this regard (Byambaa et al., 2012). The MoU was signed days before the Parliament election in June of 2012. The main objective of the MoU was to develop and strengthen mutual cooperation between the MOH and MNE, for developing HIA integration within the EIA regulatory framework, and guidelines. It was also important for building national HIA capacity and to increase uptake of the HIA. Key stakeholders that we met included: Chair of the Social and Health Policy Standing Committee of the Mongolian Parliament, ministers, vice ministers, state secretaries, directors of relevant departments and key officers of ministries of Health, Environment and Nature, Canadian Ambassador to Mongolia, WHO country director, heads of local NGOs, academics, community members and mining company representatives.

***Inclusion of HIA into the EIA law*, May 2012:** Perhaps the most significant result of these HIA adoption efforts is the inclusion of health concepts into the amendment of the environmental impact assessment law which was passed by the Mongolian parliament in May of 2012 (Byambaa et al., 2012). The projects which I was part of have led to this legislative reform that brings health into the licensing review process. A requirement that assessment of social and human health impacts be incorporated into environmental assessment regulations can facilitate mandatory conduct of HIA prior to decisions about project licensing, if strictly enforced by government authorities. It is evident that further work needs to be done in this regard.

***Creation of HIA focal point position at MOH*, Oct 2012:** Following the arrival of new HIA legislation, the MOH created a new officer position dedicated to developing HIA policy and an HIA system. This officer was able to convene and facilitate the working group to develop detailed HIA regulation, based in part on the HIA tool that was produced out of the CIHR catalyst grant and 2010 workshop. I have contributed to the development as a member of the working group. These developed regulations were included in the comprehensive EIA guidelines which were approved by the government in Oct of 2013. This progress shows effective cooperation by Ministries of Environment and Health and their joint working group. Next steps for this group include the development of an HIA management guideline. Although Mongolia's government changed mid-CIHR project, which involved the resignation of virtually all of our Ministry team complement, we managed to recapture some of our initial project impetus with new people.

***SESA workshop*, March 2013:** An additional milestone in developing a system to factor health considerations into all policy making is the introduction of the strategic HIA (sHIA). WHO, the mastermind of the sHIA, presented the idea at the national workshop on Strategic Environmental and Social Impact Assessment (SESA) co-organized by the Ministry of Mining, the Ministry of Environment and Green Development (new name for the Ministry of Environment subsequent to the change in government), World Bank and the Asian Development Bank in October of 2012. Conducting sector-wide strategic environmental and social impact assessments is another highly regarded and emerging form of IAs as it addresses social, environmental and health impacts, comprehensively, across entire sectors, rather than on a project-by-project basis. The main objectives of the workshop were to build capacity of key stakeholders on strategic environmental and social assessment, drawing on international experience and good practice, consulting stakeholders on the design of a SESA for Mongolia's mining sector policy and obtaining stakeholder input for draft regulations on environmental impact assessment, under the new EIA Law of Mongolia (SESA, 2012). The sHIA in effect generates a "bird's eye view" of likely impacts across the sector (WHO 2010), and across population groups. It identifies intervention packages and systems and the capacities needed to deliver them, and provides the logic for a sector or industry-wide health management system, while engaging a broad set of relevant stakeholders. The WHO has initiated a sHIA in Ghana focused mainly on the oil and gas sector (Janes et al., 2014). The sHIA may be more appropriate kind of impact assessment to evaluate cumulative effects of mining industry in Mongolia, as seen in the case of Umnugobi province where several world scale mega-mines operate within the radius of couple of hundred kilometres. The introduction of the sHIA and identified challenges by interest groups made this workshop valuable.

***First shipment of OT products*, July 9, 2013:** On this historic day, which I was lucky enough to witness in person, OT started shipping its first copper concentrate to the Chinese market. According to a press release from Rio Tinto issued in 2013, OT is currently extracting copper from its open-pit mine and the massive on-site concentrator that can process up to 100000 tonnes of copper ore per day is in full operation. The underground mine shaft is planned to be completed soon at the cost of US$10 billion. The underground operation is considered to be the second phase of the mine's development. It was reported that OT had paid the Government over US$1.1 billion in taxes and royalties. OT's potential as a job creator and contributor to the nation's economy are widely touted in industry press releases.

3.2.5. Nurturing the Regulatory Environment for HIA Implementation in Mongolia

Despite opportunities and benefits that HIA offer, globally the private sector mostly views HIA as an extra barrier to their revenue-making operation and is most likely to opt out unless it is a mandatory activity. In section 3.1.3, the 'external' and 'internal' drivers were discussed (Birley, 2011) that facilitate mandatory conducting of HIAs. In places where these recommended drivers are not strong enough to make companies consider voluntarily completing an HIA, a stricter driver, such as a legal requirement may be necessary for HIA utilization. This obligation will likely come with a binding law and regulation of the HIA at the national level in Mongolia. Making HIA a legal requirement may be more applicable in a LMIC context where industry may lack socially responsible mining operations and procedures, and where systems of governance do not allow for or permit citizen input.

Currently, the EIA law contains some conceptual elements of HIA by way of considerations of human health in its required content. This evolved largely due to the work of the SFU project team, the WHO, and the MOH's HIA working group, who collectively pushed the agenda and inclusion of this issue through series of advocacy and awareness activities between 2010 and 2012. Despite this accomplishment, the regulatory environment for HIA in Mongolia has a long way to go. Streamlining HIA into more laws (principal and sector specific) could gain acceptance from major development sectors and improve appreciation and coordination with the health sector. There are a number of existing laws that could be amended to include HIA elements. These include the Constitution (1992), Minerals law (2006), EIA law (2012), Investment law (2013), Law of Health (2011), Law of National Security (2012), Law of Air Pollution (2012), Law of Water (2012) and Law to Limit and Prohibit Mineral Exploration and Mining Operations at Headwaters of Rivers, Protected Water Reservoir Zones, and Forested Areas (2009). According to the 1992 Mongolian constitution, the state owns all land and natural resources and they are subject to national sovereignty and state protection (World Bank, 2006). The 1997 Mongolian Law on Mineral Resources that was amended in 2006 requires exploration license holders to comply with environmental laws. In Articles 29 and 30 of this law it indicates that exploration and mining activities may not begin without written approval. These articles also outline permitting procedures for exploration and mining projects (World Bank, 2006).

Mongolia's EIA legislation was first enacted in 1998 and has been evolving since. Permitting procedures require that exploration license holders conduct an EIA and prepare environmental protection plans that provide for measures to ensure that pollution of the environment does not exceed limits. As reported by the World Bank

(2006) the EIA must include environmental baseline data and a description of indicators, project alternatives or options, make recommendations for interventions or mitigation measures that reduce or eliminate possible negative impacts, provide an environmental risk assessment, and a monitoring program (World Bank, 2006). Globally, there are many examples of HIA successfully being integrated within existing EIA frameworks to form an integrated EHIA. “The integration of HIA into EIA can provide opportunities to ensure a holistic assessment of health and well-being through current formal approval processes” (Spickett, 2012, p.3). The different HIA training and advocacy activities discussed in the previous sections led to revisions of the EIA law enacted by the Mongolian Parliament in May 2012. These changes require inclusion of social and health impacts in the cumulative impact assessment process. Revisions to the EIA law give significant attention to HIA and urge mining companies to undertake an HIA before seeking approval for extraction (Byambaa et al. 2012).

An effort has been made by the Mongolian government to reduce the potential negative impacts of mining operations on safe drinking water. “The government passed the ‘Law to Limit and Prohibit Mineral Exploration and Mining Operations at Headwaters of Rivers, Protected Water Reservoir Zones, and Forested Areas’ (the “Long Name” Law), in July of 2009. Once passed, the Long Name Law effectively cancelled over 200 exploration and mining licences – primarily in the gold mining field – that fell within the Law’s restricted boundary lines (Phillips, 2013, p.319).” As its title indicates, the Law has the potential to successfully mitigate negative impacts that lead to water-borne diseases and exposures through restriction of mineral resource development operations from occurring near or within Mongolia’s water resources. However, sustainable and strict enforcement, along with accurate definition of those protected areas need to still be

addressed. Recently, the Mongolian Parliament has considered amending the law to ease these requirements for investment.

Though integration of the HIA into EIA law represents significant progress, considering the rapid growth of the mining industry, the economy's high dependence on the resource sector and rapid popularization of global HIA practices, Mongolia may need to consider developing an independent HIA law. This can be seen in best practices of HIA in countries such as Thailand and others, which keep all of the development sectors' activities grounded while leading the country to increased prosperity. In a growing number of countries, EIA legislation alone "may consider impacts on health, but in 1987 it was argued by WHO that EIA alone does not adequately address potential impacts on human health and well-being, with many countries subsequently accepting the need for a separate HIA" (Spickett, 2012, p.3). Developing HIA practice based on the existing EIA system should remain in Mongolia only until an independent HIA law and functional HIA capacity are available to replace it.

To further promote HIA practice in the Mongolian mining sector it appears that three specific ministries, the Ministry of Nature and Environment, the Ministry of Mining and the Ministry of Health may play crucial roles through their respective legislations in the near future. This view is based on the ever maturing state of HIA, and the relative prominence of existing EIA systems in governing the natural resources of Mongolia. There are others who still emphasize the importance of enriching health sector specific laws through the meticulous application of HIA concepts. The Law of Hygiene (1998) could be amended to improve the health sector's ownership in building the HIA system and promoting the regular practices of HIA. While this is a valid argument, if the Law of Hygiene is embedded with the HIA the HIA would lose its capacity to consider a wide

range of social determinants when evaluating health impacts at the population level, to a more traditional, narrow focused concept of risk assessment. Regardless of whether HIA legislation is moved forward as embedded in the EIA law or as independent one, detailed respective regulations, which enforce HIA practices and indicate appropriate level of multisectoral coordination, need to be put in place by the government. A road map for HIA system and management needs to be developed as this initiative moves forward. This was missing from detailed the EIA guidelines that were approved in 2013.

3.2.6. Case study: The Oyu Tolgoi Health Impact Assessment

As described above, Oyu Tolgoi (OT) is considered to be one of the largest copper-gold mines in the world. It is located in the Khanbogd soum of Umnugobi province of Mongolia, near the Mongolia-China border. Turquoise Hill Resources (THR), owns the controlling 66 percent of this joint venture. The Mongolian Government owns 34% percent. Anglo-Australian mine giant Rio Tinto acquired THR, formerly the Vancouver-based Ivanhoe Mines, in April 2012 when Rio Tinto purchased majority shares in Ivanhoe and dismissed its Board. According to the International Monetary Fund (IMF)'s estimation, OT has the potential to produce one-third of Mongolia's GDP as early as 2021. Its estimated US$10 billion development budget makes OT the largest project ever in the country's history. The full potential of OT deposits was estimated at 2.7 mil tonnes of copper and 1.7 mil ounces of gold over the projected 50 year term of projected for the mine (Rio Tinto, 2014). At the 1-year mark of the commencement of concentrate shipments (July 9th, 2014), there were total of 7079 Mongolian nationals employed at the OT project to extract 242,900 tonnes of copper-gold concentrate from its open-pit mine within the first half of 2014. "OT expects to produce up to 160,000 tonnes of copper and 700,000 ounces of gold concentrates in the second half of 2014

(OT, 2014, para. 2).” OT hopes to expand its operations through two shaft mines sooner than later as ore grade is expected to be much higher with those shaft mines. There were over 18,000 workers working for OT at one point in the construction phase (OT, 2014). However, the underground project has been put on hold by tri-party shareholders, THR, Rio Tinto and the Mongolian government, for more than a year. This is due to a disagreement on investment terms concerning project expenditures, financing and approval of the feasibility study for the second phase of expansion of the project (WSJ, 2014). The Mongolian government believes that they deserved a better deal in the investment agreement. The President, Minister of Mining, and Members of Parliament, have said that the Mongolian government’s 34% share, which also brings a 34% investment burden, should be sold to Rio Tinto so the royalty taxes can be collected and the OT project should be held fully accountable for the measured footprints that they cause. Understandably, the intended aim of OT shareholders (Rio Tinto, THR, and the government) is to generate as much revenue as possible while aiming to improve the lives of Mongolians and improve economic development. In the following statement, Rio Tinto shares its vision in terms of operating with a no harm and sustainable development position.

Rio Tinto, as the second largest mining company in the world, has a fairly good reputation globally as an environmentally friendly mining operation. It has established a strong set of guidelines for managing the social and environmental impacts of its projects. OT has adopted the Rio Tinto framework in an effort to assess and mitigate the health impacts of its operation in the Southern Gobi of Mongolia. In its publicity materials, OT is declared to have an ambition to be the “most water efficient copper-gold mine in the world” by recycling up to 80% of the water for its operations (Rio Tinto,

2014). Although OT promises to use only deep aquifer waters in its operation, community members have expressed their deep concerns over how the mine operations might lead to a possible shortage of drinking water; a resource that is already scarce in the Gobi desert.

The potential health impacts of mining differ by type and stage of mining. The OT mine completed building its open pit mine in 2013 and started exporting the product to Chinese market. The second phase of the project, which will mine copper from 2 shafts that are more than 1200 and 1500 metres deep, respectively, is supposed to get underway once the longstanding investment and tax disputes between the government and OT is resolved. The project proponents believe that $127 million claim by the government for "unpaid taxes, penalties and fines include breaches of the tax stabilization provisions of the Investment Agreement" (THR, 2014). Underground mining is likely to result in the increases of injury-related mortality, coal workers pneumoconiosis (otherwise known as black lung disease), asphyxiation and gas poisoning (Frumkin, 2010). Open pit mines, however, has a unique set of health outcomes as the contamination of the surrounding aquatic environment being the most common and serious outcome which affects the quality of drinking water source. Khanbogd soum of Umnugobi province, which houses the OT mine, sits in the Gobi desert where drinking water source and vegetation is extremely limited. With quickly escalating impacts and needs, the provision of the basic social services to the people of Khanbogd soum, the soum closest to the mine, has become subject to public scrutiny. Some suggest that the Government and OT have taken a back seat in accepting their involvement and roles. Although OT claims to invest a significant amount of resources in building the infrastructure of Khanbogd soum center, in one key informant interview another

sentiment was expressed. In this interview, the interviewee countered the corporate view by saying, “on paper everything has an answer and solution. However, the actual implementation either gets delayed or disappears like a Gobi mirage. The long-planned 55 km paved road between the OT camp and Khanbogd soum center is an example”.

According to Rio Tinto (2014), the project proponents, including the Mongolian government, intend to explore how they can maximize economic gain while improving the social well-being of the Mongolian people. In these discussions, they must consider the unintended negative impacts of this project as discussed in the section 3.2.2. With the hopes of identifying and addressing those negative impacts and promoting positive ones, the OT HIA was conducted. After the signing of the investment agreement with the Mongolian government, OT released a call for proposal (CFP) in Dec of 2009 to receive bidders’ interest to conduct a HIA in order to comply with its targeted financiers’ requirements[27] set out by the Equator principles. The reference was made to favor partnerships of local and external counterparts that possess extensive HIA expertise as well as strong local ownership. A key informant interview summarizes the climate surrounding this process:

> *“Following the 2008 social, economic, environmental baseline study of the Southern Gobi province, a social and economic impact assessment (SEIA) was conducted. Development of a community health safety and security plan (CHSSP) were amongst the five main priorities, identified through SEIA, which called for actions to develop respective programs. The HIA was assumed to be a crucial component of CHSSP program design. And we issued CFP and invited interested local and international*

[27] As noted previously, the Equator Principles (EPs) are a risk management tool used by investment banks to assess and manage environmental and social risks in projects. Currently, “79 financial institutions that cover over 70% of international Project Finance debt in emerging markets have officially adopted the EPs” (EP Association, 2013) including the IFC, the main financier of the OT project.

parties to conduct the HIA in 2009" (from an interview with OT headquarter level officer).

The key informant interview findings supported the idea that factors such as corporate social responsibility, risk management, and funding agency requirements played in a big role in the reasons why the decision was made to conduct the OT HIA, despite a lack of national legislation requiring HIAs. In line with the Equator Principles of the IFC, one of the main donors of the project, OT was required in the loan covenants to meet the requirement that they had a plan to manage potentially adverse social, health, environmental, and economic impacts by identifying respective risks to affected communities. The OT HIA was the first of its kind, not only in the mining sector, but in the country as a whole, in terms of assessing the broader impacts of human health risks in association with a project. For that reason alone, OT investors, donors, managers and those who were and still are involved in the entire process, deserve to be applauded, as noted by another key informant:

"Although HIA is emphasized within the corporate requirements of Rio Tinto, OT could have proceeded without HIA by leaving the health issues up to the local administration and hospitals since the Mongolian health system has a top down structure that pledges to provide health services free of charge at primary and secondary levels. 'But we would not do that' said a senior staff at the OT headquarters who was an integral part of the OT HIA management. 'Therefore, we decided to conduct the HIA as it was the first of its kind in the country. Even within Rio Tinto operations globally, we are the only company with special and dedicated program on community health. On one hand, this initiative was significantly missed by the local professionals and, on the other hand, this was anticipated as one of our main programs toward sustaining the social license to operate'. Conduct of our HIA and its findings has helped us a lot in convincing the company to make health a priority area and urged them to take responsive action. Conducting the HIA has helped the company (1) to fulfill its corporate social responsibility; (2) to interact with international financing institutions such as IFC in raising the funds as OT becomes fully

compliant with the soft regulations[28] *of the mining practice in Mongolia. Furthermore, this decision to conduct the HIA in 2009 will comply with a pending hard regulation, whenever it becomes available and comes into effect".*

Out of numerous proposals submitted in March of 2009 by international and national bidders, KTKK -- a consortium of multiple institutions which consisted of international experts and local professionals (including PACT international and the Public Health Institute (PHI)) -- was chosen to conduct the first HIA in the country. The Community Relations and Sustainable Development (CRSD) Department of OT LLC provided administrative assistance through the whole process. The actual conduct of the HIA was begun in June 2010, and was completed in May 2011, including the external review process. The OT HIA was conducted using methods and guidelines provided by the ICMM 'Good Practice Guide for Health Impact Assessment' (ICMM, 2010) and the IFC 'Introduction to Health Impact Assessment' (IFC 2008). In line with the standard structure of HIAs, the OT HIA was conducted in five stages: screening, scoping, baseline data collection, risk assessment and development of mitigation measures. The methodology for the assessment was approved by the Scientific Committee of the Public Health Institute and by the Ministry of Health Ethics Committee.

Data sources were used to generate a broad listing of project health, safety and security risks. These sources included a literature review (including reports on health impacts of mining projects elsewhere, and reports commissioned for the OT project), HIA screening and scoping activities between July and August 2010 (including site and

[28] Traditionally, "the term 'soft regulation or law' is associated with international law, standard, and practice. It refers to quasi-legal instruments which do not have any legally binding force, or whose binding force is somewhat 'weaker' than the binding force of traditional law, often contrasted with soft law by being referred to as 'hard law' which refers to actual binding legal instruments and laws of a state" (Christians, 2007).

community visits, interviews with managers of OT LLC and contractors, health staff and local government officials in the impacted areas), consultations with stakeholders in the affected areas in the South Gobi, and in Ulaanbaatar, and field studies conducted in the impacted communities in October 2010 (KTKK 2011). The designated impact areas of the OT project were Khanbogd soum and the adjoining soums of Manlai and Bayan-Ovoo, along with the Umnugobi province capital of Dalanzadgad, located 250 km from Khanbogd.

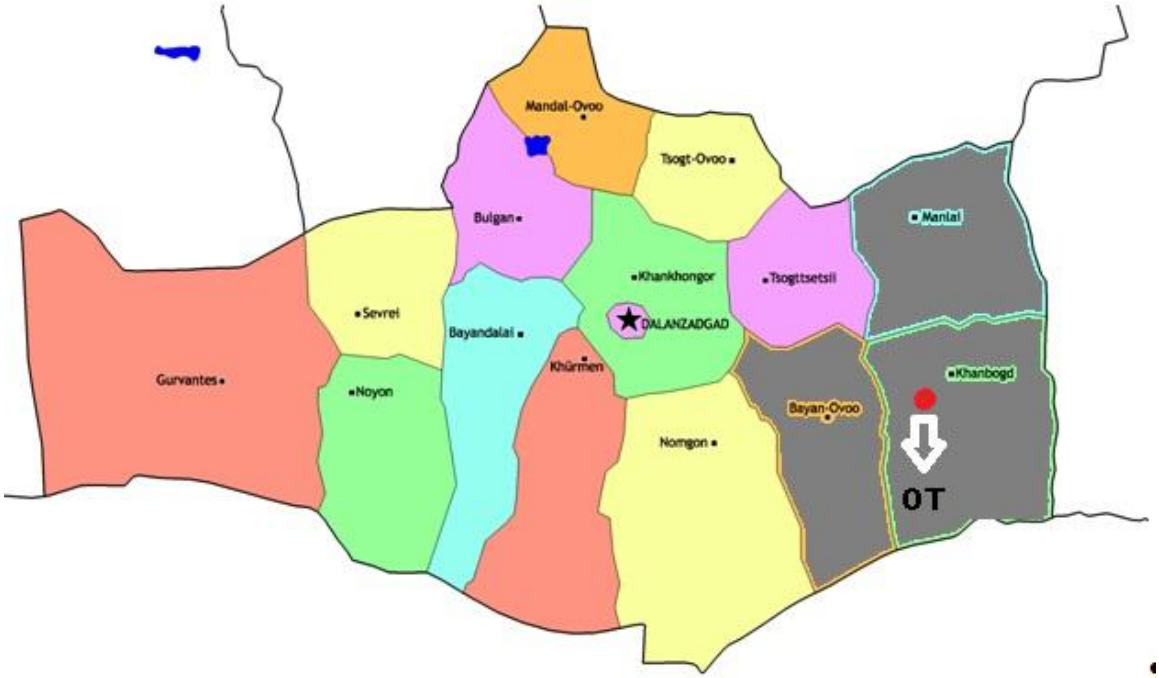

Figure 3.6. Map of OT project affected areas of Umnugobi province, highlighted in gray (Source: Wikimedia Commons)

The current total registered population of these impact areas is estimated to be about 25,500 persons (World Bank, 2010). However, many newcomers are also arriving to seek work and related opportunities. In addition, up to 2,000 drivers from trucking companies that carry coal between the nearby coalmines and the Chinese border spend variable amounts of time in Khanbogd soum. Khanbogd soum, where 4,300 residents

officially reside, may now have as many as 15,000 residents because of mining activities. An interview with a local doctor shed light on this population increase and health impacts of the mine:

> *"Life is hard. Locals increasingly struggle to make ends meet and ignore their health. We have to serve far more people with no increase to the budget. Mining is not changing the Gobi life for the better, as much as those mining companies say it is. Given their heavy dosage of positive-image publicity, I have been increasingly thinking that the mining company is only "sugar coating" reality. We must care because we are the ones who will stay to treat local people if they get sick by working at the mining company that is destined to fly away once all the resources are dug out. Soil, water and air must have been contaminated. If that is the case, it then seriously violates our constitutional rights to live in a healthy environment" –A local doctor in Khanbogd soum, Umnugobi province*

The Social Progressive Index (SPI)[29] provides an opportunity to examine the overall social wellbeing of rural communities affected by mining. According to its 2014 report, performance of indicators concerning water and sanitation as well as scarcity of water, were identified as relative weaknesses for Mongolian rural dwellings that hamper basic human needs and, therefore, social wellbeing (Amarsaikhan and Dierkes 2014).

According to the OT HIA, several positive health impacts were predicted to be achieved as a result of the project. The most obvious positive local impact of the OT project was from job opportunities, investment in infrastructure (including transport, utilities and communication) and in training and skills development. Residents of these communities were also thought to "enjoy better housing and living conditions and better nutrition as a result of increased income and improved food availability. Improvements in

[29] The Social Progressive Index is an index of indices that is calculated as an average of the score on the three dimensions: opportunity, basic human needs and foundations of well being (SPI, 2014).

health, safety and security should also result from upgraded government services for health, education and policing. In addition, more private health services may become available as the population increases" (KTKK, 2011). The community members consulted during field research anticipated that the major benefits from the OT project would be from jobs, both in the mine and in the local economy, infrastructure, and better services and variety due to higher population density (KTKK 2011).

On the other side of the ledger, a number of health risks were identified by KTKK. These included overcrowding and unsanitary living conditions, increased use of alcohol, increases in commercial and unsafe sex, increased injury (both, occupational and population) and traffic accidents, and inadequate conditions for ensuring hygienic food transport and storage (KTKK 2011). Looking through social determinants of health lens, most of these health risks look to be closely associated with population influx, weak infrastructure and inadequate health services, a mismatch between increased burden and stagnant social services. It is likely that this community will also see a rise in infectious disease and food poisoning due to overcrowded and unsanitary living conditions. In addition, the incidence of STIs/HIV may increase as a result of unsafe and commercial sex, as well as increases in mental ill-health due to constant stress caused by poor job security and higher costs of living. Injury and disability are likely to increase due to traffic accidents, and excessive alcohol consumption may lead to outcomes such as acute poisoning, chronic disease, family stress, injury and violence, to name but a few consequences. There is no immediate health impacts in the foreseeable future associated with generation of energy source for the mine as OT imports its energy from Inner Mongolian Power Corporation. Participants of the OT HIA believed that traffic injuries are increasing in the impacted communities because of "increased traffic,

increased dust and visibility problems, driver fatigue, drank driving and poor roads, increase in motorcycle ownership and holes left by road builders (KTKK, 2011, p.39)."

The effects of off-site dust on road, off-site soil contamination and contamination of some water sources were identified amongst environmental health impacts. These physical changes, including dust and lower air quality, may contribute to respiratory disease, and the increased traffic is likely to cause additional accidents and trauma. "The main concern about air quality for the affected communities is the impact of dust from the increased road traffic, especially from heavy coal transport (KTKK, 2011, p.54-56)." According to the KTKK field study (2011) findings, the local community thinks that "dust increases their risks for various adverse health impacts, including cough, influenza, nuisance and overall well-being (KTKK, 2011, p.56)." At the province level, there are communities that are exposed to higher levels of sulfur and nitrogen dioxides caused by the lack of treatment of power plant emissions. The main causes of outdoor air pollution are "incomplete coal combustion from high rank coking coal and high level of dust with noticeable particulate matter from coal transportation (KTKK, 2011, p.58)." Herders believe that dust has also been affecting their health and overall production and quality of their livestock, negatively. "The lungs of slaughtered animals were reported to be black," said one herder that I spoke with. These concerns were expressed well before the OT mining operations kicked off. Yet, many of the promised activities, including pavement of the roads to/from Khanbogd soum center and Chinese border, still remain unfulfilled.

A particular environmental health problem that concerns the community is the availability and quality of water, which impacts both community hygiene and the capacity to maintain domestic animal populations (KTKK 2011). This was the biggest concern

among communities in all three affected soum centers and was the second biggest concern among herders after destruction of roads. Only 35% of rural population has access to improved sanitation facilities and 61% of the rural population has access to improved drinking-water sources in Mongolia (WHO, 2012). “Mongolia’s falling standards of water quality are associated with health problems such as diarrheal diseases, which include dysentery, typhoid and Hepatitis A (UNDP, 2011, p.1)” which was one third of total communicable diseases in 2008. The levels of wells in the OT affected communities were reported by soum residents to be dropping whereas quality is believed to be worsened due to contamination of latrines, garbage and hardness. Population growth and climate changes are among the common explanations of local water shortage. By the time of the OT HIA conduct, none of the three soum hospitals have had, “reliable, on-site water supplies and water had to be carted or carried by car from sources up to one kilometre away (KTKK, 2011, p.56)”. The lack of access to safe drinking water in the general population is a serious violation of human rights protected by Mongolian Constitution, whereas lack of access to water in health facilities is a serious quality of care issue. Nomadic herders in Mongolia are the most vulnerable people when it comes to the lack of access to safe drinking water. Traditionally, access to water was the single deciding factor for herders when selecting their settlement area as both herders and livestock depend on surface water from very rare rivers and streams. OT-HIA stated that, “sub-surface flows may be depleted, obstructed or polluted by mine-related activity such as excavation, road building and other construction, and off road traffic which compact the subsoil. Contamination from metals used in informal mining, from engine oil and other rubbish may make the water unusable (KTKK, 2011, p.56).”

Figure 3.7. OT extraction facility along with liquid mine waste storage ponds.

The KTKK field study acknowledged potential adverse impacts such as digestive system disease, cancer, parasites and risk of cholera, typhoid outbreaks could be caused due to inadequate sewage infrastructure and waste water disposal, In addition to affecting its immediate surrounding community, the spill of such waste storage could affect wider communities through contamination of surface and sub-surface water sources. Although KTKK estimated that the number of Khanbogd soum population to be increased from 3,500 to 11,000 during OT development and has warned the relevant parties to match the provision of its necessity services to this increased demand and threats, nothing significant appears to be done by the government while OT claims that they have paid all the taxes and royalties as obliged by the investment agreement.

The CHSSP based on the OT HIA focused on four primary areas that were identified through the HIA as being most at risk as a result of the OT project. These were: 1) prevention of communicable diseases, 2) prevention of non-communicable

diseases and injuries, 3) reduction of risks related to social conflict, and 4) health systems strengthening.

In addition to identifying particular health risks in relation to mining activities, the OT HIA has identified existing challenges that hinder the adequate provision of health and public health services. The cumulative impacts of various mining-related projects in Umnugobi are already stretching the limited government health and other social services currently available (KTKK 2011). Mining companies assume that the responsibility to provide essential social services to its population including health services remains a government issue, as mining companies feel they share in the responsibility by paying required taxes. The OT HIA highlighted that local and provincial governments often lag behind in terms of providing services to affected communities, and that in Mongolia, there is not yet an adequate structure for enabling or fostering public-private cooperation in many sectors. For example, in the context of public health, the OT HIA identified a number of concerns associated with population influx, exacerbated by slow infrastructure development and inadequate social and health services (Janes et al. 2014).

In the discussion of health impacts it is important to consider the current health state of the population in the Gobi desert where the OT mining is situated. In 2012, the average life expectancy at birth was 68.71 years in Mongolia, which ranks the country at 133rd in the world, compared to the average life expectancy in other countries. Due to migration of people from the countryside to Ulaanbaatar city, the population of the capital has been growing fast and in 2012, the population of Ulaanbaatar city comprised 67.2% of the total population of the country, an increase by 12.6 %, compared to 54.6% in 1990 (CHD 2012). The economic mining opportunities brought to rural areas of the Gobi are very promising. Umnugobi was the only remote province on the 2009 list of “local

development Index[30]" of Mongolia among four major municipalities of the nation such as Orkhon, Darkhan-Uul, Tuv provinces and the capital city Ulaanbaatar because of mining developments (UNDP, 2011).

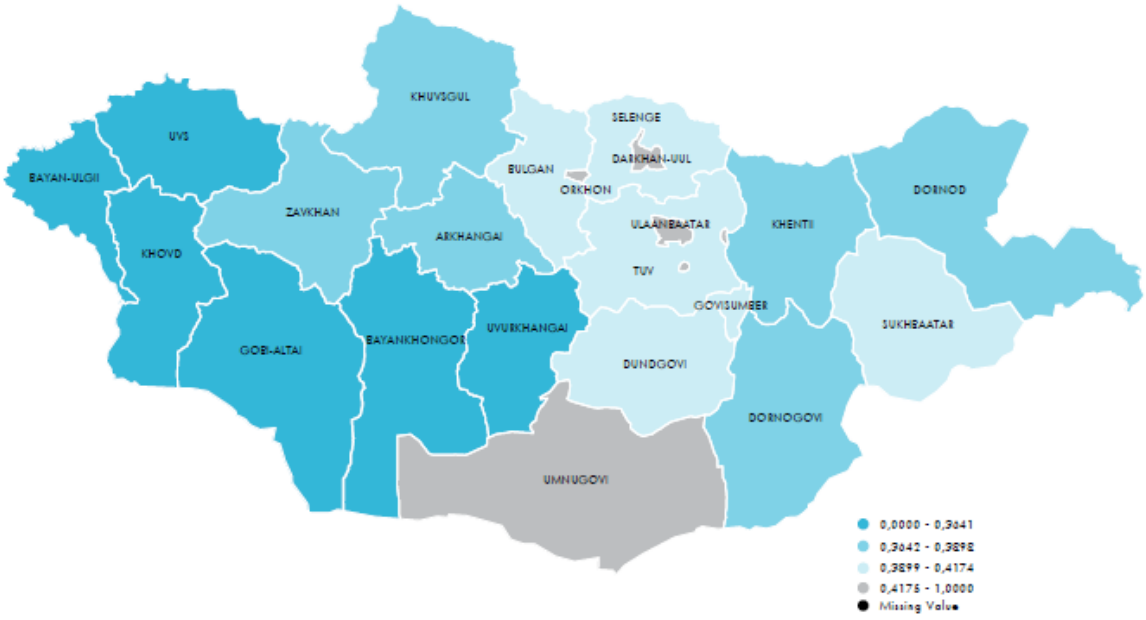

Figure 3.8. Differences in indices of provinces and capital city development (MDG 4th report by UNDP, 2011)

This index was likely to be estimated for the perceived vast potential of mega-mining projects, rather than the current situation of the Gobi area. Despite the potential advances in social development and prosperity, the existing situation of Southern Gobi and all other rural areas where there is weak infrastructure and chronic shortages of state budget and health professionals, disparities of vital health indicators are quite alarming. Local communities and environmental NGOs are making claims that mining in the Gobi desert is linked to negative social and health risks such as increased dust,

[30] "The local development index was introduced for providing equality for local development, refining local budget allocation, and improving budget planning based on local needs and features has been approved by the Government of Mongolia Resolution No.88/2010" (UNDP, 2011 p.145).

shortages in drinking water, increased road accidents, overloaded health, and increased divorce rates. These claims are made even though most mining activities in the Gobi remain in the construction and exploration stages.

Examining Health Disparities in the Gobi Desert

In the absence of HIAs, except for the OT HIA, and a reliable study that analytically evaluates and compares health statuses of the mining affected communities vs. non-affected communities at the population level, an attempt was made to see if there were any pre-existing or early signs of health disparities between those communities. This was done by analyzing selected routine health data, using birth, death, and morbidity rates. In general, the current health status of the population in Gobi desert reflects Mongolia's overall health trends.

Table 3.3. Comparison of selected health indicators of a mining affected community (Health Indicators-2012, CHD)

Selected health indicators, 2012	Khanbogd soum[31]	Umnugobi province	Country average[32]
Total population	4.300	64.400	2.867.700
Population growth rate	21.8	15.1	20.4
Crude birth rate	28.1	20.2	26.3
Crude death rate	6.3	5.1	5.9
Infant mortality	25.8	16.9	15.3
Death attributed to diseases of the digestive system, per 10,000	-	5.59	5.32
Morbidity, viral hepatitis, per 10,000	77.5	57.4	24.7

[31] Khanbogd data was obtained from the local health department statistician of the inter-soum hospital during key informant interview.

[32] Provincial and national averages were obtained from 2012-Health indicators book by Center for Health Development of Mongolia.

Selected health indicators, 2012	Khanbogd soum[31]	Umnugobi province	Country average[32]
Morbidity, Trichomoniasis, per 10,000	48.0	-	15.0
Morbidity, arterial hypertension, per 10,000	-	401.7	357.3
Outpatient morbidity, diseases of the respiratory system, per 10,000	-	1974.08	1099.44
Influenza, per 10,000	-	780.91	140.11
Outpatient morbidity, diseases of the circulatory system, per 10,000	-	824.54	817.03
Outpatient morbidity, diseases of the digestive system, per 10,000	-	1242.25	1027.81
Diseases of the musculoskeletal system and connective tissue, per 10,000	-	296.59	221.58
Early ANC coverage	-	85.7	87.5
Deaths within 24 hrs of admission at the RDTSs	n/a	62.5	30.2
Physicians per 10,000	-	20.96	30.27
Nurses per 10.000	-	24.4	34.9

The health indicators differed from the provincial or national values are highlighted in red in Table 3.2 and discussed here. Although rates of population growth and crude birth resemble the population influx in Khanbogd resulting from mining activities, values for crude death rate and infant mortality are quite alarming as they exceed both province and country averages. Other negative outcomes that could, in part, be associated with a population influx are an increase in infectious diseases such as viral hepatitis and trichomoniasis in Khanbogd. Umnugobi had higher morbidity rates of arterial hypertension compared to the country average. In general, at the Umnugobi province level it can be seen that diseases of the digestive, circulatory, and respiratory

systems are more prevalent than the country average. Morbidity from influenza is almost six-fold higher than the country average. Umnugobi has the mildest temperature in the country, so it is not common to see such high rates of influenza. This increase may be related to mining impacts, such as population influx, heightened stress, weakened immune systems, excessive drinking and lack of health services. Perhaps most important is the high degree of population turnover – people coming and going at high rates may bring influenza virus into local communities. This would be especially the case as a consequence of the influx of Chinese miners and truck drivers. In these active mining areas there is also a lower than average number of physicians and nurses per 10,000 people, supporting the claim of inadequate health services. According to the 'Structural and Performance Standards' (SPS) of family health centers, there is 1.800-2,000 persons per one physician. In reality, this means one physician covers 2,378 populations at the national average. The number of people per physician is even higher in Umnugobi compared to the national standard (CHD, 2012).

While validity of the local data used here, and linkages between health indicators (outcomes) and mining activities may be debatable, this exercise was carried out to determine if there are any health outcomes of mining activities that require an immediate action. This exercise is not meant to replace a thorough analysis of the situation, but was meant as a preliminary activity until that data is available. However, it is important to acknowledge that cumulative impacts may carry over time or across several companies operating in the same area. This can confound the attempt to link health risks and outcomes, especially at the population level. For that reason, researchers should take caution when making claims of direct causation rather than association. Comparing vital data that determines health status within OT affected areas with country and regional

averages as seen above, may be an interesting exercise, but it is not an informative one to base an evaluation of OT associated health impacts. Such an evaluation needs to consider the population density of the Gobi desert, the high number of other mining projects that are taking place in the close proximity, the recent launching of the OT production phase, and the relatively weak national health information system.

There is a possibility of pre-existing health conditions and cumulative impacts, so it is inappropriate to prematurely hold mining activities responsible without solid evidence. Cumulative, regional effects require a different kind of HIA, one that takes a higher level, strategic view, both of health risks occurring in a region as well as the system and policy-level changes that require implementation in order to manage these cumulative effects (Janes et al., 2014).

Reasons for Health Disparities Explained

An MDG implementation report by the UNDP (2011) and the Community Health Safety and Security Impact Assessment (CHSSA) report by KTKK (2011) offers potential explanations for health specific challenges concerning disparities of health status and services between urban and rural areas as well as those in mining affected vs. non-affected communities:

> ***"***People residing in remote areas and migrants not covered by health insurance due to lack of registration documents possess limited access to health aid and assistance. In a population of one million rural residents, 67.1% are herders who live up to 14 km (65%) and 50-80 km (35%) from healthcare facilities. This geographical isolation contributes greatly to the expanding disparity in child health (the 4th target set of MDG) aid and assistance between urban and rural areas. Disparities in livelihoods, regional development differences, remoteness from basic services, especially health facilities, leads to the gaps in adequate services for populations, including children" (UNDP, 2011, p.58).... Economic and social conditions in Mongolia pose a high risk for the spread of HIV. This problem could be exacerbated by negative social factors such as poverty

> (one third of the total population lives below the minimum living standard), increasing migration, growth of mobile workers due to mining and infrastructure development" (UNDP, 2011, p.71).
>
> "In 2007, a report by the National Emergency Management Agency, the Ministry of Nature and Environment, and the State Specialized Inspection Agency indicated evidence of mercury and cyanide contamination in nine provinces in the Central and Gobi regions of Mongolia. The government further reported that a total of 53 hectares of land and dozens of wells were polluted by mercury and cyanide. Also, 200,000 tons of contaminated slime and waste materials were present in 120 sites in those provinces" (UNEP, 2012, p.4).

One of the more important health challenges associated with mining in Umnugobi, and one that local residents often complain about, is respiratory problems caused by off-road dust from coal trucks. Research conducted elsewhere has indicated that there is an association between respiratory problems, including asthma and increased levels of particulate matter (PM10), when characterized by high levels of road dust (Forsberg, 2006). The OT HIA suggested that physical changes, including dust and lower air quality, if not appropriately mitigated, can contribute to respiratory disease. It is important to note however that a key finding of the HIA was that these impacts are cumulative and are a result of multiple factors, not only including the operations at OT. In response to this finding, and to limit any impacts resulting from dust, OT is implementing activities to minimise the increase in dust levels. These activities include the maintenance of other roads that are heavily used by the project, as well as improvement of the road between Khanbogd and the OT camp. Increased dust levels in Gobi are also associated with heavy road traffic from the Tavan Tolgoi (TT) coal mines (to the north of the OT mine site) to China, where up to 2,000 off-road 100-tonne trucks go daily. In addition to OT and TT, several mega-scale coal mines such as Ukhaa khudag, Ovoot Tolgoi, Alag Tolgoi and Nariin Sukhait are operating within a radius of 150 km of OT. This suggests that there could be a range of health outcomes that cannot be attributable

to any single factor or company, and the impacts on the community are cumulative and require a sector-wide strategic and cumulative impact assessment. In addition, the incidence of traffic accidents has also rapidly increased along the coal transport route. Although these data are suggestive, it should be emphasized here that Mongolia currently lacks reliable health information, baseline data, and biomarker monitoring capacity that would permit public health inspectors to measure and evaluate these health risks across different levels of exposure.

Being the first of its kind in the country, the OT HIA process was well received by interviewed participants. Those who were involved in the process claim that stakeholders learned to collaborate in the shared effort. Using an approach that was based on the international best practices that value the importance of stakeholders' engagement and broad consultation of the affected community was another big strength of the HIA. Undertaking Mongolia's first HIA where there were no formal requirements, gave the assessors flexibility in the process. Although stakeholders perceived the OT--HIA as a pioneering assessment of high value to the Mongolian mining context, key informant interviews (both, OT and non-OT respondents) highlighted shortcomings and lessons learned when asked about the weaknesses of the OT HIA.

The shortcomings identified by the respondents who worked for OT or conducted the OT-HIA:

> ***The pre-legislation era:*** *"The OT HIA was conducted in the pre-legislation era. When there was no legal mandate, there was no government support and low interest from the government, rest of the mining companies as well as the other departments of OT. Weak sense of ownership and lack of involvement was displayed by the MOH, especially in the beginning stage. We felt that we were doing it voluntarily, at own will. As much as the company wanted to take the lead, it wasn't fully encouraged by others and we obviously could not lead the process as we had no legal authority to do that. As each stage of the OT HIA had a period of learning, awareness raising, careful progression and*

negotiation, the whole process required extra resources beyond what was initially planned. Yet, we willingly went the extra mile to achieve what we aimed for".

Baseline data: *"One has to have strong evidence in order to demonstrate association between health risks and outcomes based on the trend changes from baseline data. The baseline data are needed to be able to make accurate claims. Unfortunately, in the case of Umnugobi, where multiple big mines operate, availability of health baseline data is limited to routine health statistics, which already need to be strengthened, and are highly quantitative. Some criticism of the HIA arose concerning the depth and variety of health and social indicators available, the degree to which the statistics were disaggregated, and the validity and reliability of the measures. A consensus needs to be reached on the list of essential indicators to be followed and by efforts to create them".*

Role and responsibility: *"It is not clear who will take charge in implementing the certain components or overall CHSSP. The OT HIA does not precisely address the great need for consensus in the role and responsibility division of provision of public services that are overburdened by the influx of mining activities. The government will probably point to us, but we believe that it should be a shared responsibility of all shareholders, including the government who collects taxes from us. The OT can bear certain responsibilities, not all of them, as local community and the government expect. This issue still needs to be worked out".*

Time pressures: *"Undertaking the HIA in accordance with the set timeline was extremely difficult due to several factors. The national holidays that were stretched over the summer months delayed the implementation of the HIA process by few months as it was particularly difficult to reach the identified participants of the field study and members of the MOH Ethics Committee. Overall coordination of tasks and contract negotiation was bit time consuming among HIA assessors, as KTKK included large number of collaborators. Since it was Mongolia's first HIA, lack of prior knowledge, experience and consensus that required more time for discussion threatened to influence the quality of the HIA. Finding the common ground with OT's interests in focusing more on occupational health issues as opposed to conducting the community based health assessments, by organizing an unplanned workshop to inform specialty of HIA, has resulted in additional time consuming challenge."*

The shortcomings identified by the non-OT respondents:

The report needs to be shared*: "I think the biggest flaw of OT HIA is not sharing the HIA report and CHSSP. The final report of the OT HIA is not available to the general public for review, although it is a public document. OT-HIA is not being uploaded on their website nor shared during any meetings. The response I got from OT staff was, "this is an internal and*

confidential document" when we requested it. If we do not know what is in that document and what health risks were identified then how would we accept this assessment? Results dissemination was not good. Communication could have been better if they were confident enough on their findings," says an NGO executive.[33]

Most of the non-OT respondents have complained about OT not sharing its HIA report and the resulting CHSSP. It is hard to fault OT for not publicly sharing the document as they were not obliged to do so, according to binding laws and regulation. Despite the lack of legislation requiring HIA, in line with their corporate social responsibility principles and financing institutions requirements, OT decided to conduct HIA to act as an internal guiding framework to manage potential negative and positive health impacts that could have implications both on the company and affected communities. At the same time however, the issues of stakeholder engagement and transparency, the key values of HIA, require the company to release the findings of HIA report to concerned and interested parties: it would be the right thing to do. Sharing the report and urging all stakeholders' informed involvement could lead to better ownership by the government and a more focused approach by the relevant professionals. This way, managing the public health impacts of OT mining in the affected area would become more than one company's priority. Moreover, OT would not become the subject who seems to be responsible for all the rational and irrational claims. Therefore, the report needs to be shared publicly.

Imprecise link between risks and outcomes*: A CEO of an environmental health NGO was concerned that the health effects of copper-gold mining had not been adequately addressed in the HIA OT*

[33] Janes, who conducted an external, arms-length assessment of the HIA and CHSSP, provided an English copy of the HIA for this analysis. It has not been made public outside of a small circle of "experts." Although Janes has not signed a non-disclosure agreement, he believes that OT should be the one to release the document to the public, with appropriately contextualized information.

project, and said "The consortium that conducted the impact assessment has not been clear about the root health risks of copper mining and their linkages with particular impacts rather than just documenting few assumptions that we and the Khanbogd community kind of already knew. Those identified risks read very broad and rather symbolic. I must have missed the public commenting period to state my opinions on the potential health risks and the assessment process. I do not think it was announced, publicly".

Whether the HIA should be inclusive of occupational health or impacts on populations has been an issue that the HIA community in Mongolia has not been able to come to consensus on. In case of OT, it has a separate report related to occupational health risks and mitigation plans related to worker health and safety. As a result, occupational health issues were specifically excluded by OT from the HIA and CHSSP.

***Health impacts of temporary housing**: "I do not like the fact that OT has not built any permanent settlements, not even a small mining village or township. Everybody in Mongolia and the world knows that OT is one of the largest copper-gold mines, yet its miners live in the camp consisting of hundreds of traditional gers where nomadic Mongolians live. Is OT going to build a proper modern town with infrastructure and good social services instead of paying for an expensive "fly-away" routine that brings miners to the camp for 3 weeks and then fly back to UB for 2 weeks? That could be anyone's guess. Working away from loved ones can cause a series of serious social issues that lead to respective health impacts such as excessive use of alcohol, increased risk of STIs, divorce and unsupervised children etc. Hence, it could have been more valuable if the OT HIA looked into the potentially adverse social and health impacts of living in a temporary housing away from the family".*

In addition to the aforementioned shortcomings, typical HIAs should involve methodical risk prioritization and risk assessment steps in order to determine the likelihood, magnitude and severity of the health risks. These are useful when assessing the public health significance of a risk and making the direct linkage of that risk with the company's operation. According to IFC guidelines (2009), until recently the focus of HIAs has been on the collection of information related to health impacts. Some of these health impacts might be considered minor in terms of health outcomes, or may only affect a

very small proportion of the population, while others might be quite severe and long-term, and affect large segments of the population. In order to ensure that resources are dedicated to addressing the most important health impacts, it is necessary to prioritize or rank the importance of the identified health impacts.

The CHSSP plan that was developed out of the HIA does identify a number of important needs, including the prevention of communicable diseases and con-communicable diseases and injuries, reduction of risks related to social conflict and health systems strengthening. OT recognised the increase in population in and around the mine area will put increased pressure on soum health services. However, as noted by a key informant, despite this, many of the programs implemented by OT to date focuses narrowly on the health care and clinical services.

> *As a result of the HIA, OT developed the CHSSP which is focused on four primary areas that were identified through the HIA as being most at risk as a result of the OT project. Across these four areas, OT is delivering a number of programmes aimed at building the capacity of health services. These programmes include: a doctor sponsorship Programme (DSP), improving medical waste management, improving medical equipment (Khanbogd) and assisting the Khanbogd Inter-soum hospital with diagnoses at an SOS clinic located on Oyu Tolgoi site in Khanbogd soum. Through these programmes and others that may be developed in the future, OT strives to continue to work with local government, community members, and others to address challenges related to community health.*

Programs could be more sustainable when they are integrated into a general plan of health systems strengthening, rather than a vertical program approach focusing only on a single outcome or set of determinants. Integrated health systems approaches locate programs within the overall health system, providing supports where needed to ensure that the program is implementable, and can be managed and evaluated long

term. This may need to be taken into consideration if OT wishes to develop a more comprehensive action plan that fully addresses the risks identified in the HIA.

Acquiring a Social License to Operate at Local and National Levels

As revealed by interview findings conducted with local community members, Mongolians have high expectations of the mining industry. These expectations include the idea that mining has to be conducted in a way that does not affect community health adversely and that mining has to improve the current state of health and social well-being by improving the economy. Oyu Tolgoi staff believed that their relationships with affected communities in Khanbogd, BayanOvoo and Manlai soums were generally good, but that they struggled to both inform and involve as wide proportion of the population as they would have liked. They also recognized that because of their large size, public stature, and identity as a foreign company in an increasingly nationalistic Mongolia, OT was often an unfair target of criticism. As noted by one community relations manager in Ulaanbaatar, "*If there is a single motorcycle accident within 100km of the OT site, it will somehow be said to be our fault"* (Janes et al., 2014, p.10).

The community relations staff of mining companies worry that positive information about company operations is not being communicated widely enough to the population. They also believe that local people ignore the indirect and intangible contributions that the company has made to affected communities, for example, capacity building through hiring and training local people, subsidizing medical insurance, and providing scholarships for local students to study in Ulaanbaatar and abroad. Although cooperation between the company and the local soum leadership was said to be good, in general, senior staff felt that the government was lagging well behind the company in providing essential services to affected communities. Misinformation, lack of

transparency (especially with regard to the disposition of tax revenues generated by mining), and lack of trust in official structures were cited as challenges to community relations (Janes et al. 2014).

An international HIA expert best describes the current OT situation as follows:

> *"OT is sitting in a very uncomfortable position right now. They are the only ones that have done a HIA and now they have this community health, security and safety action plan (CHSSP) that they are supposed to implement. They are getting lot of pressure to take on and deal with some of the cumulative effects for some of the other mining operations. That is not a comfortable place to be in. They do not see it as their responsibility to deal with cumulative effects, and they do not see it as their responsibility as an industry to take on some of the responsibilities that should be looked after by the local government. There is a concern within the industry that if there is no strong government lead on HIA, then the industry is reluctant to do HIAs because they do not want to end up in a situation like OT where they are going to be asked to take care of everybody else's mess."*

There has been a difference in understanding between OT and the government of Mongolia regarding their respective responsibilities insofar as both parties seem to demand more contributions from the other. Many companies feel that the government should lead and maintain responsibility for the successful delivery of all social services, including public health services, to its people as the company pays its fair share of taxes into the state budget. The government however, may want to hold the company accountable for impacts (direct or indirect) that may arise in the project affected communities. Building a mining town with adequate infrastructure, homes, roads, schools and health facilities can be complicated as a result of these differences.

This issue drew a great amount of discussion during the contract negotiation process between government and OT, and was believed to be resolved with the creation of a mutual and inclusive governing body, the Southern Gobi Regional Development

Council (SGRDC). The Government was tasked with the establishment and lead of the SGRDC that includes central and local government officials and representatives from the private sector, affected community groups, and international financial institutions. The SGRDC is meant to assist the Government in developing, financing, and implementing the strategy that emphasizes key issues of: coordination of in-migration influx, transparent and responsible governance, urban planning and development and human health care (Investment Agreement 2009, Article 4.1-4.4). It is good that this mechanism exists, so that there can be a resolution to underlying issues. However, not defining who is responsible for each issue can lead to disagreements. The OT HIA did not make a distinction between company and government responsibilities, especially in regards to specific negative health impacts. The formation of the SGRDC will only work if it is functional and well informed. The OT HIA and its subsequent risk mitigation plan can function as a key tool to inform the SGRDC's activities. In the case of OT, there is a need to revise and coordinate its CHSSP with the SGRDC plans.

Even in the presence of the shortcomings discussed above, the OT HIA was groundbreaking as the first successful HIA in Mongolia. It also led to the development of the CHSSP. What remains as a necessary and as yet incomplete component of this process is a functional, committed and coordinated partnership between the company and the government in implementing the CHSSP (or mitigation plan) sustainably. If OT successfully implements its CHSSP, it has the potential to become a benchmark for Mongolian best practices in mining and social impact mitigation (KTKK 2011). This is an opportunity for OT to enhance its social license to operate as well as the reputation of OT and its corporate partners. This is a common case of a struggle between conflicting

concepts of revenue maximization, and social improvement where the two ideologies must meet on a neutral ground for the CHSSP implementation to be successful.

3.3. Unpacking HIA through a theoretical lens: Diffusion of Innovation theory of policy change

Description of context: Adoption of any social innovation is difficult; so is the uptake of HIA. Diffusion of innovation (DOI) theory provides one way to understand how HIA as a complex social innovation has been accepted and transmitted. This section discusses DOI theory and applies it to the diffusion of HIA in Mongolia.

3.3.1. A rationale for applying DOI theory to HIA

Experiences with HIA in countries around the world (including the Mongolian example) suggest that the adoption and sustained use of HIA is difficult to achieve. When opinion leaders and advocates propose useful policy innovations like the HIA in new settings, it is not always adopted and implemented, particularly in LMICs. Spreading innovations and ideas that address health problems before such problems occur is a central feature of public health. Not all public health innovations diffuse rapidly and successfully in all contexts, as there are many conditions that lead to innovation failure or non-adoption (Greenberg, 2006). Accurate planning on how to diffuse an innovation could be more effective than making the decision to simply disseminate that innovation. Diffusing HIA is no exception. Although the HIA tool has been encouraged to manage potentially adverse footprint of development projects in most areas of the world, only few developed countries have actually been able to successfully integrate this approach into their health policy-making and to conduct HIAs regularly (Mindell, 2003). Other countries (mainly LMICs) where HIA is encouraged have seen their efforts to adopt HIA fail for various reasons. Lack of the use of theory in planning and adoption may be one such

reason (Estabrooks, 2006). This research speculates that a resolution to this non-adoption is the use of DOI and KT theories as planning tools. Diffusing an innovation may create challenges caused by country specific contextual barriers, or adopter specific competing concerns that can influence the rate of adoption.

According to DOI theory, considering an innovation's attributes (relative advantages, complexity and compatibility) helps to uncover the actions that are most important in enhancing adoption (Rogers, 2003). An example of this includes a potential adopter in the government who considers HIA to be of lower priority and their participation becomes weaker as HIA gets sent to the bottom of an already crowded agenda. This is the example of the adopter not seeing a relative advantage over other policies of the innovation and of its incompatibility with the performance of their other roles. They are likely to withdraw or only provide lukewarm endorsement of the HIA. DOI theory can be a useful tool for identifying, explaining, and overcoming these different contextual barriers. At the same time, notes Rogers, “DOI theory is an essential component of the modernization of health services worldwide, though the literature shows that it is not always an easy theory to apply” (Rogers, 2003). Diffusion is a natural social phenomenon. DOI provides the body of knowledge and tools to examine values of innovations, needs of different adopters, and effectiveness of various communication channels.

A theory[34] by definition, “must have four basic criteria: conceptual definitions, domain limitations, relationship-building, and predictions” (Wacker, 1998). Theory is

[34] “Theory is an idea or set of ideas that is presented as possibly true and is intended to explain facts or events” (Merriam-Webster.com. 2011. Retrieved May 10, 2014, from http://www.Merriam-Webster.com/dictionary/theory.

needed in order to develop measurable and useful interventions. It is useful because it posits cause-effect relationships between an innovation or interventions and the intended outcomes. Theory is applicable on many levels, ranging from the design of an intervention to the successful application of that intervention. DOI theory has been used as a way to understand the uptake or implementation of innovations in different contexts. It is a useful lens through which to examine how HIA, an already proven innovation, is adopted (Dannenberg et al., 2006). Such an approach would identify particular gaps or problems in implementation and ideally point to more effective diffusion strategies. Greenhalgh et al. (2008), write more generally about knowledge translation and validate this point by arguing that further research is needed to address identified knowledge gaps and should have the following characteristics: "be theory-driven, process rather than 'package' oriented, address common definitions, measures, and tools, be collaborative and coordinated, multidisciplinary and multi-method and participatory" (Greenhalgh, 2008, p.615; Estabrooks et al., 2006).

As a result of the sustained effort to bring HIA into the Mongolian mining sector, HIA was formally included in EIA Law amendments as a mandatory process mining companies must complete prior to obtaining a licence to operate (Byambaa et al. 2012). Despite this formal step forward, a number of challenges to HIA adoption remain in Mongolia that prevent HIA from becoming practice. These challenges include the absence of a detailed HIA management guideline, weak enforcement of regulations, intuitive resistance towards externally-introduced innovations, and the private sector's perception that the HIA is an additional barrier to operation that is expensive and time consuming. Issues of resistant attitudes and perceptions, likely by the mining industry, seem to be particularly relevant to the Mongolian case. Singhal (2009) argues that,

“when adopters are externally persuaded to buy into the vision of an outside-expert, they tend to demonstrate inertia and resistance,” which could result in a lengthy adoption process. Mongolian government officials often present strong needs for and signs of dependency on external technical support. Yet, at the same time they often demonstrate inertia toward external innovations as a result of strong nationalistic sentiments. However, presenting HIA as an advantageous approach that brings out both potential positive and negative impacts of a project, not an extra barrier to the private sector, could increase the rate of HIA adoption (Byambaa et al. 2012). This phenomenon can be examined and improved with the application of DOI theory.

Similar vignettes from other countries fill session rooms at HIA international conferences, outlining and documenting challenges ranging from assessing the need for HIA adoption, to institutionalization and legalization issues. With the burgeoning interest in knowledge translation (KT) and dissemination and implementation (D&I) science, we turn to the literature to see what one of the D&I ‘industry standards’ of theories of social change – DOI theory -- might offer. What might improve HIA adoption? And is DOI a satisfactory overall tool for this task, or are there theoretical perspectives or methods that could also be used? Answering these questions involved first, summarizing the main concepts and features of Rogers’ DOI theory, applying its concepts into the actual process of HIA adoption in Mongolia and, showing how this theory might be improved and better applied to health policy innovations in LMICs.

A realist literature review was conducted in the early stages of this research to assess how DOI theory has been used to enhance stakeholder adoption of, and sustained engagement with, HIA. The main proponent of realist reviews comments that,

"Policy-makers are more likely to be able to interpret and utilize an explanation of why a programme worked better in one context than another, rather than struggling to uncover recommendations expressed in plain numbers. A realist review provides this opportunity (Pawson, 2005, p.14). "

The three aims of this literature review included obtaining information on improving the uptake/use of HIA, determining the usefulness of DOI theory in this context, and assessing the rate of adoption of HIA in the Mongolian mining sector as a case study using Rogers' five attributes of innovations.

Key informant interviews were used to link the HIA with DOI theory. Although key informants could not speak directly to DOI theory and its application due to their unfamiliarity with the concept, many of them highly valued the importance of using the appropriate communication channels to influence key stakeholders (adopters), which is a critical feature of DOI theory. Findings of the interviews were crucial in determining the rate of HIA adoption in Mongolia. Analysis on these findings will be discussed in detail in Chapter 4, section 3.

3.3.2. An overview of DOI Theory

In this next section, details of DOI theory will be explained, along with themes from the Mongolian case discussed in this research. The section will conclude with recommendations of current methods to diffuse knowledge innovation effectively using the DOI theory.

DOI theory was initially developed in rural sociology, but has since been applied on a number of different contexts and innovations, and continues to be widely used today (Estabrooks et al., 2006). It is primarily associated with the sociologist Everett

Rogers, who used DOI to explain the rates of the adoption of agricultural innovations, and then later adapted it to other sectors and activities. According to one analysis of DOI, it encompasses "the process by which an innovation is communicated through certain channels over time among the members of a social system. DOI theory seeks to explain the spread of new ideas, opinions, attitudes, and behaviors throughout a community" (Valente, 2006, p.S23).

DOI has many important features and characteristics. Below, I briefly summarize the main elements and in the following section I will discuss each in detail.

> *"Diffusion is a special type of communication concerned with the spread of messages that are perceived to be new ideas. Communication is a process in which participants create and share information with one another in order to reach a mutual understanding. The main elements in the diffusion of new ideas include an innovation that is communicated through certain channels over time among the members of a social system (Rogers, 2003, p.5). "*
>
> *"The adoption of an innovation is a process that proceeds through several steps, beginning when individuals first learn of the innovation, and progresses through stages as they become persuaded of its importance, decide to adopt it, begin implementation, and finally, seek confirmation that they made the correct decision (Fauman, 2006, para 2). "*

The five attributes of an innovation that affect this are its relative advantage over other options, in terms of concepts of compatibility, complexity, "trialability" and observability. These will be defined in detail in section 3.5. An individual's perception of these attributes determines the rate of adoption (Rogers, 2003).

DOI theory suggests that three forms of decision-making influence potential adopters as to whether they should adopt an innovation or not. These forms are termed 'optional', 'collective' and 'authority'. "An optional decision is made by an individual who is in some way distinguished from others in a social system" (Rogers, 2003, p.38; 403).

This could be someone with the power to make a decision to adopt a new innovation like HIA, or a highly educated, influential and respected individual who can advocate for it effectively. “Collective decisions are made by all individuals in a social system, whereas ‘authority’ decisions are made for the entire social system by a few individuals in positions of influence or power. During communication between ‘collective’ stakeholders, an innovative idea is rarely evaluated from a scientific standpoint; rather, subjective perceptions of the innovation and its relevance to the current social context influence diffusion” (Rogers, 2003, p.38; 403).

DOI theory offers a means to examine policy changes or innovations. Rogers identifies three categories for the consequences of DOI: “desirable vs. undesirable, direct vs. indirect, and anticipated vs. unanticipated” (Rogers, 2003, p.31). However, Rogers also notes that adoption consequences are the most understudied area of DOI theory as innovators can be positively biased by simply assuming that the innovations they diffuse are always successful and beneficial. Two further categories of consequences, making distinctions between public and private, as well as between benefits and costs, were later added by Barbara Wejnert (Wejnert, 2002).

DOI theory has come from many disciplines, including “anthropology, early sociology, rural sociology, education, industrial sociology, and medical sociology” (Rogers, 2003, p.49). Its applications have been highly varied. It is probably the most cited social science theory in use today.

3.3.3. The Four Key Elements of DOI Theory

Rogers explains that the key elements for successful DOI include “an idea (innovation), communication channels, a social system, and time” (Hamilton, 2010, p.20). An idea is supposed to address specific needs and offer solutions to meet the

expectations of the community in question. “The perceived newness of the idea for an individual community member determines his/her reaction to it. If an idea seems new to the individual, it is an innovation” (Rogers, 2003, p.12). Further elaboration of these ideas is as follows:

> *“*A communication channel is the means by which messages get from one individual to another. Interpersonal communication and mass media are the general types of communication channels. These also include e-communication, teleconferencing, meetings, focus groups and workshops as different ways to diffuse or translate knowledge. A social system is defined as a set of interrelated units that are engaged in joint problem solving to accomplish a common goal. The members of a social system include the stakeholders, the experts, and the user-groups. All members cooperate at least to the extent of seeking to solve a common problem in order to reach a mutual goal (Rogers, 2003, p.18).”
>
> “The characteristics of a social system determine diffusion, norms that govern diffusion, roles of opinion leaders and change agents, types of innovation decisions possible, and the consequences of innovation. To use Rogers’ model in health requires us to assume that the innovation is equivalent to scientific research findings in the context of practice” (Estabrooks, 2006, p.29).
>
> "The rate of adoption is the relative speed with which an innovation is adopted by members of a social system” (Rogers, 1995, p.206).

3.3.4. Diffusion of Innovation Stages

Adoption is not the same as diffusion: Adoption is mainly a process by which an individual goes from first hearing about a product or idea, to adopting it. The idea of diffusion mainly refers to the social processes that affect the spread of an innovation over time and through social networks. “Overall, the diffusion process essentially encompasses the adoption process of several individuals over time. Diffusion of Innovation theory occurs through a five–step decision-making process” (Rogers, 2003, p.420). In his latest formulation of DOI theory, Rogers characterizes these five steps as

encompassing the concepts of: knowledge, persuasion, decision, implementation, and confirmation.

Five stages in the Decision Innovation Process

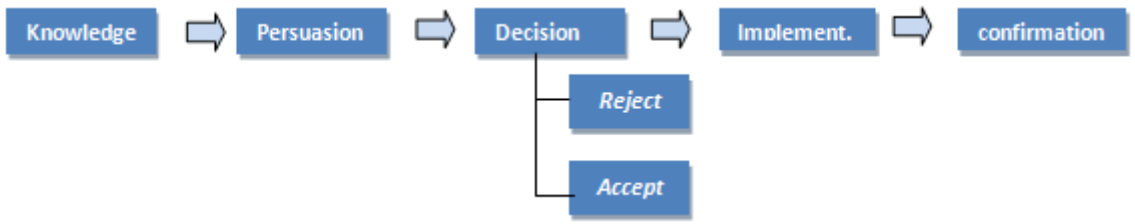

Figure 3.9. Stages of the DOI (Source: Rogers, 2003, p.171)

In a nutshell, "the process of adoption proceeds through several steps, beginning when an individual first learns of the innovation, progresses through stages when they become persuaded of its importance, decide to adopt it, begin implementation, and finally, seek confirmation that they made the correct decision" (Fauman, 2006).

As Rogers (2003) states, the knowledge stage starts when an adopter is first exposed to simple information about an innovation. It moves to the persuasion stage with his/her proactive involvement in searching for extra information. After reviewing pros and cons of the attributes, an adopter makes a decision to adopt or reject. If the decision is made to adopt an innovation, then the process moves on to the implementation stage and may continue to the confirmation stage where an innovation is fully adopted.

In diagramming HIA uptake in the Mongolian context using the five–step decision-making process of DOI theory, it would seem to be located within the decision stage, given that stakeholders are waiting to see whether or not the newly integrated HIA and EIA regulations can actually be enforced and implemented. Experiences and perceptions in the early stages of implementation effort could influence the decision of whether to continue this adoption effort or cut it short.

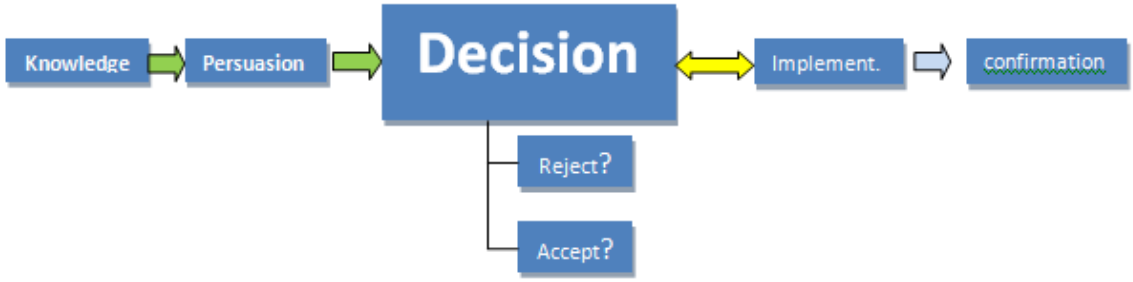

Figure 3.10. Illustration of the five stage decision model as applied to HIA uptake in Mongolia

3.3.5. Rates of Adoption

One of the central observations of DOI theory is that people become aware of an innovation at different times. Because these people become aware at different times, and adopt at different rates, there may be large temporal gaps between initial and final adopters of an innovation (Valente, 2006). Adoption can become very complicated when a new innovation is brought into a context where there are many potential adopters with differences in their roles, intentions, and perceptions. Classifying adopters, and approaching each differently, is an important step in allocating resources effectively. Rogers classified adopters based on the "degree of innovativeness and the degree to which an individual or other unit of adoption is faster to adopt new ideas than other members of a system" (Rogers, 2003, p.22).

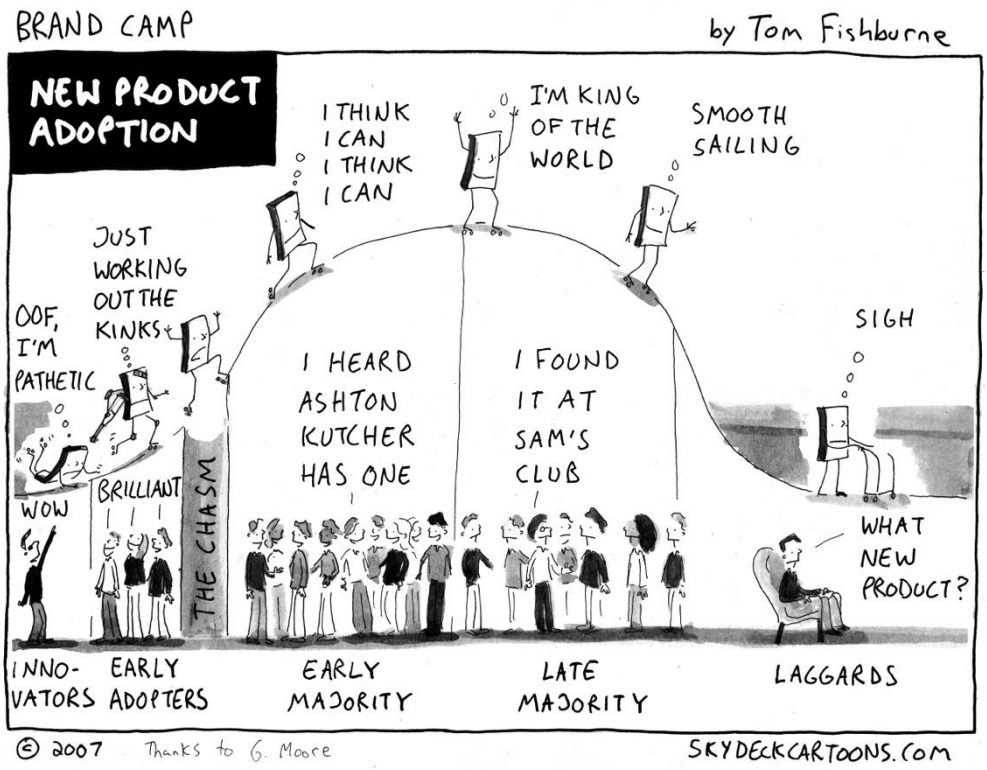

Figure 3.11. Characteristics and motivations of different adopters (Source: by Tom Fishburne)

The time dimension of adoption can be represented by an adoption curve. The area under this curve can be divided into five adopter categories: “innovators, early adopters, late adopters, late majority, and laggards. The innovators (2.5% of adopters) are the first to adopt, followed by the early adopters (13.5%), then the early majority (34%), the late majority (34%) and lastly, the laggards (16%)" (Rogers, 2003, p.284). These percentages are based on a normal distribution, where innovators are two standard deviations or more from the mean level of innovativeness. Rogers also reports that “early adopters are better educated, more literate, have higher social status and a greater degree of upward social mobility, and are wealthier than later adopters” (Rogers, 2003, p.267-271; also Nigel, 2009). Once innovation has reached a critical mass and enough individuals have adopted it, a threshold has been reached such that the innovation can be self-sustaining. Rogers developed some strategies that can help to

make an innovation become a self-sustaining. These are “to have an innovation adopted by a highly respected individual within a social network; creating an instinctive desire for a specific innovation; introducing an innovation into a group of individuals who would readily use an innovation; and providing positive reactions and benefits for early adopters of an innovation” (Rogers, 2003, p.350).

Similar to Rogers’ focus on adopters of an innovation, the Canadian Institute for Health Research (CIHR) defines a knowledge-user as “an individual who is likely to be able to use the knowledge generated through research to make informed decisions about health policies, programs and/or practices.” A knowledge-user's level and type of engagement or participation in the research process may vary depending on the nature of the research and his/her information needs. For example, a knowledge-user will have different needs depending on whether they are “a practitioner, policy-maker, educator, decision-maker, health care administrator, community leader, or an individual in a health charity, patient group, private sector organization, or media outlet” (CIHR, 2012, p.1).

Rogers (2003) states that for the adoption of an innovation to be successful, the process needs to involve innovators and adopters, plus change agents as well as opinion leaders. Exposure to media coverage can also promote the process. He highlights the key role played by opinion leaders who are influential in large social networks. As well, change agents function as a bridge between innovators and opinion leaders in order to foster and speed up the spread of an innovation despite obstacles (Hilbert, 2011).

The method of adopter categorization, based upon the curve of adoption discussed above, gained a dominant position in the early 1960’s (Rogers, 2003). The curve has two shapes: a normal bell-shaped curve that describes the frequency of adoption over time, and an S-shaped curve that describes the cumulative number of

adopters (Rogers, 2003, p.272). The relationship between these two curves is shown below.

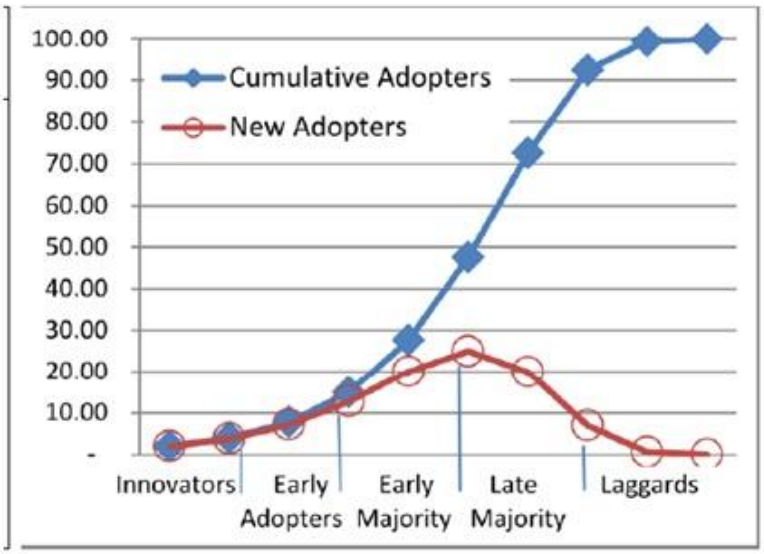

Figure 3.12. An illustration of the Diffusion of Innovation (Source: Martin Hilbert, 2011, p.718)

As this figure shows, adoption rates begin very slowly at first, but then accelerate. As the density of adopters grows, the number of non-adopters shrinks and the adoption process slows down (Rogers, 2003, p. 272; M. Hilbert, 2011). The faster the diffusion, the steeper the curve becomes. Hilbert states, “The characteristic S-shaped diffusion curves come in different shapes and sizes. This is because real-world diffusion is not following a random process of homogeneous contagion, but is influenced by the particular structure of the social network and by the characteristics of its nodes" (Hilbert, 2011, p.718). The S-shaped curve only describes successful innovation processes where an innovation spreads to almost all of the potential adopters in a social system (Rogers, 2003). “The rate of adoption is defined as the relative speed with which members of a social system adopt an innovation. It is usually measured by the length of time required for a certain percentage of the members of a social system to adopt an

innovation" (Rogers, 2003, p. 23). Adoption is a highly social process that can be pushed one way or another by a number of social processes and factors.

3.3.6. The Five Attributes of an Innovation

As introduced above, Rogers (2003) employs five perceived attributes to explain how quickly innovation can be adopted: relative advantage, compatibility, complexity, trialability, and observability. These concepts can be defined as follows:

1. Innovations with high perceived advantage may be adopted with minimum effort and resources. The processes of determining the relative advantages seem to be contextually sensitive. Relative advantage analysis helps adopters to make the decision whether to adopt or reject an innovation in the decision stage. Although relative advantage is a very important characteristic, it cannot guarantee full adoption.
2. The higher the compatibility of an innovation is with the values, needs, and current practices of the community, the higher the rate of adoption tends to be. People do not feel comfortable with changes that they feel are a big departure from the status quo, or they simply cannot envision how a change might be successfully incorporated into the existing situation. Social norms can play a big role in perceptions about compatibility, too.
3. Innovations seen by potential adopters as not overly complex and simple enough to adopt, tend to be more easily adopted. However, initial capacity and attitude of the target audience also makes a difference to the end result.
4. Innovations that target adopters are able to experiment with easily, prior to committing to it, have a higher degree of getting adopted. The higher the technicality of an innovation, the less is the chance it will get picked up broadly. new product innovations that are concrete and can be tried and dropped without having much at stake, are more readily adopted than a policy innovation.
5. In cases where potential adopters or consumers are not able to try out the innovation, then the observability attribute can be more important than trialability. Adoption of products with visible benefits can be promoted by reinforcement through positive responses of the adopter's social network. In cases of policy innovation, the importance of the observability attribute could be minimal, although if the adopter (e.g., in the case of an organization or government agency) would like to be regarded as a policy innovator, observability matters.

A useful analytic tool for elaborating the specifics of these characteristics was one created by Kurt Lewin, termed a “force field analysis” (Thomas, 1985). This tool which is discussed in Chapter 4 provides a simple framework for analyzing how various contextual forces line up along the five attributes presented here to affect the success of the innovation process.

3.3.7. Communication channels

Communication is by definition a foundational element in diffusion processes. As Rogers notes, communication encompasses the various processes “by which participants create and share information with one another in order to reach a mutual understanding" (Rogers, 2003, p.18). In the case of the diffusion of an innovation, communication concerns the exchange of information about a new idea. The construct of communication also includes an identification of particular channels through which information flows (Chambers et al., 2004): “Different communication channels play different roles at each stage of the DOI process. Channels of communication may include research publications, databases, the mass media, attendance at lectures and workshops, visits from interest groups and videos or audiotapes” (Rogers, 2003, p. 18; also: Sanson, 2004).

The source of a message and the channel that carries it are not the same. A channel is the means by which a message gets from the source to the receiver; “Communication channels are categorized into interpersonal and mass media. These channels play different roles in creating knowledge versus persuading individuals to change their attitude toward an innovation” (Rogers, 2003, p.18). Mass media channels have the advantage of reaching an intended audience rapidly, but it may only create

superficial or basic knowledge. Interpersonal channels, conversely, have a capacity to change attitudes or form new ones about a particular innovation. Face-to-face exchange is considered by Rogers to be more powerful in fostering diffusion (Rogers, 2003, p.205). This theory is further explicated by Bero et al (1998, p. 466), who argue that, “the most effective communication strategy is face-to-face exchange, as it provides an opportunity to tailor information to recipients and allows the advocate of the change to explore and, if necessary, modify the reasons why a shift in behavior should occur.” Bero and colleagues also argue that face-to-face communication is usually more effective when the exchange is between people who are similar to one another in terms of social position. Other researchers have made similar observations. In the context of public health interventions, Greed (2009, p. 152) has observed that “innovations in public health diffuse through many channels including mass media, interpersonal communications, health education of the public, continuing education of professionals, social marketing, information technology, and related bodies of literature obtaining information and influence from authoritative sources to the intended users of that information or practice.” Nisbet and Kotcher (2009) identify the important role played by change agents who “feed information to opinion leaders who interact with the more passive audience segments to influence their behavior patterns" (Nisbet and Kotcher, 2009, p.330).

Contextual influences greatly affect the understandings and actions of potential adopters. Diffusion research has shown that adopter categories are influenced to different extents by different sources and channels. Studies have found that innovators and early adopters may rely more on mass media and expert sources outside of their immediate social world, while late adopters and laggards rely more heavily on word-of-

mouth channels (Turnbull, 1980). Turnbull, for example, notes that, “all information is diffused through vertical and horizontal communication channels. Vertical channel exists if there is a meaningful difference in the interests, social status, demographic or economic characteristics of the communication units. Horizontal channel diffuse occurs where communication flows among members of groups with similar interests and characteristics" (Turnbull, 1980, p.3-4). These communication channels can further be divided into formal and informal types. A formal channel is established and managed by the originating communicator, while informal channels are not intentionally established and are not controlled by the communicator (Turnbull, 1980).

3.3.8. Social media and social marketing

The two main types of DOI communication channels identified by Rogers (interpersonal and mass media) are similar to the Bass model of diffusion that describes the introduction of a new product into the marketplace and focuses on the use of social media for marketing an innovation. Reflecting on this model, Rogers writes that, “in addition to enriching and acknowledging the importance of the two communication channels, Bass proposes that researchers use a tool to forecast the number of adoptions of a new product will occur during future time periods and at what diffusion rate. Much of the scholarly research inspired by the Bass model indicates that social marketing tools could be effectively used to diffuse an innovation" (Rogers, 2003, p.208).

Owen (2002) agrees with this argument, but differentiates DOI from the social marketing approach. Whereas in traditional DOI theory diffusion rests principally on communication processes and channels, social marketing is really a much larger idea than social communication. It is, rather, “the design, implementation, and control of programs calculated to influence the acceptability of social ideas and involves

considerations of product planning, pricing, communication, distribution and marketing research" (Kotler and Zaltman, 1971, p.5). Although different concepts are invoked in social marketing, in many ways they are similar to the elements proposed in DOI theory; “marketing techniques are bridging mechanisms between the simple possession of knowledge and the socially useful implementation of what knowledge allows” (Kotler and Zaltman, 1971, p.6). With the increased use of the internet and social media, social marketing now has new tools for reaching targets (i.e., potential adopters) and innovators, as the modern phenomenon of online communication can speed up the diffusion process greatly (Rogers, 2003). Messages via email, Twitter and Facebook can serve as interpersonal communications that are highly personalized to the individual, lowering the cost of communicating while saving time. Rogers uses the example of how free e-mail service from Hotmail was able to spread rapidly, creating an S-shaped curve for cumulatively increasing promotional messages (Rogers, 2003).

3.3.9. Reflections of Diffusion of Innovation Theory for Understanding Health Impact Assessments

This study carefully investigated the compatibility and applicability of DOI theory for explaining HIA innovation. The three aims of the literature review were to understand how to improve the uptake and use of HIA, assess whether DOI theory is useful for understanding HIA adoption, and assess the rate of adoption of HIA in the Mongolian context. Results of this review should contribute to a better understanding of the process through which these tools are adopted, and identify methods of knowledge translation and exchange that facilitate HIA adoption.

An investigation of whether there had been prior research bridging the areas of DOI theory and HIA, e.g., for public health interventions, was also carried out. I found no

systematic studies of factors that determine the uptake or successful application of HIA. Two attributes of DOI, relative advantage and compatibility, are believed to be the most important for the high adoption rate of policy tools. The Mongolian HIA efforts to date appear to have focused mainly on these two attributes. Of the three forms of decision making described by DOI (optional, collective, and authority), the ongoing effort of Mongolian HIA adoption is in the midst of shifting from optional to authority decision-making (Rogers, 2003). A shift to authority-based decision making stems from the collaborative efforts of the Canadian-Mongolian health researchers. HIA, although still in the early stages of adoption, has, on paper at least, been incorporated into law.

This approach to understanding HIA through DOI theory may be unique, and thus offers important guidance to HIA adoption in LMIC settings and to implementation science in population and public health more generally. As potential adopters have different roles, intentions, and perceptions (Rogers, 2003), it is best to identify and prioritize potential adopters. Applying DOI theory to HIA adoption can be successful only if all four key elements (idea, communication channels, time, and a social system) are present when a diffusion effort is initiated. DOI theory explains the two main communication channels needed to diffuse an innovation. Mass media is helpful to reach audiences rapidly, but its effectiveness is most often only in the realm of information or awareness of basic knowledge. Diffusion through interpersonal channels creates the formation and change of strongly held attitudes, because it involves face-to-face exchange between individuals (Rogers, 2003).

In this section I have examined Everett Rogers's DOI theory to explain the adoption rate of HIA innovation in Mongolian mining sector. Overall, DOI theory appears applicable to understanding the HIA approach. By using the conceptual framework,

elements, and attributes of DOI theory, HIA innovators and advocates should be able well positioned to advance HIA as well as its adoption success and rate to other contexts, including LMICs. In addition to the constructive theories like KT, DOI is a helpful tool in addressing many challenges to social change, as it can help us to logically frame the diffusion steps from planning to evaluation, which can increase HIA uptake in Mongolia and elsewhere.

Chapter 4.

Discussion

In the previous sections of this thesis, the emergence of the mining industry in Mongolia was discussed along with the issues that it poses for economic development potential and potential threats to human health. This unprecedented intensification of mining, along with the potential challenges to public health it represents, has created a need for the application of the HIA. Trying to match the speed of economic growth in the country, the adoption of HIA in Mongolia has been a slow but steady process. Chapter 3.3 offered key findings on how DOI provides an opportunity to analyze and evaluate HIA adoption rates in the Mongolian mining sector.

This chapter will apply DOI theory to the introduction and evaluation of HIA in the Mongolian case with the use of important analytical tools such as the Berry & Berry model, Stakeholder Analysis, and Force Field Analysis. The Berry & Berry model and the position map by Roberts et al. were used (Berry and Berry, 1999; Roberts et al., 2004; Rogers, 2003) to evaluate the triggering factors and players in HIA adoption in Mongolia. Detailed discussion of the applicability of Force Field Analysis to the Mongolian effort to adopt HIA in the mining sector is presented and explained. It compares pros and cons of the HIA innovation to evaluate the adoption rate and success by using DOI attributes.

4.1. Evaluation of HIA Adoption Factors in Mongolia: Use of the Berry and Berry Model

Berry and Berry (1999) explain that the rate of adoption amongst local policymakers is based on a range of factors that put pressure on governments, including competition, learning, mandates, and public pressure. They argue that “each of these four theoretical rationales for why diffusion occurs among governments will have a positive effect on the adoption of an innovation” (Walker et al., 2011, p.97; Berry and Berry, 1999). Based on their approach, this analysis looked at the potential triggering factors for HIA diffusion in the Mongolian mining sector. The conclusion was that there was more than one reason behind adoption. These reasons included 1) learning from others’ best experiences, 2) conforming to ‘normative pressures’, 3) addressing public pressures, and 4) competition. These explanations are each discussed and analyzed through use of the Berry & Berry model below.

First, as Walker et al. (2011) discuss, policymakers learn from one another, and will be motivated to copy innovations that have been successful elsewhere, and especially if these are positively regarded or popular among the public. Policy innovations are more likely to be adopted if the potential adopters can learn from others: “Public policy research on innovation and diffusion has assumed that managerial learning from professional associations and other sources is an important factor in promoting the diffusion of ideas” (Walker et al., 2011, 98).

Sharing knowledge and learning from others’ best practice can be mutually-beneficial (Rashman and Hartley, 2002). Relevant to this discussion is the idea of “policy entrepreneurship," similar to constructs of change agents and opinion leaders: “Policy entrepreneurs can be defined as people who seek to initiate dynamic policy change.

They do this through attempting to win support for ideas for policy innovation. Contributors to the agenda setting literature suggest that policy entrepreneurs use several activities to promote their ideas. These include identifying problems, networking in policy circles, shaping the terms of policy debates, and building coalitions" (Mintrom, 1997, p.739).

In the Mongolian example, Canadian academics with funding support from the Canadian government transferred the international best practice knowledge of HIA to Mongolia's government officials, industry, a set of relevant NGOs, and academic circles. A series of capacity building activities including trainings, workshops, and advocacy meetings were the core components of the diffusion process. HIA is still a fairly new and developing concept in Mongolia, but there is evidence of slow but steadily increasing activity at the national level (Byambaa et al., 2012). "It is important for Mongolia to learn from the experiences of other countries that have undertaken developments without adequate EIAs or HIAs, especially where there have been subsequent adverse impacts on the environment, health, and well-being of communities affected by developments" (Spickett et al., 2012, p.4).

Secondly, governments respond to external pressures. This may occur through various incentives, pressures to adopt and use certain policy innovations, or through normative influences from other jurisdictions to adopt what are perceived to be best practices in terms of public and professional legitimacy. "When central governments promote or mandate a policy change, it extends beyond learning and accelerates the innovation's adoption" (Walker et al., 2011, 98).

In Mongolia, the normative pressures that were applied were mainly from the health sector to adopt HIA policy through mandating mechanisms. In the absence of prior individual HIA policy and mandatory requirements, it was mutually decided to develop an HIA regulatory framework as part of an existing sister regulation that had been successfully adopted (Spickett et al., 2012). The existing sister regulation in the Mongolian case was the EIA. Within the existing integration effort of HIA into EIA, activities such as introduction of health concepts into EIA law furthered this innovation. The mechanism of integration of HIA into EIA law was through the 2012 amendment, and MOU signing between Ministries of Health and Environment, and the creation of a multisectoral HIA working group.

Thirdly, governments respond to public pressures, especially in democratic settings where citizens are motivated to vote on the basis of particular "hot button" issues. Demands from citizens are incorporated into policy in order to keep the public satisfied (or not too dissatisfied). The media may also play a role through publicizing scandals and otherwise providing information to the voting public (Berry and Berry, 1999).

The recent inclusion of HIA into the EIA law in Mongolia was made possible largely due to public pressure and concerns over how government was not able to resolve alleged health claims about mining that have grown in recent years. Despite this successful integration, government officials' political will, true perception, and awareness level on the potential and strength of HIA tools still have not been up to a satisfactory level. Significant resources of the diffusion by Canadian researchers were spent for various advocacy efforts.

Fourth, a seemingly irrelevant factor to the Mongolian HIA adoption context was competition. Competition occurs when institutions, politicians, or industries with similar ambitions and target communities try to surpass one another. Due to a relatively low number of multinational mining corporations and the immaturity of CSR and HIA practices, competition was not considered as a triggering factor. Instead, HIA was mainly prompted by the Canadian side associated with its economic interests in mining. Rogers believes that there are two major factors that speed up the diffusion of innovations. They include offering incentives and mandating the innovation (Rogers, 2003). Although offering an incentive could be challenging and unsustainable for resource limited LMIC settings, there is not enough evidence to conclude that this was why Mongolia opted to choose the soon mandatory approach for HIA use.

4.2. Evaluation of Stakeholders: Supporting and Opposing Forces behind Mongolian HIA Uptake.

Adoption of policy innovation requires full contribution from many if not all relevant stakeholders in order to be thoroughly successful. Given the inclusive nature of HIA as a highly intersectoral tool, the question of relevant stakeholders should be determined by the local stakeholders themselves. More representation from stakeholders in the HIA implementation process would increase the likelihood that HIA is accepted and implemented. Getting external technical assistance is certainly encouraged when there is inadequate local capacity to manage and conduct HIA. However, local ownership must be present from the beginning in order to complete the adoption process and build national HIA capacity. Presently, Mongolia is missing an inter-institutional system and management cycle that could dictate aspects of HIA procedures.

A rapid exercise to identify and evaluate Mongolian HIA stakeholders was identified as highly useful. This activity was seen as a tool to provide benefits such as facilitation for further discussion on capacity that needs to be increased. This can include role descriptions and essential responsibilities of coordination within the HIA management cycle. An effort to evaluate Mongolian stakeholders was undertaken in this analysis and involved two components. The first was an analysis of interview findings with the key informants who were interviewed and the second being articulation of a position map of stakeholders based on the accumulated findings from the analysis.

The number of stakeholders interviewed was small because many were involved in multiple organizations and thus had multiple, often overlapping, roles. This already thin list included a few external institutions and individuals who were instrumental in the Mongolian HIA adoption. This was reflected in some of the interviews.

> *"I have heard a lot of work being done by **SFU**, since 2009. **WHO** has been involved in supporting some training efforts. I have also heard a group from Australia has been interested in it. All these external expert efforts are trying to create initial interest in the idea of HIA." (an international expert).*
>
> *"In the current Mongolian situation where there is still no consensus and adequate capacity, **government** needs to take lead in the integration of HIA in EIA. Unfortunately, there is no mechanism for coordination even between **parallel ministries** as some believes that HIA is just extra work. We are missing overall systematic HIA framework that could regulate everything. Once we have built that framework and capacity, government should hand HIA over to professional and independent **NGO**s." (MOH officer)*
>
> *"Yes, HIA ideally requires a high level of involvement and effective collaboration from all concerned parties. But we cannot achieve that high level of involvement over night when there is an illiteracy and total lack of interest in HIA. On the same note, ideally, involving **community members** would be a good idea. But these poor herders are just too busy herding animals, trying to survive, and meet their ends. This could drive increased involvement from community members that "befriended" with mining company which could paint the actual image." (an NGO exec)*

*"There are only two groups of people that are the central to mining impacts and might care about HIA. Most are the **mining companies**' personnel (not miners) and community members. Local government bureaucrats actually do not really care as much as those community members who are in the immediate surroundings of a mine." (a mining company employee)*

4.2.1. The Position Map

The introduction of a new intervention like the HIA can be a very uncertain and complicated process when introduced in any context. Complexities may be further exacerbated when there are various potential adopters and when these potential adopters differ in their roles, intentions, and interests. A stakeholder analysis was conducted using persons who were involved in the HIA process to date and others who were meant to be involved. Analysis drew from an example of the position map used in the Dominican Republic to understand health reform, as described by Roberts and colleagues (Roberts et al., 2004). It was meant to identify appropriate, authoritative, and interested parties and assess their level of involvement; such an exercise has the potential to improve the HIA adoption rate by improving efforts to sustain commitment of stakeholders.

The Mongolian HIA adoption effort was led by a working group that represented key stakeholders from health and non-health sectors. It included stakeholders from government (Ministry of Environment and Nature, Ministry of Mining, and Ministry of Health), the NGO sector (Asia Foundation, Trade Unions, Mongolian Employers Federation, and the Mongolian Mining Association), the private sector (Oyu Tolgoi, Energy Resources), international organizations (World Health Organization, Asian Development Bank, and Pact International) the research sector (School of Public Health of Health Sciences University and the Public Health Institute of Mongolia), and

community representatives (from the South Gobi province). The members of the intersectoral working group had differing levels of perception, awareness and knowledge of HIA prior to their roles in the working group. In addition, each and every one of the working group members had unique positions as they represented different entities and interests and brought different levels of expertise toward the managing the health impacts of mining in Mongolia through the introduction of HIA. Stimulating and coordinating these heterogeneous interests and capacities, at times, compromising them was a challenge that both Ministry of Health and the project team had to accomplish in order to gain the initial support needed to introduce HIA in the country.

By its nature, HIA adoption can be perceived as a type of health reform as it has been considered and adopted as a policy innovation in the Mongolian mining sector. Institutionalization of HIA can be interpreted in terms of adjusting the “regulation-control knob,” one of various "control knobs" of health-sector reform (Roberts et al., 2004, p.158). If HIA is made mandatory through regulation, it may enhance the prevention of negative population health impacts resulting from policies, projects or programs, including mining developments that are problematic from a public and population health perspective.

High support	Medium support	Low support	Non-mobilized	Low opposition	Medium opposition	High opposition
WHO headquarter	MOH-HIA working group	Ministry of Health	Mongolian Parliament	Ministry of Mining	Mongolian Mining Association	Small scale mining companies
CIHR	World Bank	Ministry of Environment	Press	Big mining companies, except OT & ER		
SFU	ADB	WHO country office	Department of Health	Informal ninja miners		
	JTA	OT	MPHPA			
	Health for New century, NGO	Public Health Institute	Beneficiaries and affected communities			
		School of Public Health				

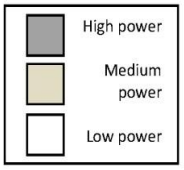

Figure 4.1. Position map of players in HIA adoption of Mongolian Mining Sector

In 'Getting Health Sector Reform Right,' Roberts and colleagues (2004, p.80) argue that, "stakeholder analysis should be completed with a clear understanding of the relevant groups and their power and positions prior to designing proper strategies to adopt any health reform idea." Classifying adopters is an important step in successfully expanding the uptake of a new innovation. In the early stages of our project, a stakeholders' analysis was conducted and later revised following recommendations generated from a consultative meeting (Roberts et al., 2004). Stakeholders' support and opposition levels along with their power rankings based on their actual efforts toward HIA adoption were analyzed. Assessment of stakeholders' positions, support, will, and power is a highly political and sensitive exercise in any partnership experience. It was

undertaken with the hopes of shedding light on an understudied area of defining and mapping the positions of opinion leaders, change agents, and institutions involved in mining sector HIA adoption. The above figure shows that powerful players like the World Health Organization (WHO) and small-scale mining companies took opposite stands towards mandatory HIA requirements due to their different interests and perceptions.

Based on the findings of this analysis, namely, differences in the interest, power and support across stakeholders, awareness raising and capacity building activities should be prioritized in order to achieve the best potential while saving crucial resources. Key informant interview participants identified the need for strict regulations that mandate HIA and organization of “must-to-attend” trainings among all relevant stakeholders as necessary steps in actually implementing the HIA practice in Mongolia. This kind of ‘dictated’ approach might work better in Mongolia given the social norm and tendency of failing to do ‘voluntary’ things which is a common practice among former socialist cultures.

4.3. Evaluation of the rate of HIA adoption in Mongolia: Integrated Application of Force Field Analysis and Attributes of Innovations aspects of DOI Theory

With regards to determining HIA adoption success and evaluating the applicability of DOI model with HIA, force field analysis was applied. This exercise of integrating Kurt Lewin’s Force Field Analysis with Everett Rogers’ DOI theory could be the first of its kind which allows for an examination of the positives and negatives associated with Mongolia’s HIA adoption process using the DOI model’s five attributes of innovation. Decisions about whether to adopt or reject the innovation are made in the

decision stage that is described in DOI theory. This comes as a result of an individual's exercise of weighing the attributes, e.g., advantages and disadvantages, of using the innovation (Rogers, 2003). "Force field analysis is a technique commonly used by development practitioners to assess forces favoring and opposing changes in working relationships within an organization" (Thomas, 1985, p.59). By using this technique, each of the attributes is studied for its relevance to Mongolian HIA adoption. "The first two attributes of DOI, advantage and compatibility, are the most important for a high adoption of policy tools and HIA adoption appears to have been closely linked to these two" (Nilunger, 2009, p.45).

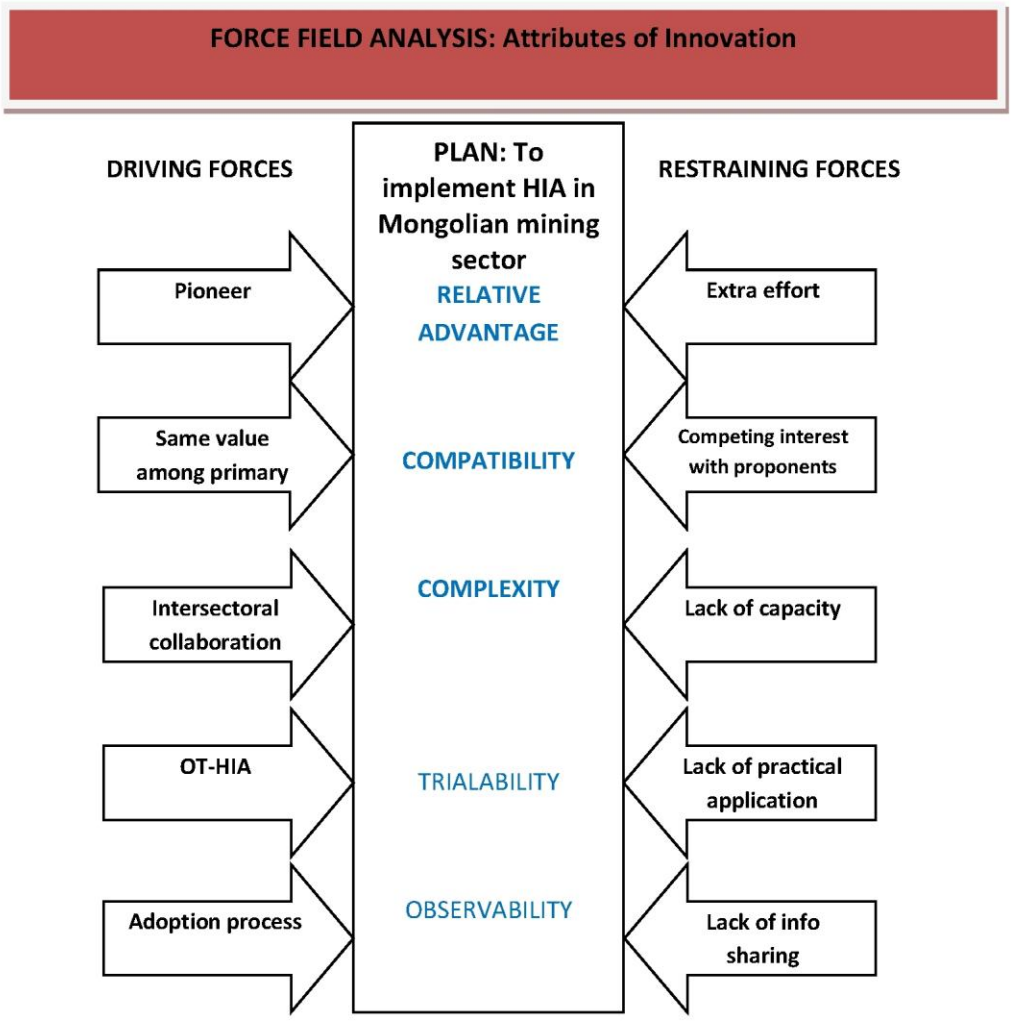

Figure 4.2. Kurt Lewin's Force Field Analysis applied for Rogers' Attributes of Innovation (Source: Katz, 1955)

4.3.1. Relative Advantage Analysis

"Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes" (Rogers, 2003, p.15). Without regulation and a history of HIA practice in Mongolia, pioneering HIA in the mining sector opens doors to better addressing population and societal health and well-being. HIA assesses the potential health impacts of mining projects, and then recommend interventions or mitigation to

reduce potential adverse health impacts and even contribute to a win-win economic situation. Economically, a healthy work force should help fulfill the employer's and government's goals of generating revenue, and a healthy community will maintain its livelihood and not overly draw down state health budget allocations. The benefits of HIA that were discussed in the section 3.1.2 can certainly make it an advantageous tool in the Mongolian context.

There are relative disadvantages to HIA as well. As Rogers argued preventive innovations "could be relatively low in relative advantage, compared to non-preventive innovations" (Rogers, 2003, p. 69). Considering HIA as a preventive innovation, we recognize that the impact of the tool will not be seen in the short run. "The rewards to the individual from adopting a preventive innovation are often delayed in time, and are relatively intangible. Also, the unwanted consequence may not materialize anyway" (Rogers, 2003, p. 176). Being the first ever HIA adoption in the country may also be a disadvantage, as it requires the creation of an enormous amount of awareness. Such groundbreaking effort would require extra resources that in return could affect successful and full adoption of HIA in resource-limited LMICs settings, including Mongolia. Rogers stated that, "anything we can do to increase the perceived relative advantage of preventive innovations can also increase their rate of adoption". In order to raise awareness and for adopters to perceive relative advantages, resources were spent towards introductory and policy level advocacy meetings.

4.3.2. Compatibility analysis

The Mongolian government is the primary adopter of HIA and the affected communities are the likely beneficiaries. The government is expected to legislate, order,

receive, and monitor it. What HIA offers is consistent with the government's existing values, needs, and goals of providing health, high quality and accessible health care, and safe environments to its citizens and Mongolian society as a whole. Other adopters of HIA such as HIA practitioners and community members have more similar and holistic views, norms, and values of social well being than project proponents. What HIA could bring is also consistent with the best interest of the affected communities and general public.

Project proponents, as secondary adopters, do not necessarily or uniformly value or feel the need for HIA. This is because in the absence of mandatory HIA practice for many years the mining companies are not accustomed to taking any social responsibility towards population health. Mining companies might not be keen to address this added requirement of HIA as it has the potential to suspend or delay their operations. This inconsistency in values could translate to incompatibility that hinders the HIA adoption rate. Overall, it could be a bit ambitious to simply assume that implementing HIA in Mongolia is as compatible as it was anywhere else in the world, given the immaturity of the foreign investment market in the country. As Stacks (2009, p.421) has noted, "Indeed, innovations that are generated locally are not just more likely to be culturally-appropriate, but also more likely to be owned by the potential adopters. When adopters are externally persuaded to buy into the vision of an outside-expert, they tend to demonstrate inertia and resistance." As per existing norms, there has not been any prior experience or norms regarding HIA for government or companies. Aside from forcing the innovation through mandatory legislation, efforts that try to change perceptions of and norms that support HIA should also take place. While changing norms is only a gradual process, it can be accomplished. In order to generate an evidence base on HIA

compatibility and benefits, a literature review was conducted in this analysis. To ensure that mining companies complete the HIA, it was necessary to mandate the tool through an EIA law amendment. The partnership agreement was signed by the Ministries of Health and Environment in order to coordinate their efforts to make HIA more compatible for potential adopters.

4.3.3. Complexity Analysis

HIA is a relatively new and very complex policy intervention. Accordingly, the perceived complexity of HIA by Mongolian adopters was a potential barrier. It was mainly due to lack of prior knowledge and lack of national HIA capacity. As many HIA experts have noted, the lack of HIA trained professionals is often a major barrier for the implementation of HIA (Birley, 2005). Although HIA requires the participation of all stakeholders throughout its stages, HIA competency can vary depending on the position, roles, intention, and involvement of particular players (Byambaa et al., 2012, p.6; Birley, 2005). This perceived complexity and lack of willingness to master the methodology of HIA could have the diffusion time of HIA taken much longer than what was originally expected. Implemented activities in overcoming complexity issues include developing simple but inclusive HIA methodology, and organizing three introductory level and one advanced level trainings among potential adopters and users. Significant turnover among government officials and professionals that was caused by the recent election results in Mongolia was a hindrance to HIA adoption rate and has negatively affected HIA capacity.

4.3.4. Trialability Analysis

A key challenge in diffusing the HIA innovation was demonstrating the actual steps and benefits of HIA innovation rather than just lecturing about it, so potential adopters in Mongolia could actually consider HIA. Although there were some efforts to try HIA as a hands-on exercise example, this did not seem as helpful as conducting an actual HIA. To date, and as discussed here, there has been only one HIA conducted in Mongolia. In the absence of current HIA regulation in Mongolia, the largest mining company Oyu Tolgoi (OT) opted out of conducting broader impact assessments through their own initiative (GOM, 2006) and contracted with Kukh Tenger Khugjil Consortium who completed an HIA in 2011. However, not many Mongolians had an opportunity to partake in this practical effort due to their lack of experience and capacity insofar as it was directed by an Australian consulting company. Despite being the pioneer HIA in the country there were several flaws. Firstly, their scope of the social determinants of health was minimal when attempting to identify potential health risks. The CHSSP did not emphasize who will be responsible for handling the identified health risks with what resources. These could be named as weaknesses of the company's HIA. In the absence of a detailed HIA regulation, experimentation and lack of law enforcement for mandatory HIA by the Mongolian government, mining companies may not be likely to fund HIAs anytime soon.

4.3.5. Observability Analysis

As HIA is still in an emerging stage, the Mongolia analysis provides little insight to this issue, although it will be interesting to see in the future whether the Mongolian HIA example is witnessed or noted internationally in a way that may foster diffusion elsewhere. Most of the interested parties, adopters and public never had a chance to

view OT's HIA report. The OT-HIA report was never shared publicly. However, a number of workshops for practitioners and stakeholders involved hands-on HIA exercises and practice assessments, conducted by the SFU research team and a local NGO. This may have in part filled the observability and trialability gap. Further efforts should focus on how to increase the number of HIAs in the country and how to better expose adopters and users to actual HIA practices. The issue of transparency in information sharing is equally important. Appropriate public consultations, town hall meetings and midterm reviews are the preferred forms of the participatory approach that allows adopters and community members to see the processes and results of the innovation. Given the fact that trialability and observability are largely lacking (Mitchell, 2009) with HIA in Mongolia, it is highly advised to make HIA practice a normative process in Mongolia. In this way, more HIAs will be conducted and more hands-on opportunities will be provided to prospective practitioners. Generally and globally though, as Nilunger (2009, p.45) notes, "HIA is observable as the idea behind it and its development can be found relatively easily in published journals and in grey literature. It has been discussed in open forums and experimented and studied at research institutions and universities. The aim and methods of HIA have been widely debated, which has increased its visibility."

After examining the advantages and disadvantages of the five DOI attributes of innovation, it can be concluded that the rate of Mongolian HIA adoption has steadily progressed as seen in the integration of the HIA into the newly amended EIA law, commencement of national consensus on the necessity of HIA, and the limited but dedicated number of HIA advocates and practitioners in the country. However, the adoption rate could be slow or slowing because HIA is a preventive innovation, there is a lack of a prior body of knowledge, little experience and incomplete regulation. Also,

Mongolia is not working towards institutionalization of HIA and is lacking detailed guidelines for the implementation and management of HIA.

When academics and advocates propose health innovations like HIA in LMIC settings, they may encounter certain challenges caused by country specific-contextual barriers or adopter specific-competing concerns. These can be a decisive factor for innovation adoption rate. Looking at the Mongolian HIA adoption experience, it is not only government officials' perceptions of the five attributes of HIA innovation that determines the rate of adoption. Different adopters such as health professionals, researchers, mining industry managers, civil society and most importantly community representatives whose opinion have a deciding impact should also be taken into account.

4.4. Applicability of Diffusion of Innovation Theory

Considering the broad applicability of its concepts and success stories across many different disciplines, DOI has the potential to be called a 'one size fits all' theory of change. And changes in society often tend to occur spontaneously, in the absence of a generalizable theoretical framework or a careful planning process that could have improved the success of stable diffusion uptake. DOI theory and research fill this gap by providing evidence-based knowledge and tools to examine values and processes underlying innovation adoption and spread, the needs of different adopters, and the effectiveness of various communication processes and channels in bringing about local level as well as macro level social change (Singhal, 2010).

In reality, a ‘one size fits all’ approach does not work, insofar as people have diverse needs and expectations. Similarly, there is no single innovation and channel of communication that can be culturally and socially appropriate to all circumstances. For example, it is a well-known fact that rural Mongolians have a higher risk and incidence for cardiovascular disease, gastrointestinal disease, and stomach cancer, purportedly due to their heavy meat diet. However, suggesting an increase in vegetable consumption or even vegetarianism is not a viable solution due to social, environmental, economic, and cultural restrictions. Socially, herding Mongolians prefer their pastoral nomadic lifestyle over settled farming and agriculture. Economically, at a population level there is almost no alternate diet they could access, afford, and substitute for meat consumption. Culturally, Mongolians not only prefer a heavy meat diet, but they refuse to eat vegetables, as demonstrated in the popular proverb, "Meat is for men, grass is for animals." Such norms and the need for contextual appropriateness present various obstacles to efforts focused on diffusing a change under one universal theory or assumption. Application of DOI is highly recommended but it needs to be modified from setting to setting in order to suit each specific context. In this era of overwhelming information and opportunities, we should be extremely selective, well-informed, and rational when choosing an innovation to promote, selecting and employing diffusion channels and communication strategies, and engaging with change agents, opinion leaders and other key stakeholders, and adopters at various stages in the change process.

4.4.1. Advantages of Diffusion of Innovations Theory:

In addition to DOI theory, there are a few other theories related to how innovations diffuse through social organizations, e.g., the theory of positive deviance, the

theory of random selection, the theory of opinion leadership, and the trickle-down theory; each outlines processes through which different segments of social systems come to accept and adopt an innovation (Turnbull, 1980). However, DOI's attention to multiple, diverse factors and processes in micro to macro level social change makes it a more complete and detailed theory, with the capacity to integrate key recommendations and concepts from these other theories as appropriate without sacrificing the integrity of the overall theoretical approach. Basically, Rogers suggests that “the popularity of diffusion research is due to its practical importance and its applied nature” (Rogers, 2003, p.57). Although most scholars would agree that the DOI is fundamentally a communication process, several distinctive advantages of the DOI make it distinct and particularly successful in its application relative to other communication approaches (Singhal, 2010). Rogers (2003) believes that the sense of newness that DOI creates for the content of its delivering message increases the rate of adoption. In addition to focusing on raising awareness and creating knowledge, DOI researchers also emphasize attitude change, decision-making, and application of innovation processes. This study of behaviour gives DOI a clear advantage over similar theories and methods.

Another advantage of DOI over other communication approaches is that it highlights the fundamental importance of *time* in the innovation process for individuals as well as broad social systems. In a given moment, diverse adopters could evidence different rates of adoption depending on the starting time, perceptions of the innovation, and level of understanding. Change agents and opinion leaders pursue effective but quick adoption, and time is a key focus in DOI in evaluating the adoption process (Rogers, 2003).

DOI gives emphasis to the use of interpersonal and mass communication channels, theoretically as well as practically. Depending on the nature of innovations, targeted adopters, and the normative context, one communication channel could be more appropriate than one another. For example, in the information and knowledge stages of DOI, mass communication could yield better results whereas an interpersonal communication channel would suit persuasion and confirmation stages better. Using a particular communication channel can speed or slow the rate of adoption and affect the expenditure of resources.

4.4.2. Disadvantages of Diffusion of Innovations Theory:

Although DOI is a continuously evolving theory that has been updated and tested by a very large community of scholars, there are significant limitations that must be mentioned. First, it has been suggested that DOI practice needs to attend to the value and role of indigenous knowledge. Singhal (2010) writes that innovations that are of local origin are likely to be more culturally appropriate. As such, they are more likely to be adopted by locals. When potential local adopters are faced with pressures to adopt an innovation by experts who are also considered by the community to be outsiders, they may simply resist or drag their feet. Getting to know the attitudes of adopters in this regard can be a difficult task. For example, the Ministry of Health of Mongolia often presents a strong desire for and dependency on external technical support. Yet, they occasionally reject or demonstrate inertia towards this external support due to their ambition for country ownership. In this vein, Zeitlen's Positive Deviance (PD) theory may be applicable: it critics the role of outside expertise, and posits that the wisdom to solve the problem lies within a community or organization (Singhal, 2010). An "inside-out diffusion" approach based on PD may improve DOI theory.

Another limitation with DOI theory is that the research examining the non-adoption of innovation and its root causes is relatively limited. Diffusion of Innovation discusses how different adopter types could influence adoption success, but does not move beyond this. Writes Turnbull (1980, p. 4) “Although non-adoption can be explained as the final outcome of an individual process of adoption that failed, some argue that non-adoption should be seen as a positive part of the social selection process”.

An additional issue with DOI theory is that although it takes time into account through the slow diffusing nature of any social innovation process, it still has room to expand this parameter. There are still areas that could be developed within the theory to evaluate methods of innovation uptake, its short-term output, mid-term outcome and long-term impact. These parameters remain a somewhat ambiguous process that needs to be further developed in line with time parameters. Being able to estimate an approximate diffusion time line for innovations, under certain conditions, would help change agents in planning and evaluating the diffusion of an innovation.

Much current work on DOI emphasizes quantitative metrics of adoption that have been developed mainly from large surveys of potential adopters. These work tends to be highly descriptive and cross sectional, and, “leaves us with few hypotheses as to what may be responsible for the success of this particular approach” (Singhal 2010, para 9). The results of these quantitative studies are to underscore the diffusion process as an attribute of individuals rather than of social and cultural systems. Interpersonal characteristics affecting communication are also underemphasized. Rogers suggests that this problem is based on disciplinary traditions: “The discipline-related bias results from social scientists who conduct diffusion research. They are specialists in conducting surveys of potential adopters. This particular research skill channels them into an

individual-blame definition of diffusion problems, and away from a system-blame viewpoint. In contrast, anthropologists conducting qualitative research instead of surveys have been less focused on individuals' roles, and more commonly point to system-blame definition of diffusion problems" (Rogers, 2003, p.119).

4.5. Knowledge Translation and Diffusion of Innovations theory

4.5.1. Overlapping theoretical concepts and terms

A health policy innovation or body of empirical knowledge cannot be worthwhile if it is just sitting unused and undiffused. To be diffused and utilized effectively, knowledge needs to be transmitted through audience-appropriate activities and communication channels. The approach known as knowledge translation (KT) involves actors, ideas and approaches that it defies a single definition. KT describes the middle, meeting ground between research and action. Ideally, KT is supposed to link research and action (Campbell, 2008). KT is typically divided into "integrated" versus "end-of-grant" activities. Integrated KT (IKT) is thought to be the more useful and powerful, way to affect knowledge use. In IKT the potential users of research are included and engaged in the entire research process – helping to formulate research questions, methods, and analyze the results. This approach is known by a number of terms – for example, collaborative research, co-production of knowledge, and action-oriented research. IKT has the potential to generate findings that are more relevant to, and thus more likely to be used, by the intended user (CIHR 2012).

The Knowledge to Action Process, defined by CIHR (2012), conceptualizes the relationship between knowledge creation and action.

"A knowledge creation 'funnel' conveys the idea that knowledge needs to be increasingly distilled before it is ready for application. The action part of the process can be thought of as a cycle leading to implementation or application of knowledge. In contrast to the knowledge funnel, the action cycle represents the activities that may be needed for knowledge application" (Graham, 2006, p.18).

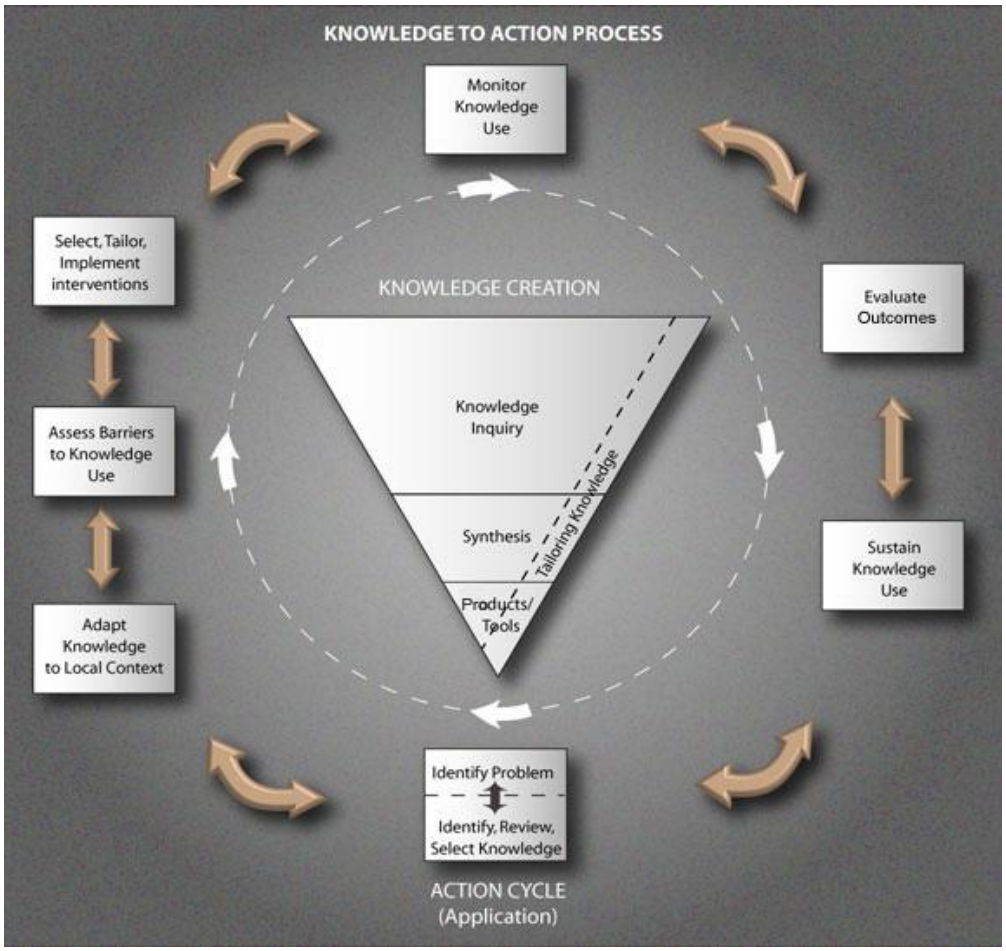

Figure 4.3. Illustration of the Knowledge to Action process by Graham (Source: Graham, 2006, p.19).

From the above image it can be seen that knowledge creation has three stages of inquiry, synthesis and products. This knowledge to action cycle has a revolving pattern that depicts processes to iteratively better the knowledge base and its use, by contextually tailoring knowledge to the specific needs of a learning community, i.e., potential adopters, and responding to the need to address

barriers and gaps as they turn up (Graham, 2006). Ultimately, we want to see the appropriate applications of evidence-based intellectual knowledge and discoveries in real life; however, there always seems to be a disconnect between the scientific community and practical world (Green et al., 2009). As this study illustrates, DOI is a very useful approach to couple to understanding knowledge translation processes and outcomes.

On a slightly different note, Choi (2005) argues that evidence-based innovation does not always work, as scientists get skeptical about the extent to which research is used while policy-makers get skeptical about the usefulness of research due to their different mentalities. Choi also states that researchers strive to search for absolute truth by using a rational model whereas policymakers search for relative truth or compromise by using an intuitive model.

The question is about how this gap between knowledge generators and users can be bridged. Current methods to diffuse and transfer knowledge innovation effectively could be strengthened and improved by using a theory such as DOI that offers planning and evaluation tools.

Recall that DOI is the process through which new innovations moved from one place to another as outcomes of appropriate communication channels and interactions among players, whereas KT is “the synthesis, exchange and application of knowledge by relevant stakeholders to accelerate the benefits of global and local innovation in strengthening health systems and improving people’s health” (CCGHR, 2010, p.7). Although the emphasis is somewhat different, at the core of both is the challenge of communicating with key stakeholders and potential targeted adopters. Decision makers’

basically precautionary and skeptical attitudes are valid when determining public policy, especially in LMIC settings where resources are limited. “When resources are scarce, it is particularly important to ensure that they are used wisely—health problems causing suffering and millions of premature deaths every year cannot afford wasted time or money. Policies and interventions must reflect the best possible current knowledge” (Gavin and Nasreen, 2011, p. xvii). In agreement with Gavin and Nasreen’s argument, researchers need to do better job reaching out to decision makers and demonstrating the relative advantages of the knowledge that they are proposing (Campbell, 2008). Certain DOI elements such as innovation attributes and targeted communication strategies could provide a unique opportunity in narrowing down the “know-do gap” as discussed by Campbell. In a KT ‘push-pull model’, researchers who push the knowledge product have to make research findings more accessible and understandable to decision-makers (i.e., those who ‘pull’ in the knowledge) (Campbell, 2008). In contrast, DOI through its wide range of communication strategies and channels can act as a vehicle to effectively deliver that knowledge product to those who need it. Notes Estabrooks et al., “despite calls for theory development, currently there is no satisfactory KT theory and, and in fact, some question whether there can or should be such an overarching theory. While not frequently used in the health sciences, the theory closest to achieving this status is that of DOI” (Estabrooks et al., 2006, p.1).

4.5.2. Moving Knowledge into Action

Examining insights on how KT and DOI are associated is important to this analysis. Consideration of the seemingly straightforward action of bringing intellectual knowledge into practice has resulted in many complex and overlapping terms across countries, disciplines, and researchers; these include the terms knowledge translation

or exchange (the terms often preferred in Canada), knowledge diffusion and knowledge uptake, and research utilization, to name only a few, (Straus et al., 2011, Ann et al., 2010). It is possible that this overlap of terms could be contributing to the challenges of understanding resource materials and applying these concepts. Switching between these different terms within a single article can make it challenging for change agents and users to understand main points of theory and application. KT can be described as a technical term that might not be used much outside of the research world, whereas the term DOI might be more fittingly used among practitioners who strive to make a change. However, they are both fundamentally based on best practices and lessons learned from scholarship and real-world experiences.

Inconsistent terms for the presentation and utilization of KT and DOI make for challenges in finding and synthesizing the literature, as well. In order to improve the situation, it would be helpful to have standardized terms and a glossary, although pulling off the dialogue and deliberative processes that would be needed would be a challenge. It can also be understood that the terms KT and DOI are often interchangeable, though they do not necessarily have to encompass one another as there are documented examples of similar concepts being expressed and explained through different terms in the USA, Canada, and other countries. Our approach towards DOI, KT and other knowledge disseminating concepts and definitions should be pragmatic, avoiding fixed boundaries or rigid definitions of DOI and KT. Also, spending time debating theoretical distinctions may not be useful as these theories can be dependent upon disciplines, cultures, and countries. ‘Moving knowledge into action’ could function as an applicable term for all these overlapping theoretical concepts and terms.

4.6. Challenges and Recommendations as described by Stakeholders

This section provides a discussion on the challenges and lessons learned that were identified through literature reviews, key informant interviews, and participant observations.

4.6.1. Challenges

Key informants were asked about the challenges that they encountered or are still experiencing with the HIA adoption and implementation processes. For concise illustration, a summary of these challenges is presented in Table 4.1, along with recommendations for overcoming these issues. The OT HIA specific challenges that have been discussed in section 3.2.6 will not be reiterated here. The overall challenges and recommendations that were accumulated through key informant interviews and participant observations fall into three categories based on their distinct roles and consequences. These include: improving the HIA supportive environment, improving HIA implementation, and furthering acceleration of the HIA adoption process in the mining sector. Although categorizing these challenges is a relatively arbitrary process, it is a useful exercise for identifying barriers and systematizing the priorities related to the overall HIA adoption process.

Table 4.1. Challenges and Recommendations

Challenges	Consequences for HIA adoption	Recommendation	Potential collaborators
A: To improve HIA supportive environment			
• Weak political will and inconsistent government support	• Lack of funding support for HIA training • Health sector is victimized by ill-motivated political promises • Weak ownership and excessive dependency on outsiders' assistance	• Sustained advocacy activities among policy makers • Enact independent HIA law • Government step up its leadership in providing healthy living environment to its citizens	• Leading: GoM • Complementary: HIA practitioners, WHO, CCGHR, private sector
• High turnover rate in the government and lack of institutional memory	• Causes major setback as it wipes out accomplishments (learning and consensus) that have occurred during the previous government(s) • Weak working relationship between ministries	• Improve use of strategic documents in regards to health impacts of non-health sector activities • Finalize and approve national strategy on health impacts of mining industry • Improve inter-sectoral and inter-ministerial collaboration. Urge MOH and MNE to implement existing MoU	• Leading: MOH, MNE, MOM • Complementary: all stakeholders
B: To improve HIA implementation			
• Weak enforcement of laws/regulations	• Is perceived to be caused due to absence of explicit HIA regulations, advertising and capacity	• Include HIA specific clauses into the respective regulations and job descriptions of SPIA inspectors, and train with it	• Leading: SPIA, MOH, MNE • Complementary: HIA practitioners

Challenges	Consequences for HIA adoption	Recommendation	Potential collaborators
• Insufficient awareness of the need for health consideration in non-health sectors' decision making	• Definitions of health and its determinants are narrowly understood and appreciated	• Urge MOH to promote broad definition of health through various advocacy and educational activities • Employ commonly understood language when discussing health impacts • Scale-up HIA practice to other development sectors beyond mining	• Leading: MOH, HIA practitioners • Complementary: WHO, CCGHR, policy makers, private sector
• Weak expertise level capacity of HIA	• Too broad and imprecise HIA is conducted which demolishes reputation of HIA process	• *Institutionalize HIA* • Adopt HIA training (short, long term) curriculum • Raise funding to carry out routine trainings • Offer training for cost among EIA practitioners while EIA based HIA lasts	• Leading: MOH • Complementary: HSUM, HIA practitioners, MNE, WHO, CCGHR
• Absence of (vital, non-aggregated) baseline data specific to the affected regions	• Makes it impossible to monitor overall trend of health impacts of project activities	• To promote building and accessibility of baseline data across demographics and key regions	• Leading: MOH, health researchers • Complementary: NSO, MNE, HSUM
• Absence of government body to order, monitor and evaluate HIAs	• Overall coordination of HIA practice get lost as there is no leadership	• Designate government institution/agency to be in charge of HIA management and coordination	• Leading: GoM complementary: MOH
• Absence of HIA management guideline and quality standards	• Creates uncertainly, disconnect and sometimes, overlapping within government system	• Develop HIA management guideline and quality standards	• Leading: MOH • Complementary: WHO, CCGHR,SPIA, HIA practitioners
• Low emphasis on the implementation of a mitigation plan (CHSSP in case of OT HIA)	• Downgrades ultimate meaning of HIA as the process tends to be discontinued due to lacks of commitment, understanding and funding	• - improve monitoring on the implementation of mitigation plans • - improve functionality of SGRDC to effectively implement CHSSP of OT	• Leading: MOH, SPIA • Complementary: SGRDC, OT LLC

Challenges	Consequences for HIA adoption	Recommendation	Potential collaborators
C: To further accelerate HIA adoption process in the mining sector			
• A difficulty in managing health impacts of ASM activities	• Is perceived to be very difficult to keep those small companies accountable for their action	• Expand adoption of HIA practice into the ASM by developing specific regulations targeting them and building their capacity	• Leading: MOH, MOM • Complementary: WHO,CCGHR, SPIA, Mongolian Mining Association
• Lack of wide range of HIA acceptance by private sector	• Is perceived to slow down the implementation of HIA process	• Sustained advocacy activities based on promotion of CSR, SLO concepts	• Leading: MOH • Complementary: WHO, CCGHR, MOM Mongolian Mining Association, private sector
• Absence of a national institution to lead and carry out further adoption and capacity building processes of HIA	• Inadequate capacity • Inadequate funding	• Encourage capacity building and self-identification of local public health institutions into the HIA expertise/leadership role	• Leading: MOH • Complementary: CCGHR, HIA practitioners, WHO

Alternatively, these challenges can be divided into the following three layers: *root challenges* related to HIA needs that demands for action and evidence building (mostly identified at the community level), *direct challenges* related to HIA adoption process such as weak capacity, complex nature of HIA, high competing interests (mostly identified at the HIA practitioners and government officials level), and lastly, *indirect challenges* such as corruption and weak law enforcement.

Some of the significant challenges include low awareness and low participation by non-health sectors. Acknowledgement and awareness of government officials and mining companies on issues covered within the HIA, seems to be low. The HIA is less likely to gain political support if it lacks awareness and interest. Consequently, this could result in weak collaboration, even resistance from stakeholders. During the

implementation stage, recommendations and activities of health action plans directed toward the non-health sector may face challenges due to the exclusion of non-health practitioners in the HIA process. If HIA practitioners focus on negative health impacts and ignore positive developments of projects, project proponents and their supporters may see HIA as an extra barrier and avoid having to use it. Promoting positive impacts, CSR and SLO concepts through sustained advocacy activities would draw mutually beneficial support from the non-health and private sectors. It would be beneficial if industry partners are mandated to disclose HIA results to concerned parties, so that the HIA can inform future decisions in mitigating the potential adverse impacts.

Another challenge of the OT-HIA was weak collaboration between health and environment sectors**.** Although the HIA has officially become part of the existing environmental assessment, in practice it still fails to consider a broader range of health and social issues, or incorporate them into plans and programs. In such a context, “the HIA may get lost within a rather complex EIA, if integration efforts take place without addressing major flaws of the EIA, such as procedural rigidity, narrow definition of health, strict rules of evidence, an adversarial environment, and a narrow focus on the physical environment" (Cole and Fielding, 2007, p.397). There is also the issue of competing agendas and lack of efficient collaboration between health and environmental sectors. This has the potential to diminish findings and practical implications of the EHIA. There is a need for strictly enforced legal environmental guidelines added to the HIA. In the absence of environmental guidelines, environmental components will be completely only on a voluntary basis. When an independent HIA law is enacted and enforced in Mongolia, the HIA needs to evolve as a comprehensive policy tool, not as a narrow-focused health risk assessment. With the current marriage of the HIA and EIA, a way to

move forward with more effective collaboration is with the implementation of the MoU that was signed in 2013 between the MOH and the MEGD.

It is also important to understand that HIAs undertaken in resource-poor settings are particularly challenged by limited baseline population health data (Winkler et al. 2010), and limited information about existing health, social, and environmental vulnerabilities (Harris-Roxas and Harris 2011). Basing decisions more objectively on population profile data is important, but may be difficult when these data do not exist (Birley, 2003). Without baseline data, key performance indicators that are decisive to the evaluation of project activities cannot be collected or analysed. Generally, indicators are of three kinds: indicators that assess the input of the relevant financial, human, and structural resources (buildings, equipment, drugs, medical technology, vehicles, appropriately trained personnel, etc.); process indicators that assess the adequate implementation of activities and whether the project is reaching targeted communities; and outcome indicators which measure the long-term health effects of a program. The findings from the key informant interviews revealed that Mongolia is no exception to this issue of limited baseline data.

The HIA places a high emphasis on a qualitative approach. “An emerging problem of HIA is that there is little guidance on what information is needed in order to draw conclusions. Sometimes, listing the expected health outcomes from a proposal, as qualitative data, is sufficient to inform decision making. Many important impacts are not amenable to quantification but are still supported by good evidence" (Mindell et al., 2001, p.173). As revealed in the key informant interviews, HIA often draws a debate as a tool that largely employs qualitative methods and not quantitative methods. Not being able to use quantitative methods and numbers that are easier to understand, consistent with

local expectations, and considered more legitimate by potential users could be hampering the effective application of the HIA.

While illustrating factors (health or environmental) from a quantitative perspective may be an easier way to understand specific issues, qualitative methods still provide a rich data source. Academic and research institutions need to focus on health risks among vulnerable and affected communities. Qualitative research in this area can be particularly meaningful. The government should focus on strengthening its existing routine health information system to provide the quantitative piece. Future HIAs may provide health and social data to specific communities that may serve as baseline data values.

Particular institutional challenges, such as low awareness, weak expert level capacity, high turnover rate, the absence of institutional memory, and the lack of a government body to oversee the management of HIA were all found to hinder the HIA adoption effort in Mongolia. It is important to acknowledge that the quality of the HIA process could be far less than acceptable if local HIA institutions and practitioners do not possess sustained and adequate capacity, including knowledge, skills, and experience in implementing HIAs. Sustained capacity must come from institutionalized capacity.

Similarly, Brunnschweiler et al. (2008) argues that the resource curse does not exist, and that we should consider the “institutional curse” (due to poor institutional systems) related to too much resource dependency. They state that, “the empirically significant relationship between institutional quality and resource dependence reflects that countries with poor institutions are unlikely to develop non-primary production sectors to reduce their dependence on resource exports. If so, the causality would be

from institutions to dependence, and not the other way around. It would be inappropriate to talk about the curse of resources then" (Brunnschweiler, 2008, p.261). This notion is further supported by van der Ploeg (2011, p. 383), who argues that "resource rich countries with bad institutions typically are poor and remain poor. Related cross-country evidence strongly suggests that natural resources—oil and minerals in particular—exert a negative and nonlinear impact on growth via their deleterious impact on institutional quality". These arguments shed light on to the Mongolian resource sector's HIA uptake, as the scope of institutional challenges they speak of, seems to be significant and have not yet been acknowledged by the Mongolian government. If they want to succeed in normalizing HIA practice, then these institutional challenges must be acknowledged and acted on.

An additional concern for the HIA in Mongolia is that the government lacks guidelines and structures for the overall management of HIAs. Therefore, the names of potential collaborators to implement these recommendations are identified in table 4.1, while the level of hierarchy of these counterparts is presented in Figure 4.4. Overall, HIA management and quality standards should be overseen by the government and its professional agencies. The actual HIA should be conducted by independent institutions with appropriate qualifications. The health sector, particularly the MOH, needs to sustain its leadership role in promoting the consideration of health into other sectors' policy making (health-in-all-policy) and they need to consider the SDH concepts in this work. "HIA ensures that health professionals are engaged in decisions that affect health outcomes, rather than treating the problems at a later date" (Harris-Roxas, 2012, p.43). This role carries the rare potential for health professionals to ensure that wealth capital is not achieved at the expense of health capital. This can be achieved with the consistent

effort by the government. Communities, on the other hand, should actively participate in the all stages of HIAs as one of the key stakeholders. However, as Kwiatkowski (2009) noted, capacity is lacking at individual, institutional and community levels. (Kwiatkowski, 2009) The participation of the public and civil society is restricted and mainly formal. In most cases, feedback from civil society is ignored. There is a need to improve the public participation process. According to ICMM (2010), it is best to identify health risks and the means to respond to them by consulting closely with local stakeholders. These may include community people, local government officials, and health personnel.

4.6.2. Proposed Organizational Chart for HIA Management in Mongolia

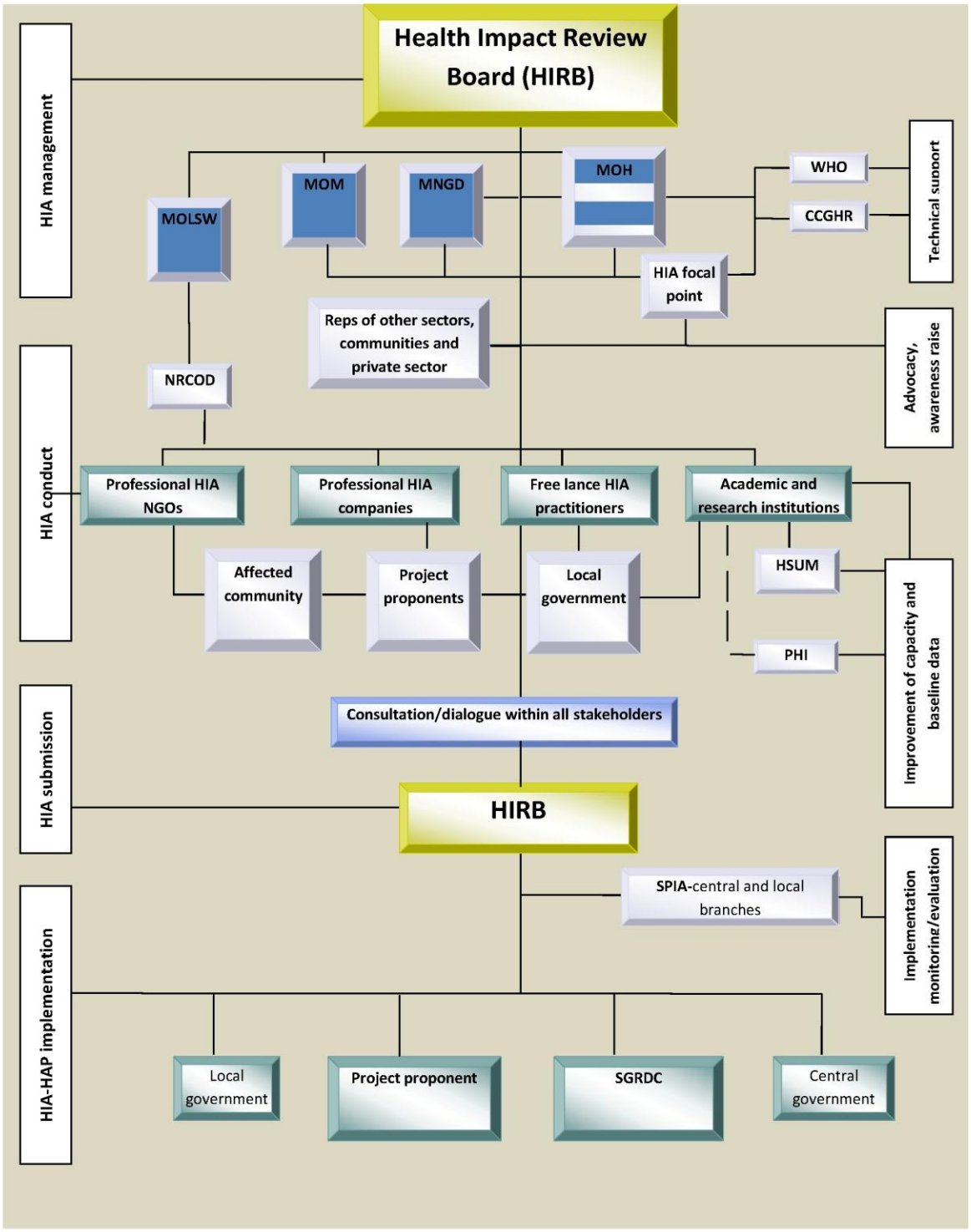

Figure 4.4. Organizational Chart for HIA management in Mongolia

This organizational chart is recommended for the overall management of HIA practice in Mongolia. It is relevant for commencing, conducting, implementation and monitoring stages of the HIA. The Health Impact Review Board (HIRB) as shown in Figure 4.4 is based on best practices of the Nunavut Impact Review Board (NIRB) of Nunavut, Canada, but slightly tailored to the Mongolian context. The NIRB consists of representatives from regional Inuit Associations, Nunavut Tunngavik Incorporated, and local and federal government. “The NIRB was created by the Nunavut Land Claims Agreement to govern the assessment of the potential impacts of proposed developments in the Nunavut Settlement Area prior to the approval of required project authorizations. The NIRB assesses the potential biophysical and socio-economic impact of proposals and makes recommendations and decisions based on which projects may proceed. The Board also establishes monitoring programs for projects that have been assessed and approved” (NIRB, 2014, para 2).

The newly created HIA focal point position at the MOH in Mongolia should be central in moving forward with the necessary roles to provide leadership in the management, support and coordination of HIA implementation in Mongolia. Appropriate institutions are recommended for continuous advocacy, awareness raising and capacity building activities. International organizations such as the WHO and the Canadian Coalition for Global Health Research (CCGHR) appear to be committed to continuing their expertise and technical support for HIAs. The Mongolian government should certainly take advantage of this exceptional opportunity. Ultimately, the HIRB and those who undertake the HIA should make sure that the HIA process is transparent, inclusive, professional and independent, as per HIA standards. The principle of an independency implies that any government agency is not eligible to conduct the HIA, and this includes

the Public Health Institute (PHI). However, the PHI along with the HSUM, as academic and research institutions may play in an important role in building national HIA capacity, as well as generating baseline data, the key component for quantitative analysis portions of the HIA process.

The State Professional Inspection Agency (SPIA) is a well-recognized state agency that enforces implementation of binding laws, regulations and standards with branches in every province and sub-province of the country. With necessary training in HIA quality standards, SPIA has the potential to ensure that the Health Action Plan (HAP) of the HIA is sufficiently implemented at local levels by responsible parties. The implementation of the HAP would be more effective and instantaneous if there was involvement from a currently functioning body that consisted of key counterparts. In the case of the Umnugobi mining project, the South Gobi Regional Development Council (SGRDC) satisfies these criteria. The organizational hierarchy chart depicted in Figure 4.4 should serve as the basis for future discussions in developing HIA management systems. It is not sufficient to have regulations without a framework. Regulations need to be paired with qualified practitioners who can actually do the work. There also has to be mechanisms to evaluate if framework components are effective.

4.7. Study limitations

A number of limitations to this research must be acknowledged.

Firstly, there were very few peer reviewed articles and web publications specific to LMICs on HIA capacity building, adoption experiences, and evaluation. Most of the literature focused on methods and practices of HIA within developed countries. Also, to

my knowledge there has been one other discussion of HIA adoption as might potentially relate to DOI, though that researcher applies a different policy framework (see: Nilunger 2009). Secondly, there were differences in the understanding of HIA definitions and values among study participants. Distinct and inaccurate understanding of HIA among the interviewed participants, made interviews lengthy as they required explanations rather than solely being a data collection activity. Interview participants acknowledged limited HIA language content in the Mongolian language as a significant contributing limitation for understanding and adopting of the HIA. This issue of language barrier will continue to be a limitation until adequate national expert capacity is built, and concepts of HIA are interpreted. Finally, a small sample size for key informant interviews is another limitation of this analysis. This was due to the early stages of HIA development in Mongolia. As such, the number of prospective interviewees was limited. Those who could directly speak to the practical application and challenges of HIA were exceptionally limited due to a fact that there has been only one HIA conducted in the country across all development sectors' activities. However, due to this small number of key informants, this may be a comprehensive analysis within the Mongolian context.

Chapter 5.

Conclusion

Mining produces a broad range of potential risks to population health. Mongolia is no exception to these mining induced health risks. Given the small population size (even smaller in the affected Gobi region), these large scale mining projects increase social inequity in rural areas. The weak infrastructure in these rural areas and the lack of previous experience in managing the public health impacts of development projects, make these communities even more susceptible to health impacts. Increases in pulmonary diseases, STI/HIV/AIDS, accidents, injuries, divorce, mental health disorders and excessive use of alcohol are potential health risks resulting from mining activity, directly or indirectly. For this reason, Mongolia is in need of a tool to measure mining development, and ensuring that the expansion of mining activities does not come at the expense of social and public health. The HIA was introduced in Mongolia to fill this need.

The HIA was suggested to the Mongolian government by academics from Simon Fraser University and the World Health Organization. The HIA would be a tool to manage public health impacts of the mining industry and help to identify, measure, and mitigate potentially adverse health risks of mining activities. The establishment of a mandatory HIA system and mechanism is widely regarded as an imperative solution for harnessing the benefits from mining and minimizing negative impacts and health risks.

The HIA provides an opportunity for decision makers to consider potential adverse effects on health and to consider how these effects are linked to social, economic, and ecosystem processes that lie outside the health sector. The HIA also provides an opportunity to discuss strategies to mitigate these impacts. To be influential, the HIA needs to be implemented in the early stages of industry projects to provide effective input in the decision making process. HIAs are multidisciplinary, intersectoral, participatory, and include a focus on health inequalities. These essential principles establish best practices for addressing the impacts of mining in Mongolia.

This analysis examined the use of a visionary theoretical framework (the Diffusion of Innovation Theory, DOI) and explained how it can further the process of adoption and use of HIAs. This review also addressed the trajectory and current state of HIA uptake in the Mongolian mining sector.

Diffusion of Innovations theory was believed to be, and then found to be, a useful lens to evaluate HIA adoption. It also provided information on how the adoption process can be further developed. A change in society often occurs spontaneously, without careful planning or a generalizable framework that explains diffusion uptake. Diffusion of Innovations theory provides a body of knowledge and tools to examine values of innovations, the needs of different adopters, and the effectiveness of various communication channels. Most importantly, it evaluates the rate of adoption of innovations. Using DOI theory as a theoretical framework when introducing the HIA or a new policy innovation can certainly result in better adoption success rate as it offers an explanation for uptake.

Another objective of this research was to determine the rate of HIA adoption in the Mongolian mining sector. The integrated knowledge translation efforts of the HIA in the Mongolian mining sector began in 2009. These activities included a variety of knowledge translation efforts such as: secondary analysis of literature reviews; development of HIA tool and methods; introductory and capacity building training (locally and internationally); provision of various technical support to the government ministries; awareness raise among decision makers and private sector managers; and advocacy within decision makers to factor health considerations into the non-health sectors' decision making.

Collective and synergistic accomplishments of these activities have been successful. Based on the analysis of attributes of innovation as explained in DOI theory, it can be concluded that the HIA adoption process in the Mongolian mining sector is in a good position. The rate of adoption has steadily progressed as HIAs are now being legislatively mandated within the EIA law, a national consensus on the necessity of HIA being agreed upon, and a limited but dedicated number of HIA advocates and practitioners with built capacity can be found in the country. Key stakeholders are able to understand that HIA identifies project's social, environmental, cultural, and economic impacts on health and thus differ from Health Risk Assessment and Environmental Impact Assessment. More importantly, through engaging in this HIA adoption opportunity that is highly multisectoral, all stakeholders within and beyond the health sector, have realized that the health is not only the concern of the health sector. By that it was a groundbreaking work.

An important development of the HIA adoption process is the pioneering HIA conducted by OT. To date it is the only HIA conducted in the country. For this reason, it

was incredible value to examine this HIA as a case study in this analysis, as it had the potential to add value to the HIA adoption process in Mongolia. Although conducting the OT HIA was a learning and practical assessment process, the company now sits on the hot seat of possibly being the only responsible one to implement the health action plan (CHSSP) developed with the results of the HIA. This was in the absence of strong lead or involvement by the Mongolian government. The success of the knowledge translation activities has been the result of a deliberative, highly participatory approach to knowledge exchange that brought together a large number of concerned and affected stakeholders. These people were highly motivated and wanted to make the mining industry a positive development for Mongolians and to secure the wellbeing of workers in the mining industry and the local community.

However, there is concern for the continuity of HIA adoption efforts. Adoption efforts needs to be continued and scaled-up until they reach a point where Mongolia is able to conduct HIAs regularly and efficiently for all major development projects. This includes the mining sector with its local capacity, and to mitigate adverse health impacts for HIA identified risks. The current HIA momentum could slow down if there is a lack of continuous government support, coordination and political will. What also needs to continue is full participation from private sector, involvement of affected communities, as well as constant capacity building for national practitioners. A number of equally important challenges remain as significant concerns that may hinder the full implementation of the HIA in Mongolia. These include an absence of expert level capacity, limited baseline data, a lack of a detailed HIA management guideline and quality standards, and a government body to oversee the overall management of the HIA process.

In an effort to ease the process of overcoming these implementation challenges, a range of recommendations and original contributions have been made based on the findings, observations and learning of this analysis. Sustained advocacy activities urging better corporate social responsibility may create increased involvement from the private sector. This also has the potential to create improved leadership and support from the government. As for the previously noted ineffective collaboration between concerned ministries, the previously signed MoU could be used as a legitimate tool to urge these bodies to collaborate more efficiently. Creating pressure that central and local government can feel, with help from the affected communities, may be another way to improve government involvement and development of a higher-level strategy to mitigate adverse health impact. Health Impact Assessment capacity needs to be built continuously through short-and-long term trainings offered at designated professional institution(s) with institutionalized authority and accreditation capacity. Employing commonly understood language when discussing health impacts with the affected community members could improve the level of understanding. Regardless of whether Mongolia moves forward with HIA legislation as embedded within the EIA law or as independent one, detailed respective regulations which enforce the conduct of regular HIA practices, needs to be put in place and monitored by the government.

The road map-organizational chart for an HIA system and management, which was missing from detailed EIA guidelines approved in 2013, should be adopted out of national consensus. A draft organizational chart for the management of an HIA system has been proposed as one of the original contributions of this analysis (Figure 4.4). This organizational chart could serve as a base for future discussions for developing an HIA management system. This management system should be implemented upon

consensus of all involved parties. The creation of a highly representative, HIA-governing mechanism, such as the Health Impact Review Board may be useful for governing and coordinating overall HIA management in Mongolia. Another recommendation is to work with international expert institutions, such as the WHO, and the CCGHR to undertake a strategic HIA of the mining sector as a whole. These are not only the next logical steps of knowledge translation and advocacy, but it is absolutely required if Mongolia is to develop the system it needs to respond to the health risks associated with the industry and to convert resource wealth into tangible social benefits.

Finally, following the many countries that have realized the limitations of the EIA and accepting the need for a separate HIA practice (as recommended by the WHO) Mongolia should consider developing an independent HIA law. This could improve the level of ownership and leadership of the MOH in the coordination with other stakeholders for multisectoral HIA practice in Mongolia. The current system of integrating the HIA into EIA system should be implemented in Mongolia, but only until an independent HIA law exists, and functional HIA capacity replaces it.

References

Abrams SM, Mahoney MC, Hyland A, Cummings M, Davis W (2006) Early evidence on the effectiveness of clean indoor air legislation in New York State. Am J Public Health; 96:296–298.

Ahern MM, Hendryx M, Conley J, Fedorko E, Ducatman A, Zullig KJ (2011) The association between mountain top mining and birth defects among live births in central Appalachia1996– 2003, Journal of Environmental Research, DoI:10.1016/j.envres.2011.05.019

Amarsaikhan U, Dierkes J (2014) Mongolia in the 2014 Social Progress Index, retrieved from http://blogs.ubc.ca/mongolia/2014/mongolia-2014-social-progress-index/ (date accessed: May 8, 2014)

Ann MK, Lokker C, Wilczynski NL, Ciliska D, Dobbins M, Davis DA, Haynes RB, Straus SE (2010) A cross-sectional study of the number and frequency of terms used to refer to knowledge translation in a body of health literature in 2006: a Tower of Babel? Implementation Science 2010, 5:16

Asia Pacific Investment Partners (2011), retrieved from http://apipcorp.com/ (date accessed: Feb 24, 2014)

Bammer G, Ritter A, J KJ, Lintzeris N, (2009) Fast-tracking implementation through trial design: the case of buprenorphine treatment in Victoria. Australia and New Zealand Journal of Public Health 2009, 33(1):34-39

Banken R, (2001) Strategies for institutionalising HIA. Brussels: WHO Europe, ECHP Policy Learning Curve no 1, retrieved from http://www.who.dk/document/E75552.pdf (date accessed Oct 2, 2013)

Batjargal, T., Otgonjargal, E., Baek, K., & Yang, J. S. (2010), Assessment of metals contamination of soils in Ulaanbaatar, Mongolia. Journal of hazardous materials, 184(1), 872-876.

Baur X, Bakehe P, Vellguth H. (2012), Bronchial asthma and COPD due to irritants in the workplace – an evidence-based approach. J Occup Med Toxicol. 7(1):19.

Bennett G, Jessani N. (2011), The knowledge translation toolkit: bridging the know-do gap: a resource for researchers, SAGE Publications India Pvt Ltd, retrieved from http://www.idrc.ca/EN/Resources/Publications/openebooks/508-3/index.html (date accessed: May 6, 2014)

Bero LA, Grilli R, Grimshaw JM, et al. (1998), Closing the gap between research and practice: an overview of systematic reviews of interventions to promote the implementation of research findings, BMJ 1998; 317: 465-468

Berry, F. S. and Berry, W. D. (1999), Innovation and Diffusion Models in Policy Research in P. A. Sabatier (ed.) Theories of the Policy Process. Boulder, Colorado: Westview.

Best A, Greenhalgh T, Lewis S, Saul JE, Carroll S, and Bitz J (2012), Large-System Transformation in Health Care: A Realist Review, the Milbank Quarterly, Vol. 90, No. 3, (pp. 421–456)

Bhatia R, Wernham A (2008), Integrating human health into environmental impact assessment: an unrealized opportunity for environmental health and justice. Environ Health Perspect 116:991-1000.

Birley, M. H. (2011) *Health impact assessment: Principles and practice*. Abingdon, Oxon, UK: Earthscan.

Blocker JS Jr. (2006), Did prohibition really work? Alcohol prohibition as a public health innovation. Am J Public Health. 96:233–243.

Boote, D.N. & Beile, P. (2005), Scholars before researchers: On the centrality of the dissertation literature review in research preparation. Educational Researcher 34/6: 3-15.

Borak J, Salipante-Zaidel C, Slade MD, Fields CA. (2012), Mortality disparities in Appalachia: reassessment of major risk factors. J Occup Environ Med. 54(2):146-56. DoI: 10.1097/JOM.0b013e318246f395.

Bos R, Birley M, Furu P and Engel C (2003), Health opportunities in development: a course manual on developing intersectoral decision-making skills in support of health impact assessment, Geneva: World Health Organization.

Brereton P, Kitchenham BA, Budgen D, Turner M, Khalil M (2007), Lessons from applying the systematic literature review process within the software engineering domain, Journal of Systems and Software, Volume 80, Issue 4, Pages 571–583

Brunnschweiler, Christa N. and Bulte, Erwin H (2008), The Resource Curse Revisited and Revised: A Tale of Paradoxes and Red Herrings. Journal of Environmental Economics and Management 55(3): 248–64.

Byambaa T, Janes CR, Davison C (2012) Challenges of building Health Impact Assessment capacity in developing countries: A Review. Journal of Global Health, Volume 2, Issue 2, Fall 2012, http://www.ghjournal.org/wp-content/uploads/2012/12/JGH-Fall-2012-FINAL.pdf.

Campbell S (2008), *The Knowledge Translation Toolkit: International Development Research Centre*. Work in Progress, retrieved from http://idl-bnc.idrc.ca/dspace/bitstream/10625/46960/1/133361.pdf (date accessed: Feb 18, 2014)

Canadian Coalition for Global Health Research (CCGHR) (2010), Knowledge Translation in Low and Middle income countries: A Learning Module. Retrieved from http://www.cihr-irsc.gc.ca/e/44240.html (date accessed: July 30, 2014).

Canadian Institutes of Health Research (CIHR) (2012), Guide to Knowledge Translation Planning at CIHR: Integrated and End-of-Grant Approaches

Caussy D, Kumar P, Than Sein U. (2003), Health impact assessment needs in south-east Asian countries. Bull World Health Organ. 81(6): 439–443.

Centers for Disease Control and Prevention (CDC) (2014), Health impact assessment. Retrieved from http://www.cdc.gov/healthyplaces/hia.htm (date accessed: March 1, 2014)

Centre for Health Development (CHD). (2012) Health Indicators, Mongolia. Retrieved from http://www.chd.moh.mn/images/pdf/sma/2013/eruul_mendiin_uzuulelt_2013_eng 3(1).pdf (date accessed: Apr 16, 2014)

Chambers KJ, Corbett J, Keller CP, Wood CJB (2004), Indigenous Knowledge, Mapping, and GIS: A Diffusion of Innovation Perspective, CARTOGRAPHICA, Volume 59: Fall 2004.

Choi BK, Pang T, Lin V, Puska P, Sherman G, Goddard M, Ackland MJ, Sainsbury P, Stachenko S, Morrison H and Clottey C. (2005), Can scientists and policy makers work together? J. Epidemiol. Community Health 59; 632-637.

Christians, Allison (2007), Hard Law & Soft Law. Wisconsin International Law Journal 25 (2). SSRN 988782

CIA (2010), World Factbook: Mongolia. Retrieved from https://www.cia.gov/library/publications/the-world-factbook/geos/mg.html. (date accessed: March 25, 2011)

Cole BL and Fielding JE (2007), Health Impact Assessment: A Tool to Help Policy Makers Understand Health beyond Health Care. Annual Review of Public Health 28: 393 -412, DOI: 10.1146/annurev.publhealth.28.083006.131942

Cole BL (2008) Building Health Impact Assessment (HIA) Capacity: A Strategy for Congress and Government. Retrieved from: https://www.prevent.org/data/files/initiatives/buildignhealthimpactassessmenthiacapacity.pdf (date accessed: Jan 27, 2014)

Cooper, Harris (1998), Synthesizing research: A guide for literature reviews. 3rd edition. Thousand Oaks, CA: Sage.

Cunningham R (2011), Evaluating Health Impact Assessments in New Zealand. Wellington, New Zealand: Ministry of Health. https://www.health.gov.nz/system/files/documents/publications/evaluating-hias.pdf (accessed August 14, 2014)

Dannenberg, Bhatia R, Cole BL, Dora C, Fielding JE and Kraft K (2006), Growing the field of health impact assessment in the United States: an agenda for research and practice. *Am J Public Health*, 96: 262–270.

Davison CM, (2005) Education and Employment Patterns among Northern Aboriginal Youth: A study of resiliency, development and community health. Proceedings from the 3rd Northern Research Forum: Resilient North–Human Responses to Global Change, Yellowknife, NT. http://www.rha.is/static/files/NRF/OpenAssemblies/Yellowknife2004/3rd-nrf_plenary-3_davison_yr_paper.pdf (accessed August 14, 2014)

DeWalt KM. & DeWalt BR. (2002), Participant observation: a guide for fieldworkers. Walnut Creek, CA: AltaMira Press.

Dietz T, Stern PC (2002), New Tools for Environmental Protection: Education, Information, and Voluntary Measures. Washington, DC: The National Academies Press.

Dudka S, Adriano DC (1997), Environmental Impacts of Metal Ore Mining and Processing: A Review, Journal of Environmental Quality, DoI:10.2134/jeq1997.00472425002600030003x

Equator Principles (EP) Association (2013), The Equator Principles III – 2013. Retrieved from: http://www.equator-principles.com/resources/equator_principles_III.pdf (date accessed: July 30, 2014)

Erlandson DA, Harris EL, Skipper BL & Allen SD (1993), Doing naturalistic inquiry: a guide to methods. Newbury Park, CA: Sage.

Estabrooks AC, Thompson DE, Jacque JE. Lovely, AH (2006), A guide to knowledge translation theory Journal of Continuing Education in the Health Professions, Volume 26, Issue 1, pages 25–36.

Fauman Michael A (2006), Diffusion of Medical Innovation. Psychiatric Times [serial online]. 23(4):26-27. Retrieved from: Social Sciences Full Text (H.W. Wilson), Ipswich, MA (date accessed: April 1, 2014)

Francis. D (2007), Mongolia risks killing mining sector, The National Post. Retrieved from http://www.financialpost.com/scripts/story.html?id=bd5c323c-cde2-4f93-8a7a-65dde63079a8&k=21658 (date accessed: May 17, 2014)

Frumkin, Howard (2010), Environmental health: from global to local, first edition. Jossey-Bass, ISBN 0-7879-7383-1.

Garcıa-Goni M, Maroto A, Rubalcaba L (2007), Innovation and motivation in public health professionals, Health Policy 84 (2007) 344–358.

Garland CF, Garland FC, Gorham ED, et al. (2006), The role of vitamin D in cancer prevention. Am J Public Health. 96:252–261.

Government Accountability Office (GAO), U.S Congressional Committees (2012), MINE SAFETY: Reports and Key Studies Support the Scientific Conclusions Underlying the Proposed Exposure Limit for Respirable Coal Mine Dust, available from: http://www.gao.gov/assets/600/593780.pdf, accessed at Aug, 11, 2014.

Government of Mongolia and Ivanhoe Mines Mongolia INC LLC and Tio Tinto International Holdings Limited, Investment Agreement (2009). Retrieved from http://www.turquoisehill.com/i/pdf/Oyu_Tolgoi_IA_ENG.PDF (date accessed: July 30, 2014)

Graham ID, Logan J, Harrison MB, Straus SE, Tetroe J, Caswell W, and Robinson N (2006), Lost in Knowledge Translation: Time for a Map? The Journal of Continuing Education in the Health Professions, Volume 26, pp. 13–24.

Grayson R, Delgertsoo T, Murray W, Tumenbayar B, Batbayar M, Tuul U, Bayarbat D and Erdene-Baatar C (2004), The People's Gold Rush in Mongolia – the Rise of the 'Ninja' Phenomenon. World Placer Journal, volume 4, pages 1-112. Retrieved from www.mine.mn (date accessed: Mar 5, 2014)

Green LW (2008), Making research relevant: if it is an evidence-based practice, where's the practice-based evidence? Family Practice 2008; 25: i20–i24.

Green LW, Ottoson JM, Garcia C, and Hiatt RA (2009), Diffusion Theory and Knowledge Dissemination, Utilization, and Integration in Public Health, Annu. Rev. Public Health, 30:151–74.

Greenberg MR (2006), The Diffusion of Public Health Innovations, 96, No. 2, American Journal of Public Health.

Habitat Corp (2014), What is HIA. Retrieved from http://www.habitatcorp.com/what-is-hia/hia-eia-sia/ (date accessed: July 2013)

Hamilton, A (2010), Diffusion of innovation: Web 2.0. *Occupational Therapy Now*, 12(1), 18-21. Retrieved from http://search.proquest.com.proxy.lib.sfu.ca/docview/229532162?accountid=13800 (date accessed: Nov 26, 2013)

Harada M, Nakachi S, Cheu T, Hamada H, Ono Y, Tsuda T, Yanagida K, Kizaki T, Ohno H (1999), Monitoring of mercury pollution in Tanzania: relation between head hair mercury and health, Sci. Total Environ. 227 249–256.

Harris P, Spickett J (2011), Health impact assessment in Australia: A review and directions for progress, Environmental Impact Assessment Review 31425–432.

Harris-Roxas B and Harris E (2011), Differing forms, differing purposes: A typology of health impact assessment. *Environmental Impact Assessment Review* 31.4: 396-403.

Harris-Roxas B, Viliani F, Bond A, Cave B, Divall M, Furu P, Harris P, Soeberg M, Wernham A and Winkler M (2012), Health impact assessment: the state of the art, Impact Assessment and Project Appraisal, Vol. 30, No. 1, 45–55, DOI: 10.1080/14615517.2012.666035.

Harris-Roxas B and Harris PJ (2007), Learning by doing: the value of case studies of health impact assessment. NSW Public Health Bull, 18 9–10: 161–163.

Hendryx M, Ahern MM & Nurkiewicz TR (2007), Hospitalization Patterns Associated with Appalachian Coal Mining, Journal of Toxicology and Environmental Health, Part A: Current Issues, 70:24, 2064-2070, DOI:10.1080/15287390701601236.

Hendryx M, Wolfe L, Luo J, Webb B (2012), Self-Reported Cancer Rates in Two Rural Areas of West Virginia with and Without Mountaintop Coal Mining, Journal of Community Health 37:320–327, DOI 10.1007/s10900-011-9448-5,

High MM (2013), Polluted money, polluted wealth: Emerging regimes of value in the Mongolian gold rush. American Ethnologist, 40: 676–688. doi: 10.1111/amet.12047.

Hilbert, M (2011), The end justifies the definition: The manifold outlooks on the digital divide and their practical usefulness for policy-making. Telecommunications Policy, 35(8), 715-736.

International Business Publications (IBP) (2003), Mongolia: Mineral, Mining Sector Investment and Business Guide, Volume 1: Strategic Information and Regulations. Retrieved from: http://books.google.ca/books?id=orsMGx_2aHYC&pg=PA121&lpg=PA121&dq=mining+licenses+by+year+mongolia&source=bl&ots=104i2dyrFM&sig=DwquZZS__gTWV0TAedSFLPXguFQ&hl=en&sa=X&ei=geLqU7GxDKbwiwLMuoDACg&ved=0CFEQ6AEwCA#v=onepage&q=mining%20licenses%20by%20year%20mongolia&f=false.

International Council on Mining and Metals (ICMM) (2010), Good Practice Guidance on Health Impact Assessment. Retrieved from http://www.icmm.com/library/hia (date accessed: July 28, 2014)

International Finance Corporation (IFC) (2009), Introduction to Health Impact Assessment. Retrieved from: http://www.ifc.org/wps/wcm/connect/a0f1120048855a5a85dcd76a6515bb18/HealthImpact.pdf?MOD=AJPERES (date accessed: Aug 13, 2014)

International Organization for Standardization (ISO) (2002), Strategic advisory group on corporate social responsibility, preliminary working definition of organizational social responsibility, ISO/TMB AGCSR N4. Retrieved from http://www.iso.org/iso/iso26000_2002-en.pdf (date accessed: May 18, 2014)

Janes CR, Byambaa T, Lkahgvasuren O, Pfeiffer M, Sodnompil T, Wagler M (2013), Health Impact Assessment and Sustainable Development in the Resource Sector: Managing the Public Health Impacts of Resource Extraction in the “Asian Eldorado”, Proceedings from the Public Health Policy in Asia: Rights, Risks, Redistribution, and Resilience Conference, December, 2013, Vancouver, BC.

Janes CR, Corbett KK, Davison C, Laing L, Snyder J (2011), Health Impact Assessment: Background, Methods, and Tools for the Mongolian Mining Sector. Canadian Institutes for Health Research, Catalyst Grant Proposal.

Jarlais D, Sloboda Z, Friedman S,Tempalski B, McKnight C, Braine N (2006), Comparing the diffusion of D.A.R.E. and syringe exchange programs. Am J Public Health.

Johnston, Lesley Ann (2008), Mining Mongolia: Resource Access, Climate change and Vulnerability on the steppe, M.Sc. thesis, Faculty of Health Sciences, Simon Fraser University.

Jonsen K, Jehn KA (2009), Using triangulation to validate themes in qualitative studies. Qualitative Research in Organizations and Management: An International Journal, Vol. 4 Iss: 2, pp.123 – 150. Retrieved from: http://www.emeraldinsight.com/journals.htm?articleid=1806130&show=abstract#sthash.oQfbCHK7.dpuf (date accessed: Apr 15, 2012)

Kang E, Lee Y, Harris P, Koh K, Kim K. (2011), Health impact assessment in Korea, Environmental Impact Assessment Review ,Volume 31, Issue 4,438–440. Retrieved from http://dx.doi.org/10.1016/j.eiar.2010.02.005 (date accessed: Sep 19, 2012)

Katz, E., & Lazarsfeld, P (1955), Personal Influence: the part played by people in the flow of mass communications, New York: The Free Press.

Kawulich, B (2005), Participant Observation as a Data Collection Method. Forum Qualitative Sozialforschung / Forum: Qualitative Social Research, 6(2). Retrieved from http://www.qualitative-research.net/index.php/fqs/article/view/466/996 (date accessed: Oct 9, 2013)

Kemm J (2008), Health impact assessment: An aid to political decision-making, Scandinavian Journal of Public Health, 36: 785–788.

Kemm J (2013), Health Impact Assessment: Past Achievement, Current Understanding, and future progress.

Kemm J, Parry J, Palmer S (2004), Health inequalities and HIA, Editors, Health impact assessment: concept, theory, techniques, and applications, Oxford University Press Inc., New York

Kørnøv L (2009), Strategic Environmental Assessment as catalyst of healthier spatial planning: The Danish guidance and practice. Environ Impact Assess Rev; 29(1):60–65.

Kotler P, Zaltman G (1971), Social marketing: An approach to planned social change, Journal of Marketing, Vol.35

Kukh Tenger Khugjil Consortium (KTKK) (2011), Oyu Tolgoi Community Health Safety and Security Impact Assessment, not available online

Kværner J, Swensen G, and Erikstad L (2006), Assessing environmental vulnerability in EIA: the content and context of the vulnerability concept in an alternative approach to standard EIA procedure. Environmental Impact Assessment Review, 26, 511–527.

Kwiatkowski RE, Tikhonov T, Peace DM and Bourassa B (2009), Canadian Indigenous engagement and capacity building in health impact assessment, Impact Assessment and Project Appraisal, 27(1), p. 57–67

Langley R. and Lipton D (2013), Occupational Issues Related to Respiratory Irritants. IN W.J. Meggs (ed.) The Toxicant Induction of Irritant Asthma, Rhinitis and Related Conditions, DOI 10.1007/978-1-4614-9044-9, © Springer Science Business Media, LLC

Lee JH, Röbbel N and Dora C (2013), Cross-country analysis of the institutionalization of Health Impact Assessment. Social Determinants of Health Discussion Paper Series 8 (Policy & Practice). Geneva, World Health Organization

Lim, Louisa (2009), Mongolians Seek Fortune in Gold, But at a Cost. Retrieved from: http://www.npr.org/2009/09/07/112516360/mongolians-seek-fortune-in-gold-but-at-a-cost (date accessed: Apr 7, 2014)

Lindgreen, A. and Swaen, V (2010), Corporate Social Responsibility. International Journal of Management Reviews, 12: 1–7. doi: 10.1111/j.1468-2370.2009.00277.x

Lkhasuren O, Takahashi K, Dash-Onolt L (2007), Occupational Lung Diseases and the Mining Industry in Mongolia, International Journal of occupational and environmental health Volume 13 Issue 2, pp. 195-201.

Lock K, McKee M (2005), Health impact assessment: assessing opportunities and barriers to intersectoral health improvement in an expanded European Union. *J Epidemiol Community Health*, 356–360.

Lo Y, Dooyema CA, Neri A, Durant J, Jefferies T, Medina-Marino A, de Ravello L, Thoroughman D, Davis L, Dankoli RS, Samson MY, Ibrahim LM, Okechukwu O, Umar-Tsafe NT, Dama AH, Brown MJ (2012), Childhood Lead Poisoning Associated with Gold Ore Processing: a Village-Level Investigation—Zamfara State, Nigeria, October–November 2010. Environ Health Perspect 120:1450–1455.

Merriam-Webster.com (2011), Retrieved from http://www.Merriam-Webster.com/dictionary/theory (date accessed: Apr 27, 2013)

Miles MB, Huberman AM, Saldaña J (1994) Qualitative Data Analysis, A Methods Sourcebook, Edition 3, Sage publications.

Mindell J, Boltong A (2005), MINI-SYMPOSIUM—PUBLIC HEALTH OBSERVATORIES: Supporting health impact assessment in practice Public Health 119, 246–252.

Mindell J, Hansell A, Morrison D, Douglas M, Joffe M (2001), What do we need for robust and quantitative health impact assessment? J Public Health Med, 23:173-178.

Mindell J, Ison E, Joffe M (2003), A glossary for health impact assessment, J Epidemiol Community Health; 57:647–651.

Mindell JS, Boltongb A, Forde I (2008), A review of health impact assessment frameworks, Public Health (2008) 122, 1177-1187.

Mineral Resources Authority of Mongolia (MRAM) (2013), Statistical Bulletin of the mining sector. Retrieved from http://www.mram.gov.mn/images/stories/mram/statistek/monthly_report_2013-12.pdf(date accessed: May 3, 2014)

Mineral Resources Authority of Mongolia (MRAM) (2012), Annual report: 2008-2012. Retrieved from: http://www.mram.gov.mn/images/stories/mram/MRAM%202008-2012%20for%20web%20final.pdf.

Mineral Resources Authority of Mongolia (MRAM) (2013), Annual report: 2013. Retrieved from:http://www.mram.gov.mn/images/stories/mram/2013%20%20jiliin%20tailan.pdf.

Mintrom M (1997), Policy Entrepreneurs and the Diffusion of Innovation, American Journal of Political Science, Vol. 41, No. 3 (Jul., 1997), pp. 738-770.

Moher D, Liberati A, Tetzlaff J, Altman DG (2009), Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement, BMJ: British Medical Journal, Vol. 339, No. 7716, pp. 332-336. Retrieved fromhttp://www.jstor.org.proxy.lib.sfu.ca/stable/25672329 (date accessed: Jan 28, 2014)

Mongolian Economy Journal (2014), OT's impact on economy. Retrieved from http://www.mongolianeconomy.mn/en/i/4910(date accessed: May 14, 2014)

Mongolian Mining Journal (2012), What the Oyu Tolgoi agreement contains and what it means for Mongolia. Retrieved from http://en.mongolianminingjournal.com/content/19679.shtml (date accessed: Mar 9, 2014)

National Research Council (2011), U.S Committee on Health Impact Assessment. Improving Health in the United States: The Role of Health Impact Assessment. Washington (DC): National Academies Press (US). Retrieved from http://www.ncbi.nlm.nih.gov/books/NBK83546/(date accessed: June 6, 2014)

Newhook R, Hirtle H, Byrne K, Meek ME (2003), Releases from copper smelters and refineries and zinc plants in Canada: human health exposure and risk characterization, Science of the Total Environment Volume 301, Issues 1–3, 1 January 2003, Pages 23–41.

Nilunger, Mannheimer L (2009), Health Impact Assessment as A Policy Innovation. Academic Dissertatin, University of Tampere, Sweden. Retrieved fromhttp://tampub.uta.fi/bitstream/handle/10024/66496/978-951-44-7775-1.pdf?sequence=1, (date accessed: July 26, 2014)

Nisbet, MC, Kotcher, JE (2009), A Two-Step Flow of Influence?: Opinion-Leader Campaigns on Climate Change, Science Communication,30: 328-354, first published on January 8, 2009 doi:10.1177/1075547008328797.

Nunavut Impact Review Board (NIRB) (2014), Retrieved from http://www.nirb.ca/# (date accessed: Feb 5, 2014)

Ogola JS, Mitullah WV and Omulo MA (2002), Impact of gold mining on the environment and human health: A case study in the Migori gold belt, Kenya, Environmental Geochemistry and Health 24: 141–158.

Owen R, Ntoko A, Zhang D, Dong J (2002), Public Policy and Diffusion of Innovation, Social Indicators Research 60: 179–190, 2002.

Oyunbileg, S., Wang, J.-D., Sumberzul, N., Chang, Y.-Y. and Erdenchimeg, E (2011), Health impact of pneumoconiosis in Mongolia: Estimation of losses in life expectancy and quality adjusted life expectancy. Am. J. Ind. Med., 54: 285–292. doi: 10.1002/ajim.20930

Palenque Declaration (2006), Message of the Living Spirit of the Convening of Indigenous Peoples for the Healing of Mother Earth.

Pawson R, Greenhalgh T, Harvey G, et al. (2005), Realist review—a new method of systematic review designed for complex policy interventions. J Health Serv Res Policy; 10(Suppl 1):21–34.

Pew Trusts, Health Impact Project (2014), Retrieved from http://www.pewtrusts.org/our_work_detail.aspx?id=328622 (date accessed: July 30, 2014)

Phillips SK and Buxbaum DC (2013), Capital Markets: Mongolia, The Mining Law Review, Second Edition, Erik Richer La Fleche, Editor, Law Business Research Ltd., London, UK.

Pike, R (2012), Social License to Operate. Research Paper, the Relevance of Social Licence to Operate for Mining Companies. Schroder Investment Management North America Inc. (“SIMNA Inc.”). Retrieved from http://www.schroderfunds.com/staticfiles/Schroders/Sites/Americas/US%20Institutional%202011/pdfs/Social-Licence-to-Operate.pdf (date accessed: June 12, 2013)

Ploeg vd, Frederick (2011), Natural Resources: Curse or Blessing? Journal of Economic Literature, 49(2): 366-420. DOI: 10.1257/jel.49.2.366.

Quigley R, Taylor L (2002), Health Impact Assessment – a review of reviews, Health Development Agency, Bulletin of the World Health Organization 2003;81:415-419.

Rashman, L. and Hartley, J (2002), 'Leading and learning? Knowledge transfer in the beacon council scheme', Public Administration, 80 (3): 523-542.

Rio Tinto (2014), Oyu Tolgoi commences copper concentrate shipments to customers, press release Retrieved from http://www.riotinto.com/copper/oyu-tolgoi-4025.aspx (date accessed: May 2, 2014)

Roberts MJ, Hsiao WB, Reich PMR (2004), *Getting Health Reform Right: A Guide to Improving Performance and Equity*. Oxford University Press, USA. Retrieved from http://www.myilibrary.com?ID=83808 (date accessed: April 3, 2012)

Rogers, Everett (1995), *Diffusion of innovation* (4th ed.). New York: Free Press.

Rogers, Everett (2002), Diffusion of preventive innovations, Addictive Behaviors 27, 989–993.

Rogers, Everett (2003), *Diffusion of Innovations (*5th ed.). New York: Free Press.

Sachs, J. D., & Warner, A. M (2001), The curse of natural resources. European Economic Review, 45, 827–838.

Sarre G, Cooke J (2008), Developing indicators for measuring Research Capacity Development in primary care organizations: a consensus approach using a nominal group technique. Health and Social Care in the Community.

Sharma M, Kanekar A (2008), Diffusion of Innovations Theory for Alcohol, Tobacco, and Drugs, Journal of Alcohol & Drug Education, Vol. 52, No. 1.

Singhal A, Sternin J & Dura L (2009), Combating Malnutrition in the Land of a Thousand Rice Fields: Positive Deviance Grows Roots in Vietnam. *Positive Deviance Wisdom Series, Number 1,* pp. 1-8. Boston, Tufts University: Positive Deviance Initiative. 11.

Singhal, A (2010), Positive Deviance and Social Change Retrieved from http://www.communicationforsocialchange.org/pdfs/singhal_arvind_positive%20deviance%20and%20social%20change_mazi%20june%202010.pdf (date accessed: Oct 3, 2013)

Snyder J, et al (2011), An equity tool for health impact assessments: Reflections from Mongolia, Environ Impact Asses Rev. doi:10.1016/j.eiar.2011.08.006.

Social Progress Imperative (SPI) (2014), Social Progress Index 2014. Retrieved from http://www.socialprogressimperative.org/data/spi (date accessed: July 30, 2014)

Sorokina OE, Enkh-Amgalan S (2012), Lead in the landscapes of Ulaanbaatar city (Mongolia). Arid Ecosystems Volume 2, HYPERLINK "http://link.springer.com/journal/13330/2/1/page/1" Issue 1 , pp 61-67. DOI: 10.1134/S2079096112010088.

Spickett J, Batmunkh T and Jones S (2012), Health Impact Assessment in Mongolia: Current Situation, Directions, and Challenges, Asia Pac J Public Health, August 2012, DOI: 10.1177/1010539512455043.

Stacks, Don W, Salwen,Michael Brian (2009), *An Integrated Approach to Communication Theory and Research.* New York: Routledge.

Steinemann A (2000), Rethinking human health impact assessment. Environmental Impact Assessment Review, 20: 627–645.

Strategic Environmental and Social Impact Assessment (SESA) (2012), Regulations under the new Law on Environmental Impact Assessment, Workshop Report, obtained from the Ministry of Mining.

Straus SE, Tetroe JM, Graham ID (2011), Knowledge translation is the use of knowledge in health care decision making, Journal of Clinical Epidemiology, Volume 64, Issue 1, January 2011, Pages 6–10.

Sukkumnoed, S. Sabrum, N. Nuntavorakarn, S (2009), Health Impact Assessment: Empowering people, ensuring health, Thailand's HIA Development Report 2007-2008, ISBN: 978-974-499-116-4.

Oyu Tolgoi (2014), Press Release: Oyu Tolgoi-update on production and operations. Retrieved from http://ot.mn/en/media/press-release/160714 (accessed at Aug 12, 2014)

Oxford Business Group (2012), The Report: Mongolia-2012, p. 97. ISBN 978-1-907065-53-8. Retrieved from http://books.google.ca/books?id=VsfehNpL3JkC&pg=PA97&redir_esc=y#v=onepage&q&f=false (date accessed: July 30, 2014)

Turnbull PW, Meenaghan A (1980), Diffusion of Innovation and Opinion Leadership, European Journal of Marketing, Vol. 14 Iss: 1, pp.3 – 33. DOI: 10.1108/EUM0000000004893

Turquoise Hill Resources (2013), Oyu Tolgoi (copper-gold) Mongolia, Overview. Retrieved from http://www.turquoisehill.com/s/Oyu_Tolgoi.asp (date accessed: Feb 21, 2014)

Turquoise Hill Resources (2013), Press Release: Review of Second quarter of operations. Retrieved from : http://www.juniorminingnetwork.com/junior-miner-news/news-releases/627-tsx/trq/32438-turquoise-hill-announces-financial-results-and-review-of-operations-for-the-second-quarter-of-2014.html#.U-rXgeN3JSN (date accessed Aug 12, 2014)

United Nations Development Programme (UNDP) (2011), The Millennium Development Goals Implementation: The Fourth National Report. Retrieved from http://www.mn.undp.org/content/mongolia/en/home/library/National-MDG-reports/The-Fourth-National-MDG-Report-2011/ (date accessed: May 17, 2014)

United Nations Development Programme (UNDP) (2011), Mongolia: Access to Water and Sanitation. Retrieved from http://www.undp.org/content/dam/undp/library/Poverty%20Reduction/MDG%20Strategies/mongolia.pdf (date accessed: Aug 12, 2014)

United Nations Environment Programme (UNEP) (2012), Analysis of formalization approaches in the artisanal and small-scale gold mining sector based on experiences in Ecuador, Mongolia, Peru, Tanzania and Uganda: Mongolia Case Study. Retrieved from http://www.unep.org/chemicalsandwaste/Portals/9/Mercury/Documents/ASGM/Formalization_ARM/Case%20Studies%20Mongolia%20June%202012.pdf (date accessed: May 3, 2014)

University of California at Los Angeles (UCLA) (2004), Key Informant Interviews, Center for Health Policy Research. Retrieved from: http://healthpolicy.ucla.edu/programs/health-data/trainings/Documents/tw_cba23.pdf (date accessed: Mar 4, 2014)

University of York (2006), York Health Economics Consortium for the Department of Health, Cost benefits analysis of health impact assessment -final report.

Valente TW, Fosados R (2006), Diffusion of innovations and network segmentation: the part played by people in promoting health. Sex. Transm. Dis. 33(7 Suppl.):23–31.

Veerman JL, Bekker MP, and Mackenbach JP (2006), Health impact assessment and advocacy: A challenging combination. Sozial-und Praventivmedizin, 51 (3), 151–152.

Wacker JG (1998), A definition of theory: research guidelines for different theory-building research methods in operations management. Journal of operations management, 16(4), 361-385.

Walker RW, Avellaneda CN & Berry FS (2011), Exploring the Diffusion of Innovation among High And Low Innovative Localities, Public Management Review, 13:1, 95-125, DOI: 10.1080/14719037.2010.501616.

Wall Street Journal (WSJ) (2014), Turquoise Hill Eyes Oyu Tolgoi Underground Project Restart Proposal Retrieved from http://online.wsj.com/article/BT-CO-20140213-703525.html (date accessed: July 30, 2014)

Wang, Xiao-Rong; Christiani, David C (2000), Respiratory Symptoms and Functional Status in Workers Exposed to Silica, Asbestos, and Coal Mine Dusts, Journal of Occupational and Environmental Medicine, Issue: Volume 42(11), pp 1076-1084.

Wejnert B (2002), Integrating Models of Diffusion of Innovations, Annual Review of Sociology.

Western Australia (2007), Department of Health & Western Australia. Environmental Health Directorate.Health impact assessment in WA : discussion paper.

Weston A (2011),Work-related lung diseases. IARC Sci Publ;163:387–405.

Winkler MS et al. (2010), Assessing health impacts in complex eco-epidemiological settings in the humid tropics: advancing tools and methods. Environmental Impact Assessment Review, 30 (1), 52–61.

Winkler MS, Krieger GR, Divall MJ, Cissé G, Wielga M, Singer BH, Tanner M & Utzinger J (2013), Untapped potential of health impact assessment, Bulletin of the World Health Organization*, p 1-16.* ID: BLT.12.112318.

Wirth DA (1995), The Rio Declaration on Environment and Development: Two Steps Forward and One Back, or Vice Versa. Georgia Law Review, 29, 599-653.

World Bank (2004), Striking a better balance: the World Bank Group and extractive industries - the final report of the extractive industries review. Washington, DC: World Bank. Retrieved from http://documents.worldbank.org/curated/en/2004/09/5138809/striking-better-balance-world-bank-group-extractive-industries-final-report-extractive-industries-review (date accessed: Apr 9, 2014)

World Bank (2006), A Review of Environmental and Social Impacts in the Mining Sector, East Asia and Pacific Region, discussion paper. Retrieved from www.worldbank.org/eapenvironment (date accessed: Feb 20, 2014)

World Bank (2014), Country Overview-Mongolia. Retrieved from http://www.worldbank.org/en/country/mongolia/overview (date accessed: July 30, 2014)

World Health Organization (WHO) (1999), Regional Office for Europe and European Center for Health Policy. Gothenburg consensus paper: Health impact assessment, main concepts and suggested approach. Retrieved from http://www.euro.who.int/document/PAE/Gothenburgpaper.pdf (date accessed: May 10, 2014)

World Health Organization (WHO) (1986), The Ottawa Charter for Health Promotion. First International Conference on Health Promotion, Ottawa, 21 November 1986. Retrieved from http://www.who.int/healthpromotion/conferences/previous/ottawa/en/. (date accessed: Dec 11, 2011)

World Health Organization (WHO) (2010), Managing the public health impacts of natural resource extraction activities, discussion paper, WHO: Geneva.

World Health Organization (WHO) (2012), Global Health Observatory. Public health and environment: Water, sanitation and hygiene. Retrieved from http://apps.who.int/ghodata/ (date accessed: Aug 12, 2014)

World Health Organization (WHO) (2013), The determinants of health. Retrieved from: http://www.who.int/hia/evidence/doh/en/.

World Health Organization (WHO)(1997), Jakarta Declaration on leading health promotion into the 21st century. [Internet], World Health Organization, Geneva (1997). Retrieved from: www.who.int/hpr/NPH/docs/jakarta_declaration_en.pdf.

Wu L, Rutherford S, Chu C (2011), The need for health impact assessment in China: potential benefits for public health and steps forward. Environ Impact Asses Rev. 31:420-424.

Yin RK (2002), Case Study Research, Design and Methods, 3rd ed. Newbury Park, Sage Publications.

Oyunbileg J, Kupul J, Burmaa B (2008), History, Development and Future of Public Health Institute of Mongolia, Mongolian Medical Sciences, 4 (146) [In Mongolian]