Uncommon Solutions to Common Problems: Reducing Air Pollution in Ulaanbaatar, Mongolia

Photo by Tamir Bayarsaikhan, UNICEF, 2018

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DISCLAIMER

The author conducted this study as part of the program of professional education at the Frank Batten School of Leadership and Public Policy, University of Virginia. This paper is submitted in partial fulfilment of the course requirements for the Master of Public Policy degree. The judgments and conclusions are solely those of the author, and are not necessarily endorsed by the Batten School, by the University of Virginia, or by any other entity.

UNIVERSITY OF VIRGINIA HONOR STATEMENT

On my honor as a student, I have neither given nor received unauthorized aid on this report.

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LIST OF ACRONYMS

GDP- Gross domestic product

MNT - Mongolian currency, the Tugrug

UN - United Nations

UNICEF - United Nations Children's Fund

USAID - United States Agency for International Development

USD - United States Dollars

WHO - World Health Organization

KEY TERMS

Ger - A traditional Mongolian home, made out of wood, felt, and canvas

Ger area(s) - Neighborhoods located on the outskirts of Ulaanbaatar city

Tugrug - Mongolian currency, with a current exchange rate of 1 USD → 2647.84 MNT (29 April 2019)

Kheseg - Smallest administrative unit in Ulaanbaatar; about 200 households each (See Appendix F)

Kheseg leader - Community leader at the *kheseg* level in Ulaanbaatar

CLIENT PROFILE: GERHUB

This report was prepared for GerHub, whose mission is stated below.

"We are a nonprofit social enterprise that seeks to find innovative and creative solutions to some of the most pressing issues in the ger areas of Ulaanbaatar. We partner with top universities and institutions globally in the fields of architecture, design, and engineering. Our current projects focus on researching and developing ways to affordably modify and modernize the Mongolian ger to meet the housing needs of ger area residents."

EXECUTIVE SUMMARY

A high level of air pollution has caused a health crisis in Ulaanbaatar, Mongolia. It is estimated that one in 10 deaths in Ulaanbaatar is attributed to air pollution (Allen et al., 2011). Air pollution has been linked to negative health effects in all stages of life, from birth to old age, and poses significant economic costs to Mongolia due to loss of life and reduced productivity. The main cause of air pollution is rooted in the 200,000 households located in the outskirts of Ulaanbaatar city, in what are known as ger areas, where they collectively burn about 600,000 tons of raw coal for heat during the winter (Cousins, 2019). Despite government efforts to tackle air pollution by banning rural to urban migration and the use of coal (starting in May 2019), top-down, unorganized policies have not made significant changes to existing high air pollution levels (Cousins, 2019).

The scope of this report will focus on combating air pollution at its source: the household level in ger areas. This analysis focuses on providing innovative, bottom-up solutions for GerHub to implement in ger areas to reduce coal consumption. This report specifically focuses on the following four alternatives:

Alternative 1: Let Present Trends Continue
Alternative 2: Use the Positive Deviance Method to Find Outliers in Ger Areas
Alternative 3: Spread an Education Campaign Using Behavioral Nudges
Alternative 4: Conduct a Case Competition

These four alternatives are then evaluated against the following three criteria, listed in order of importance to GerHub:

Criterion 1: Innovativeness
Criterion 2: Cost
Criterion 3: Implementation Feasibility

This report ultimately recommends GerHub to implement **Alternative 3, to spread an education campaign using behavioral nudges.** This alternative is the most innovative out of the presented options, as behavioral nudges have only recently been incorporated as a policy tool in the public sector. In agreement with GerHub's mission to find innovative solutions to common problems, this alternative will combat Ulaanbaatar's air pollution at the source, while potentially providing improved health outcomes for ger area residents.

PROBLEM STATEMENT

One in 10 deaths in Ulaanbaatar, Mongolia is attributed to air pollution (Allen et al., 2011). The main source of air pollution resides in the 200,000 households located in the outskirts of the city, called ger areas, which predominantly use coal for heating in the winter. Without access to a cheaper, cleaner alternative for heating, these households collectively burn 600,000 tons of raw coal a year based on a 2019 WHO report (2019). As a result, coal combustion from ger areas currently comprises 80 percent of the air pollution in Ulaanbaatar (Namsrai, 2017). Toxins in the air from air pollution are causing a health crisis, as particulate matter has been linked to causing respiratory diseases, lung cancer, and poor reproductive health (Davaasambuu et al., 2014). While the Mongolian government has implemented various policies to reduce air pollution, traditional top-down approaches have not yielded impactful results. Using available data and research on untraditional, bottom-up strategies, this analysis aims to recommend implementable solutions for GerHub to improve everyday Mongolians' quality of life in Ulaanbaatar's ger areas.

BACKGROUND

There are a multitude of environmental, economic, and societal factors that have led to Mongolia's current air pollution crisis. This section contextualizes how and why air pollution and its negative impacts on society continue to pose major challenges in Ulaanbaatar, Mongolia.

Climate Change and Economic Incentives Increase Rural to Urban Migration

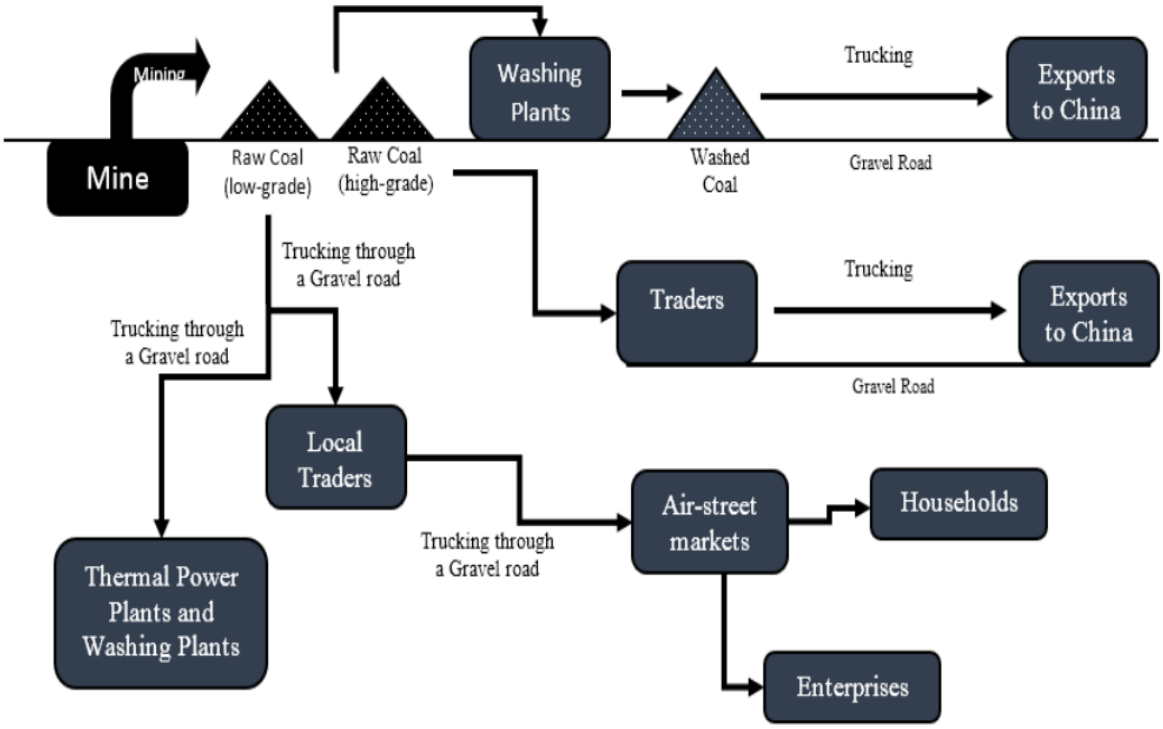
Rapid rural to urban migration has doubled Ulaanbaatar's population in the last two decades. The majority of Ulaanbaatar's newest residents are former nomads who moved to the city in search of new economic opportunities. Others were driven out of the countryside after a series of harsh winters and dry summers that killed their livestock, a critical source of livelihood. Annually, about 40,000 newcomers settle in Ulaanbaatar, which is now home to about 1.4 million Mongolians, or nearly half of the country's entire population of 3 million (Geoghehan, 2014).

Out of the 1.4 million Ulaanbaatar residents, about 60 percent, or 800,000 residents, live in ger areas without access to proper public services such as plumbing, central heat, or running water. These residents make up about 200,000 households in ger areas (Cousins, 2019). Most ger area residents live in a Mongolian traditional "ger," a tent-like structure made out of wood, felt, and canvas. Although designed for ease of mobility, fit for a nomadic lifestyle, a Mongolian ger is not particularly ideal for life in the city, especially in winter months. In 2017, the Mongolian National Agency for Meteorology and Environment Monitoring reported that winter months typically extend from November through March (WHO, 2019). As temperatures during these winter months reach as low as -40 degrees Celsius, ger area households burn an average of 3-5 tons of raw coal, or about 600,000 tons cumulatively to stay warm during winter in the world's coldest capital (Cousins, 2019).

Coal as a Cheap Source of Fuel for Heating

Mongolia is rich in coal and other mineral resources, making coal the cheapest source of fuel for ger households relative to other options (Economic Research Institute, 2017). In 2016, Mongolia mined about 18.7 million tons of coal, 67 percent of which was exported (mainly to China) and about 33 percent of which was consumed domestically (Economic Research Institute, 2017). The two main domestic consumers of coal are large city plants and households as shown in **Figure 1**. Compared to large plants that purchase coal directly from the mine, households incur a higher cost when purchasing market-priced coal due to intermediaries involved in the distribution chain. Despite this added cost, domestically mined, raw coal continues to be the cheapest fuel option for ger area Mongolians during the winter. On average, ger households spend about 5,000-6,000 MNT (about $3 USD) a day on coal (Amarzaya, T., personal communication, April 22, 2019). In the context of a median household income of about 200,000 MNT (about $80 USD) a week, ger households spend anywhere from 30 to 40 percent of their weekly income on coal (World Bank, 2010; Amarzaya, 2019).

Figure 1. Mongolian Coal Distribution Chain



Source: Economic Research Institute, 2017

Without access to a cheaper, cleaner alternative to coal for heating, the cumulation of coal-burning by ger area residents is the source of 80 percent of the air pollution in Ulaanbaatar (Namsrai, 2017). As a result, Ulaanbaatar became the most polluted capital in the world in 2016, exceeding both New Delhi, India, and Beijing, China (UNICEF, 2018).

Air Pollution Causes a Health Crisis in Ulaanbaatar

High levels of air pollution from coal combustion have been linked to negative health effects including respiratory diseases, lung cancer, and lower reproductive health (Allen et al., 2011). In October of 2018, the World Health Organization (WHO) declared air pollution as the "new tobacco" (Ghebreyesus, 2018). On some days, walking outside for three hours in polluted air can be equivalent to smoking up to 20 cigarettes (Echenique, 2018). Specifically, it is PM2.5, an invisible tiny particle in polluted air, that causes most of the negative health effects to those exposed to low quality air (Health Effects Institute, 2018). Today, nine in 10 people globally breathe polluted air that is disproportionately concentrated in cities of developing countries (WHO, 2018). Globally, air pollution was the fourth leading cause of deaths in 2013, following tobacco smoke (see **Appendix A**) (Global Burden of Disease, 2013). The WHO estimates an average of 4.2 million deaths are due to ambient (outdoor) air pollution while 3.8 million deaths are caused by indoor, household exposure to smoke (WHO, 2018). The percentage of households exposed to household air pollution is about 40 percent (Lange et al., 2018). Although air pollution harms all who are exposed to it, it disproportionately affects young children and the elderly populations. In 2013, about 5 percent of

deaths of children under five and about 10 percent of deaths among adults over 50 years old were related to air pollution (World Bank, 2016). In comparison, less than one percent of deaths among young adults were attributed to air pollution (World Bank, 2016). This age pattern of mortality rates has been unchanged since 1990 (World Bank, 2016). Collectively, the simple act of breathing is killing about 7 million people a year (WHO, 2014).

The current WHO guideline for an acceptable level of PM2.5 is set to 10 mg/m3 per year (UNICEF, 2018). In 2016, the average level of PM2.5 in Ulaanbaatar exceeded WHO guidelines by more than 25 times (UNICEF, 2018). Due to high levels of PM2.5 in the air, about 3,300 deaths are caused by air pollution annually in Mongolia (Cousins, 2019). Of these deaths in 2016, 1,800 were from diseases attributable to household air pollution and a further 1,500 deaths were from diseases attributable to outdoor air pollution (Cousins, 2019). These diseases included heart disease, stroke, lung cancer, acute low respiratory infections, and chronic obstructive pulmonary disease. In the span of over 10 years, the number of respiratory diseases in Mongolia has increased by 2.7 times per 10,000 populations (UNICEF, 2018).

Mongolian children and expecting mothers face adverse health effects even before birth (UNICEF, 2018). In winter months when air pollution level was at its highest, fetal deaths were recorded to have increased by 3.5 times (UNICEF, 2018). Among children under the age of five, pneumonia linked to air pollution was the second leading cause of mortality, causing 435 children to die in 2015 (UNICEF, 2018). In areas of the city where pollution is higher than the average, children were shown to have 40 percent lower lung function on average (UNICEF, 2018).

Economic Costs of Air Pollution

Air pollution not only causes negative health effects, but it also creates economic losses for the global community. As illustrated in **Appendix B**, the global community in 2015 lost nearly $179 billion USD in labor incomes from premature mortality to air pollution exposure, an increase of about $47 billion USD or 36 percent since 1995 in real terms (Lange et al., 2018). From household air pollution alone, the world economy has lost $60 billion USD in forgone labor output in 2015 (see **Appendix C**) (Lange et al., 2018). East Asia is one of the regions with the fastest growing economic losses from air pollution. For example, economic losses have more than doubled between 1995 and 2015, totalling $62 billion USD or 0.3 percent of regional total GDP (Lange et al., 2018).

In Mongolia, the average health cost on society from deaths and loss of productivity attributed to air pollution was about $463 million USD, or about 18.8 percent of Ulaanbaatar's gross domestic product according to a 2011 World Bank report (World Bank, 2011). Another report in 2016 by the World Bank and Institute of Health Metrics and Evaluations estimated that Mongolia lost about $2.1 billion USD in welfare losses or 6.9 percent of Mongolia's GDP due to deaths from air pollution (World Bank & IHME, 2016).

WHAT HAS BEEN DONE? RETHINKING POSSIBLE SOLUTIONS

The Mongolian government has failed to reduce air pollution through traditional public policy strategies. In March 2017, the government approved a policy to decrease air pollution by at least 50 percent by 2025 (WHO, 2018). Similar to previous attempts, however, corruption in the Mongolian parliament has been a major source of public concern. In Transparency International's 2018 Transparency Perceptions Index, Mongolia received a score of 37 out of 100.[1] With a high level of perceived level of corruption from the public, it creates doubt on the probability of success of the upcoming ban on coal. Therefore, for the purpose of this project, the following review of available literature will focus on learning from past nongovernmental, bottom-up strategies to problem-solving that have created sustainable change in other contexts.

Technical Solutions Fail to Address Behavioral Challenges

The consensus among available literature concludes that installing clean cook stoves and improved fuels are some of the best technical solutions to reducing air pollution and improving household health. However, the literature also highlights that energy efficient stoves and improved fuel dissemination programs are met with low adoption rates (Lewis et al., 2012). For example, between 2012 and 2019, the World Bank oversaw and implemented the Ulaanbaatar Clean Air Project. This project subsidized 120,000 clean cook stoves to ger area households to replace coal-burning stoves (World Bank, 2019). In agreement with the literature, many of the households did not successfully adopt or keep the cook stoves. Rather, many of the recipients resold the stoves for additional income (World Bank, 2014). Many technical solutions run into such challenges as potential consumers often do not know about the value or benefits of the new technology.

Recent literature has evolved to understand that a blend of technical, behavioral, and educational solutions working in tandem would yield desired results in reducing indoor air pollution (Barnes, 2014). For example, one study examined 600 households across four provinces in northern China to understand how families interact with their stoves based on where the stove is located in the home and cultural norms of each province. One of the four provinces was Inner Mongolia, whose participants in this study lived in similar home structures as the Mongolian ger, where the stove is in the center of the one-room home. Through questionnaires of participants and local village health workers, the researchers found that certain behaviors in the home increase exposure to indoor air pollution, such as the duration of cooking time and whether the door on the stove closed properly. These findings suggest the need for solutions to comprise of both technical (clean stoves) and behavioral (habit adjustments) factors (Yinlong et al., 2006). It should be noted that although this study has a large sample size, researchers used face-to-face interviews with participants using a questionnaire to collect data, which could be affected by human error and participants' bias to over- or underestimate their answers during an interview. Second, the gender of respondents varied across

[1] This score is based on a scale from 0 (perceived level of corruption is high) to 100 (perceived level of corruption is low).

provinces. The proportion of female respondents in one village was higher than other provinces, which could have affected cross community comparisons to conclude unbiased results.
In general, research into how behavioral interventions can help curb negative behavior in households is relatively new. It was only after the failure of numerous cook stove technical implementation programs around the world that led researchers to focus on the role of behavioral interventions in addition to education and adhering to cultural norms. Therefore, there is a gap in literature in terms of identifying specific behavioral interventions that are effective in reducing coal usage in the home.

The Power of Positive Deviance in Creating Change on the Ground

Positive deviance is a bottom-up approach that has proven to be effective in the field of international development. It is defined as, "The observation that in most settings a few at risk individuals follow uncommon, beneficial practices and consequently experience better outcomes than their neighbors who share similar risks," (Marsh et al., 2004). This model finds outliers in a community, and replicates techniques used in that household to disseminate to others in the community. Positive deviance has been predominantly used to reduce malnutrition and improve public health in developing countries. For example, when health workers in Vietnam weighed children across four villages, they discovered that some children were well nourished, despite living in poor households. By interviewing and learning from families that have healthy children, the health workers learned that by adding crabs from rice paddies to meals and washing hands, the children were fed nutritious meals. After two-years of spreading best practices learned from outliers within the community, child malnutrition rates decreased by 85 percent among participants in the study (Sternin & Choo, 2000). This method in literature has been applauded for exceptional results as it tends to be more community-centric and context-specific than purely technical solutions. Specifically, because the solutions come from the people within the community, cultural and social barriers are often already mitigated in the solution.

Could Nudging be the Solution?

The concept of nudging in the public sector became widely popular with the introduction of the book, *Nudge*, written by behavioral economists Cass Sunstein and Richard Thaler in 2009. In this book, the authors define nudging as, "...any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates. Putting fruit at eye level counts as a nudge. Banning junk food does not." (Sunstein & Thaler, 2009).

Nudging has since become a popular tool in crafting public policy. In the same year that *Nudge* was published, President Barack Obama recruited Sunstein to streamline regulations using insights from behavioral science, catalyzing countries such as Australia, Canada, India, and Peru among others to establish "nudge units" in their governments (Afif, 2017). Behavioral nudges are not limited to governments. Private organizations have also used nudges to achieve specific goals. For example,

Virgin Atlantic has implemented nudges to incentivize pilots to reduce fuel usage on flights to fight climate change (Gosnell et al., 2016). In both public and private contexts, evidence-based nudges from behavioral science are increasingly gaining interest from leaders to achieve desired outcomes without restricting freedom of choice. Since nudges work with human behavior at a basic level, it is reasonable to assume that results from effective nudges in one part of the world can achieve similar results in another, surpassing cultural and societal barriers.

In *Nudge*, Sunstein and Thaler argue that social influence, specifically, is one of the most effective ways to nudge behavior among other techniques (2009). There are two general ways that social influence can be used as a nudge: 1) information and 2) peer pressure (Sunstein & Thaler, 2009). Social influence in the form of information involves how the actions and thoughts of other peers signal how it might be the best action or thought for you (Sunstein & Thaler, 2009). On the other hand, social influence in the form of peer pressure involves a person altering behavior to go along with the crowd to avoid disapproval from their peers (Sunstein & Thaler, 2009).

To understand how social influence works to nudge behavior, listed below are a few examples:

1) Officials in Minnesota increased tax compliance by informing taxpayers that more than 90 percent of Minnesotans already paid their taxes, reducing the desire to cheat and increasing the desire to conform to social norms by paying taxes (Coleman, 1996).
2) Randomly assigned roommates in college freshman dorms had a significant influence over how a student performed academically (McEwan & Soderberg, 2006).
3) Simply informing hotel guests that 75 percent of previous guests reused their towels led to subsequent guests to reuse their towels too (Goldstein, Cialdini, & Griskevicius, 2008).

The general lesson from these examples is that people want to conform to social norms (Sunstein & Thaler, 2009). By informing people about what others like them are doing, individuals can be strongly swayed to change behavior to avoid being the odd one out. In the context of this report, a nudge informed by social norms could be applied in ger areas to reduce coal consumption.

In summary, available literature identifies two bottom-up strategies that can be used to reduce household coal consumption and, consequently, improve resident health and quality of life in Ulaanbaatar. First, the method of positive deviance, if done right and effectively, could potentially balloon into a community-centric solution found by the people, for the people. Second, behavioral nudges appear to be a promising low-cost and innovative path to solving existing problems.

ALTERNATIVES

This section presents a list of alternatives or potential solutions to the existing problem of extreme air pollution in Ulaanbaatar. Since the main source of air pollution lies at the household level in ger areas, the overarching goal of these alternatives is to reduce coal consumption from its current levels. The four alternatives considered in this section are: 1) let present trends continue, 2) use the positive deviance method to find outliers in ger areas, 3) spread an education campaign using behavioral nudges, and 4) conduct a case competition. These four alternatives were selected from an array of options after extensive research within available literature in the field of global development and public health. Alternatives in this context are creative yet implementable ways that GerHub can help reduce household air pollution in Ulaanbaatar and improve the quality of life in ger areas.

Alternative 1: Let Present Trends Continue

This alternative encourages GerHub to continue its current operations and projects without additional need to implement new programs. This alternative helps answer the question "What if we did nothing?" by analyzing current trends using evaluative criteria. Undergoing this analysis will allow GerHub the opportunity to compare current efforts against alternative solutions below to see if a new solution is preferred, or even necessary.

Under this option, the Mongolian government will continue to initiate policy reforms to reduce air pollution without additional changes. Most notably, the Mongolian government enacted a ban on using raw coal by households which will go into effect in May of 2019 (WHO, 2018). While this national policy is aimed to improve air quality, the government has not offered neither cheaper nor subsidized alternative sources of fuel for heat for ger area families. This leaves already cash-strapped families and a small economy to bear the burden of the new policy, which most Mongolians are not likely to follow based on the high level of distrust of the public sector. Additionally, there is no compliance mechanism planned for enforcing this ban.

Assuming that households will not change coal consumption behavior absent a compliance mechanism of this new law, ger households will continue to use 600,000 tons of raw coal that will cause 3,300 deaths in the following winter if present trends continue (Cousins, 2019).

Alternative 2: Use the Positive Deviance Method to Find Outliers in Ger Areas

The positive deviance method rests on the assumption that there are unique outliers in ger area communities that use less coal on average than their peers, resulting in lower household air pollution. This model suggests finding these outliers in the community through household surveys. Once an outlier(s) has been identified, the next step is to help replicate techniques and strategies used in that household to disseminate to others in the community.

There are two main critiques of the positive deviance method. First, critics cite a lack of conceptual clarity in the positive deviance model, as it does not have a clear definition and limited theory to

apply in different contexts (Albanna et al., 2018). Second, critics are skeptical of the practicality of positive deviance (Marsh et al., 2004; Bradley et al., 2009; LeMahieu, Nordstrum, & Gale, 2017). Main practicality concerns include that the current positive deviance model relies too heavily on in-depth, primary-data collection with low probability of success in identifying a positive deviance. These critics, in one form or another, propose incorporating big data from national databases in the positive deviance search process that could potentially reduce time, cost, and effort in all steps of the process.

GerHub would carry out the positive deviance framework, modeled after the framework in **Appendix D**. In a true sense of a nongovernmental, bottom-up approach, this alternative requires substantial groundwork and time to identify positive deviants. However, based on other case studies, the positive deviance approach has the potential to be sustainable and scalable in the long-term, as the solution stems from within the community, creating a foundation of trust when scaling the positive deviance technique or practice to the broader population.

Alternative 3: Spread an Education Campaign Using Behavioral Nudges

Behavioral nudges tap into insights from behavioral economics, psychology, and neuroscience to understand how humans behave and make decisions to design evidence-based interventions. A behavioral nudge is meant to present available choices in a way that leads an individual to choose the option that is most beneficial to them, without restricting their freedom of choice. This alternative involves GerHub creating and spreading an education campaign in ger areas using social influence nudges to reduce coal consumption by individual households. To change current behavior (high consumption of coal) towards a desired one (consuming less coal), social psychologists and behavioral economists have found that simply telling people what others are doing is an effective way to nudge. The practices of other people may be surprising, leading people to be much more affected by learning what they are (Sunstein & Thaler, 2009).

A 2014 study involving 42,000 households in Southern California found that informing participants about their energy consumption levels compared to their neighbors led to nearly a seven percent reduction in electricity use (Brandon et al., 2019). To put this into perspective, the price of electricity had to have decreased by 70 percent to achieve the same magnitude of effect (Brandon et al., 2019). The seven percent reduction resulted from two individual nudges, which each produced about two to four percent respectively. In addition to proving that behavioral nudges are effective tools to changing consumer behavior compared to market-based approaches, this study showed that the effects of nudges can be complementary. In short, using multiple nudges in tandem could amplify, not negate, effects aimed at desired behavioral changes (Brandon et al., 2019).

This alternative will be modeled after the Southern California study. Ger area households will be selected to participate in a study where GerHub will send a flyer infographic to select households outlining how much coal they consume relative to their neighbors (the nudge). The flyer should also contain educational statistics and graphics of how household coal use directly affects the residents'

health (educational content). In a similar goal of the Southern California utility experiment, the goal of this alternative is to reduce coal consumption for households who consume more than their peers on average, by using social pressure via the education campaign. The intuition is that once the households who overuse coal discover that their peers use less coal on average, their desire to fit in socially with their neighbors and friends (following social norms) will nudge them to reduce their current level of coal use.

Humans tend to have a strong desire to conform to their peers, which is why social pressure is a useful behavioral nudge to help guide individuals make better decisions. By leveraging this human tendency to conform, a social nudge has the potential to alter unwanted behavior. The effects of reduced coal consumption by ger households are better health outcomes, increased spending capacity as purchase of coal decreases, and less health-related expenses on average.

Alternative 4: Conduct a Case Competition

A case competition can serve as a creative avenue for funneling new ideas, often from unusual sources, to solve social problems where the best idea is rewarded with a prize. Under this option, GerHub would be in charge of creating and conducting an annual, worldwide case competition, with the focus of attracting university students studying architecture, engineering, etc., to help design new solutions for ger area's most pressing problems. GerHub will gather a panel of judges who are experts in the field of architecture, engineering, design, and environmental science to assess entries and award a monetary prize of $2,000 USD or 5,296,008 MNT.

In summary, the case competition would be structured as the following:

Target audience: Undergraduate and graduate university students from accredited institutions
Majors: Open to all majors, but prefer engineering, design, architecture, and urban planning majors
Instructions for Participants: Create a proposal to improve existing issues in ger areas in one of the following topics:

1) Find cleaner alternatives to coal that is cheaper and accessible
2)Design a new way to construct the ger to better insulate and control temperature

Time Period: 1 year; Advertising (3 months); Open period (6 months); Judging (2 months)
Incentives: $2,000 cash prize (5,296,008 MNT); a chance to apply skills in real world situations

The goal of this alternative is to generate new ways of thinking about the problem of household air pollution and other related ger area issues and find potential solutions. Air pollution is caused by many factors and this option could potentially find ways to tackle some of the challenges that can ultimately lead to a reduction in air pollution.

EVALUATIVE CRITERIA

This section describes three criteria that each of the alternatives will be evaluated by to ultimately lead to a specific recommendation. Every alternative listed in the previous section will be analyzed for its level of innovativeness, cost, and implementation feasibility by GerHub. Ultimately, evaluations through these criteria will help inform the most suitable recommendation for GerHub.

Criterion 1: Innovativeness

Innovativeness will be defined as a nontraditional method of achieving reduction in coal use. This criterion will assess how each alternative identifies new and more effective solutions that add value for ger area residents. Tangentially, it will assess the level of technology integration and extent of user-centricity in each alternative. The United Nations as recent as 2014 started to focus more on benefits of innovation in development. Currently, there are three major benefits to considering innovation as an evaluative criterion in projects. Innovation typically leads to more diverse partnerships, creates new pathways for scaling, and contributes to the development of new services and skill sets (UNDP, 2016). GerHub as an organization values the merits of innovative solutions to rethink conventional wisdom when solving existing issues in ger areas. Therefore, innovativeness will be considered as the most important criterion in this analysis. Innovativeness will be assessed relatively between alternatives and scored by the following metric: **high, medium, and low**, where **high** is the desired outcome.

Criterion 2: Cost to GerHub

A recommended solution should be mindful of cost to GerHub in this report. Therefore, annual costs to GerHub will be calculated for each alternative when conducting an analysis. The metrics that will be used to assess cost will be, but not limited to: average wages for additional workforce, material costs, outside consulting services, and other direct costs to GerHub. For most nonprofit organizations, cost of taking on an additional project is an important decision that requires time and scarce resources. A recommended solution to GerHub will be considerate of costs when making a final recommendation. All costs will be measured using **Mongolian tugrugs (MNT).**

Criterion 3: Implementation Feasibility

It is important that the recommended solution be implementable by GerHub. As a nonprofit social enterprise that seeks to experiment with innovative solutions, a recommended solution should be within GerHub's capacity to implement. Therefore, implementation feasibility assesses the extent to which GerHub can solely carry out the recommended solution in the short-term (one year). Implementation feasibility will be based on GerHub's current number of employees, available funds, and area of expertise that exist within the organization. Implementation feasibility will be measured by ordinal ranking: **high, medium, and low**, where **high** is the desired outcome.

EVALUATION OF ALTERNATIVES

This section evaluates each of the policy alternatives (let present trends continue, positive deviance method, behavioral nudge, and case competition) under the three evaluative criteria (innovativeness, cost, and implementation feasibility). This section is organized by criteria, and evaluates how each alternative fares under innovativeness, cost, and implementation feasibility.

There are general assumptions that apply to all four alternatives, listed below.

1) All alternatives are set to operate within a one-year window or what is referred to as "short-term"
2) Ordinal ranking of high, medium, and low for each alternative is scored based on how each alternative ranks relative to one another

The conclusion of this section will be summarized in an outcomes matrix, which will inform the basis for a recommended solution after analysis.

CRITERION 1: INNOVATIVENESS

The level of innovativeness or how each alternative utilizes non-traditional methods of achieving reduction in coal use. Innovativeness will be assessed by the following metric: **high, medium, and low**, where **high** is the desired outcome.

Alternative 1: Let Present Trends Continue

This option is **low** on innovativeness. Current trends to reduce air pollution Ulaanbaatar are mainly limited to traditional, top-down government policies which have been the status quo since air pollution became a public health crisis in Mongolia. Government policies in Mongolia so far have not included innovative elements, the latest of these policies being simply a ban on coal without providing cheaper alternatives for fuel. For GerHub, allowing current trends to continue is not aligned with its mission to find innovative solutions.

Alternative 2: Use the Positive Deviance Method to Find Outliers in the Community

Using the positive deviance method in ger areas scores a **medium** on the level of innovativeness. The positive deviance method first appeared in available literature in the international development field in the 1960s (Positive Deviance Collaborative, 2019). It was first used predominantly to reduce malnutrition by identifying outliers within a community and sharing their best practices to the entire community. The positive deviance approach to eliminate childhood malnutrition has been implemented across numerous communities across 45 countries (Positive Deviance Collaborative, 2019). However, this approach is both labor and time-intensive as it requires substantial human and financial resources to implement. Recent literature indicates the possibility of reducing the amount of human and financial resources necessary by using big data to identify outliers (the most time-

consuming phase). In the context of Mongolia, however, large-scale, individual household data on coal consumption is currently unavailable to incorporate technology and data into this approach.

Alternative 3: Spread an Education Campaign Using Behavioral Nudges

This option scores a **high** on the level of innovativeness. Behavioral nudges are on the frontier of policy both in the public and private sector, as they aim to influence individuals, organizations, and societies to make better decisions using psychological and social cues. This option requires trial and error and experimentation on behalf of GerHub, as there have been only few cases of nonprofit social enterprises implementing social nudges within available literature. Using this alternative will require GerHub to be creative and collaborate with social psychologists familiar with ger areas to craft an effective education campaign uniquely tailored to reducing coal consumption using nudges. The benefits of this option, if successfully implemented, is the option to easily scale up the scope of intervention, create partnerships and relationships with community stakeholders, and learn a new skill for experimental projects for GerHub. Under this option, GerHub would be one of the few organizations to use nudges to impact the local community directly.

Alternative 4: Conduct a Case Competition

This option scores a **medium** on the innovativeness scale. Case competitions have the potential to source creative ideas and out-of-the-box solutions to address high coal consumption and air pollution in ger areas from an international pool of participants. However, there is a risk that proposed solutions from participants unfamiliar with Mongolia will not be tailored solutions to the unique geography and climate of Ulaanbaatar's ger areas. Therefore, some or a majority of submitted solutions may not add value for either ger area residents or generate new ideas for GerHub. Additionally, since there are many case competitions available for university students to enter, using the University of Virginia as an example, students may be incentivized by the prize money to submit a reliable, conventional method of solving cases, rather than focusing on innovative, unconventional solutions to an existing problem of air pollution in Ulaanbaatar.

CRITERION 2: COST TO GERHUB

The projected cost to GerHub for each option is calculated and assessed below. The cost evaluation is estimated on a short-term, one-year timeline. If applicable, costs for each alternative are calculated under specific assumptions, which are specified at the beginning of each alternative.

Alternative 1: Let Present Trends Continue

GerHub does not incur any additional costs to its operations under this alternative. By allowing present trends to continue, this alternative does not require GerHub to adopt new programs, therefore posing no expenses to GerHub.

Alternative 2: Use the Positive Deviance Method to Find Outliers in the Community

Assumptions:

1) Unit of analysis (beneficiary) will be at the household level
2) Scope of this study will cover about 2,000 households or 10 *khesegs* in Ulaanbaatar
3) GerHub will hire 10 *kheseg* leaders as contracted employees
4) Average hourly wage is 10,000 MNT *(Source: Badruun Gardi)*
5) This project will be implemented on a one-year timespan (52 weeks)
6) Office space and community center are provided for by GerHub
7) Only external hires will be *kheseg* leaders, as internal staff can take on project manager, training, and data management roles
8) A working day will be assumed at 5 hours to carry out work during daylight

Table 1. Cost Calculation for Positive Deviance Method

Estimated Cost Calculation for External Human Resources/*Kheseg* Leaders
[10 *kheseg* leaders * 5 hours/day * 10,000 MNT/hour * 5 days/week] = 2,500,000 MNT per week
[2,500,000 MNT/week * 52 weeks] = 130,000,000 MNT per year
Estimated Cost for Other Expenses (transportation, equipment, and workshops)
20,000,000 MNT per year
Estimated Total Cost
[130,000,000 MNT + 20,000,000 MNT] = 150,000,000 MNT per year

This alternative will cost GerHub an estimated **150,000,000 MNT per year**, covering about 2,000 households from the select 10 *khesegs* (see **Table 1**). This estimate assumes that human resources will comprise about 87 percent of total project cost based on an existing cost analysis report on the positive deviance method to reduce child malnutrition in West Bengal, India. This cost analysis was conducted by Abt Associates in partnership with the United States Agency for International Development (Sodani et al., 2012). The goal of the West Bengal cost analysis report was to inform other organizations and countries considering implementing the positive deviance method of the cost breakdown during the lifespan of the project. In the West Bengal study, about 87 percent of total cost was comprised of human resources (human resources, recurrent training, community mobilization), which was the basis of the cost assumption for this report (Sodani et al., 2012). All remaining costs made up about 13 percent of total costs, including transportation, equipment, and one-time workshops. To see how each component of the positive deviance approach weighs as a part of total cost, refer to **Table 2**.

Table 2. Breakdown of Positive Deviance Inputs and Percentage of Total Cost

CAPITAL COSTS		
Input	**Description**	**% of Total Cost**
Equipment/furniture/tools	Office equpment, office furniture, & positive deviance tools	0.4
Training	One-time workshops, including sensitation training	4.0
Subtotal Capital		**4.4**
RECURRENT COSTS		
Human Resources	Project coordinator, data manager, kheseg leaders, etc.	12.9
Training - Recurrent	Data collection & management workshops, monthly	54.6
Community Mobilization	Costs related to raising awareness in the community	20.3
Office Space	Office space used by personnel to manage project operations	1.4
Transportation	Travel costs incurred by program personnel	3.5
Office operations	Anticipated expenses and contingencies	2.9
Subtotal Recurrent		**95.6**
TOTAL		**100.0**

Source: Sodani et al., 2012

It is important to note that the cost of this project in West Bengal was provided by more than one stakeholder. The donor agency, UNICEF, contributed 35.6 percent and the government of India incurred 64.4 percent of the total costs (Sodani et al., 2012) .

If GerHub can find ways to reduce human resource expenditures under this alternative (i.e. make internal hires), the projected cost for the positive deviance method will be lower. For more details on specific components of the overall annual cost, see chart in **Appendix E**.

Alternative 3: Spread an Education Campaign Using Behavioral Nudges

Assumptions:

1) Unit of analysis (beneficiary) will be at the household level
2) Scope of this study will cover about 2,000 households or 10 *khesegs* in Ulaanbaatar
3) GerHub will hire 10 *kheseg* leaders as contracted employees
4) Average hourly wage is 10,000 MNT *(Source: Badruun Gardi)*
5) This project will be implemented on a one-year timespan (52 weeks)
6) Office space and community center are provided for by GerHub
7) Only external hires will be *kheseg* leaders, as internal staff can take on leadership roles, including a psychology consultant from the current board
8) A working day will be assumed at 5 hours to carry out work during daylight

Table 3. Cost Calculation for Behavioral Nudge Option

Estimated Cost Calculation for External Human Resources/*Kheseg* Leaders
[10 *kheseg* leaders * 5 hours/day * 10,000 MNT/hour * 5 days/week] = 2,500,000 MNT per week
[2,500,000 MNT/week * 52 weeks] = 130,000,000 MNT per year
Estimated Material Cost for Nudge
[100 flyer paper * 20 MNT/paper * 100 printing * 300 MNT/printing] = 32,000 MNT for nudge
Estimated Total Cost
[130,000,000 MNT + 32,000 MNT] = 130,032,000 MNT per year

This alternative over one year will cost GerHub an estimated **130,032,000 MNT**. This estimate is based on materials needed (paper, printing, etc.) and labor necessary (*kheseg* leaders) to implement the the education campaign over one year. Unit costs for materials were based on current market prices for paper and printing in Mongolia. Human resources make up a majority of the overall cost of this alternative. Therefore, the annual cost can be altered depending on wage rate and number of individuals needed to carry out the implementation. For more details, see **Table 3**.

Alternative 4: Conduct a Case Competition

Assumptions:

1) GerHub will hire a website developer at a weekly rate of 966,000 MNT for 3 weeks *(Source: Mongolia.gogo.mn)*
2) Prize for case competition winner will be $2,000 USD or 5,296,008 MNT
3) 3 judges for case competition evaluation will participate free of charge
4) This project will be implemented on a one-year timespan (52 weeks)

Table 4. Cost Calculation for Conducting a Case Competition

Estimated Cost Calculation for External Human Resources/Website Developer
[1 website developer * 966,000 MNT/week * 3 weeks] = 2,898,000 MNT per project
Estimated Cash Prize
5,296,008 MNT
Estimated Total Cost
[2,898,000 MNT + 5,296,008 MNT] = 8,194,008 MNT per year

This option will cost GerHub about **8,194,008 MNT** for one year to implement based on the above assumptions. The bulk of the costs to this project will be at the beginning (website development for the case competition) and awarding the prize money at the end of the year. This report assumes that website development will be a one-time cost over three weeks and any website maintenance will be done by existing staff. For more details, see **Table 4**.

CRITERION 3: IMPLEMENTATION FEASIBILITY

Implementation feasibility assesses the extent to which GerHub can solely carry out the recommended solution in the short-term. For the purpose of this report, short-term will be considered as one year since the start of the implementation of a recommended option. The level of implementation feasibility will be measured and indicated by ordinal ranking: **high, medium, and low**, where **high** is the desired outcome.

Alternative 1: Let Present Trends Continue

This option is **high** in implementation feasibility, as it does not require GerHub to take any additional action to current projects and operations. Therefore, going forward with current trends will allow GerHub to focus on current, ongoing projects without the human resource strain of trying to plan and implement a new initiative.

Alternative 2: Use the Positive Deviance Method to Find Outliers in the Community

Implementing the positive deviance method in ger areas scores a **low** in implementation feasibility solely by GerHub. Research into past studies that have used the positive deviance method to create change in a community has commonly been known to require a large team of researchers, typically for more than one year to complete a project. In the West Bengal example, the positive deviance project took about five years in total to complete at the district level similar to ger areas, which required the Department of Social Welfare of the Government of West Bengal and UNICEF to hire two additional full-time staff members as well as other contract employees to implement the project (Sodani et al., 2012). In short, the potential large-scale and long-term nature of the project required by this option poses a potential barrier for implementation for GerHub without outside assistance from partner organizations.

Alternative 3: Spread an Education Campaign Using Behavioral Nudges

This option scores a **medium** on the level of implementation feasibility for GerHub. Since GerHub has existing connections to individuals with a background in psychology (the founder, Badruun Gardi, and board member, Dr. Dulamdary Enkhtor), this report assumes that connecting with a social psychologist will not be a significant barrier to implementation and this role can be fulfilled internally. While GerHub has most of the capacity to implement an education campaign using strategic messages such as nudges to reduce coal consumption, this option requires a minimum level of partnerships with outside stakeholders to carry out the project. Examples of outside stakeholders include a partnership with *kheseg* leaders, neighborhood leaders employed by the local government, to gain access to ger households. GerHub has a working relationship with *kheseg* leaders from previous community-based projects that will most likely lead to easy buy-in from this group to collaborate on this solution. See **Appendix F** for more details on the role of *kheseg* leaders.

Alternative 4: Conduct a Case Competition

Implementing a case competition run by GerHub scores a **high** on feasibility. This option is not as labor, time, or resource-intensive relative to the previous two options. The anticipated requirements for this option is designing a website and marketing over the internet, making it highly feasible for GerHub to hire a website developer on a one-time basis. A majority of the implementation will be front-loaded, as designing a website for the case competition, creating the case content material, and marketing will be towards the launch of the competition. Judging submissions and choosing a winner will be at the end after an open period of the case when participants submit their proposals to solve the air pollution crisis in Ulaanbaatar.

OUTCOMES MATRIX: SUMMARY OF EVALUATIONS

The following table shows a summary of the four alternatives (present trends, positive deviance, behavioral nudge, case competition) against the three criteria (innovativeness, cost, implementation feasibility). Out of the three criteria, innovativeness is the most important criterion, followed by cost, and lastly, implementation feasibility.

	Innovativeness	**Cost**	**Implementation Feasibility**
Alternative 1: Present Trends	Low	0 MNT	High
Alternative 2: Positive Deviance	Medium	150,000,000 MNT	Low
Alternative 3: Behavioral Nudge	**High**	**130,032,000 MNT**	**Medium**
Alternative 4: Case Competition	Medium	8,194,008 MNT	High

RECOMMENDATION & IMPLEMENTATION STRATEGY

| Alternative 3: Spread an Education Campaign Using Behavioral Nudges |

It is recommended that GerHub pursue **Alternative 3: Spread an Education Campaign Using Behavioral Nudges**. After evaluation of the four potential options against the criteria of cost, innovativeness, and implementation feasibility, spreading an education campaign using behavioral nudges is the most innovative solution to reduce coal use in ger households with manageable costs and implementation requirements. An education campaign coupled with behavioral nudges aligns well with GerHub's mission of finding innovative solutions to existing problems. At the time of this report, there are no other government or private entities experimenting with behavioral nudges as a viable solution for Ulaanbaatar's air pollution crisis. Since the source of the problem rests at the ger household level, GerHub has the unique opportunity to interact with residents of ger areas directly when implementing this solution.

Limitations

There are some challenges associated with going forward with the recommended solution related to cost and implementation. While spreading an education campaign with nudges is not the cheapest option, there are opportunities to reduce cost by adjusting inputs related to human resources and rate of compensation. The scope of the project can also be reduced to cover fewer households than 2,000 households to reduce costs significantly. In terms of implementation, this option requires GerHub to conduct substantial groundwork to find a more accurate estimate of average ger household consumption of coal in winter months since this type of data at the individual household level is not currently available.

Coal consumption within households is hard to track, unlike electricity consumption which can be tracked by the utility company as seen in the Southern California study. Therefore, GerHub will most likely have to rely on hiring and partnering with *khoroo* leaders to get a self-reported estimate of baseline coal consumption in ger area neighborhoods. A related challenge to self-reported data could be inaccurate estimates of coal consumption by the reporter and the potential risk of inaccurate data collection and recording, risking an inaccurate estimate of baseline consumption and, later, monitoring and evaluating the intervention.

While Ulaanbaatar residents are generally aware that air pollution has negative effects on their personal and household health, many may not be aware of the direct damage their coal use may be causing inside their home. If residents are more educated about the link between the coal they are burning and its impact on health, in addition to feeling social pressure from the added nudge on the campaign, this recommendation has the potential to enact behavioral change in relation to coal use in gers.

ACTIONABLE STEPS

| Alternative 3: Spread an Education Campaign Using Behavioral Nudges |

This section will outline actionable steps for GerHub to take in order to implement the recommended option of spreading an education campaign using behavioral nudges. In order to assess whether or not the nudge is effective, this option will be implemented based on experimental design with a representative sample of households from ger areas, randomized at the *kheseg* level. In the implementation phase, a successful partnership with *kheseg* leaders will be critical to the success of this project.

Project Design

Step 1: Generate a random sample of *khesegs* or micro-districts.
This report recommends starting this project small by selecting a random, representative sample of 10 *khesegs* or micro-districts. Assuming that each *kheseg* has about 200 households, recruiting 10 *khesegs* will include about 2,000 households all together. Five out of the 10 chosen *khesegs* will form the group that does not receive the nudge (control group), while the remaining 5 will be the *khesegs* whose residing households will receive the nudge. Working with 10 *khesegs* and their leaders is presumably a manageable amount for the initial trial of this project.

Step 2: Find a baseline estimate of ger household coal consumption.
Each of the 10 *kheseg* leaders will survey the households under their supervision and ask participants to self-report the amount of coal they use on a weekly basis, since most households purchase their coal supply per week. *Kheseg* leaders will then record the data of weekly coal use for each household as well as find the average coal consumption level for their micro-district. This will be the baseline estimate of coal use.

Step 3: Design the nudge.
The nudge will be delivered through an educational flyer with individual nudges for each of the households in the 5 *khesegs* (about 1,000 households) chosen to receive the nudge. In this step, GerHub (with consultation from a social psychologist) will design educational flyers using the average *kheseg* coal consumption and individual household consumption. The nudge will look similar to the following example:

"You use 20% more coal on average compared to your neighbors in this kheseg."

Then the flyer should include health statistics that show the relationship between coal-burning and negative health effects. For example:

"Exposure to air pollution from coal for 3 hours a day can be equal to smoking up to 20 cigarettes."

This nudge leverages social norms and pressure to influence individual households to reduce their coal consumption to at least reach the average within their neighborhoods if they are currently over consuming.

Step 4: Distribute the nudge to each receiving household.
Kheseg leaders will go household to household to deliver their individual nudges based on their specific coal use.

Step 5: Track and measure progress.
Following the distribution of the nudge, *kheseg* leaders will check in with households on a weekly basis to record coal consumption for individual households.

Step 6: Measure effect.
At the end of the project, GerHub will assess recorded data to see if the nudge was effective in reducing coal consumption on average.

Timeline & Next Steps
The duration of this project should start in winter months ranging across 2019-2020 when coal use creates the most air pollution. Monitoring and evaluation of collected data will take remainder of the year.

If there is a significant reduction of coal use from this project, GerHub can use this data to partner with other organizations, like UNICEF, to scale the project to include the entire 200,000 households in ger area of Ulaanbaatar.

CONSIDERATIONS OF TRADE-OFFS

This section outlines the trade-offs between the other alternatives that were ultimately not recommended after analysis against evaluative criteria.

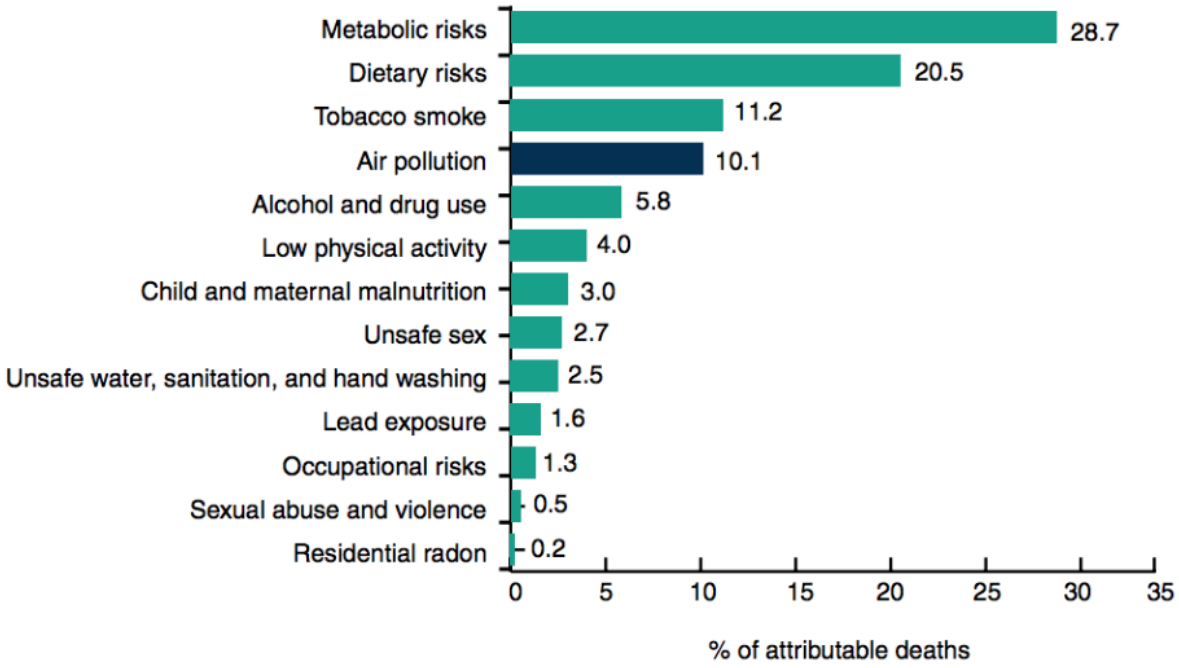
Although letting present trends continue (Alternative 1) incurs no cost to GerHub and has a high implementation feasibility, it scored the lowest on the criterion on innovativeness in this analysis. As an organization that promotes creativity and values innovativeness in its projects, this option would not be satisfactory or fitting to GerHub's mission. However, should GerHub decide to wait on any course of action, the recent government ban on coal that will go into effect in May 2019 presents a unique situation for GerHub to allow present trends to continue to see if the ban will work in practice to eliminate coal use from ger area households.

Since the positive deviance method option (Alternative 2) is relatively high-cost and low on implementation feasibility, it poses two large barriers to GerHub's resources and operational capacity. Since GerHub has multiple ongoing projects and partnerships, this option would most likely require human and financial resources to be redirected as well as hiring additional personnel, adding onto cost. In the long-term, however, the positive deviance approach could be a viable option for GerHub under the condition that it partners with another organization or government entity to combine resources and capacities.

Lastly, while conducting a case competition (Alternative 4) is the cheapest option outside of letting present trends continue (Alternative 1), it runs the risk of not generating solutions that GerHub can implement. Additionally, it poses a risk of not attracting enough applicants to represent diverse solutions to ger area challenges since there are many case competitions available to university students at most points throughout their academic career.

APPENDIX A. Air pollution was the fourth leading cause for death globally in 2013.

Percentage of Attributable Deaths by Risk Factor: Globally, 2013



Sources: World Bank and IHME, using data from IHME, GBD, 2013

APPENDIX B. In 2015, the global community lost nearly $179 billion USD in labor incomes from premature mortality to air pollution exposure, an increase of about $47 billion USD or 36 percent since 1995 in real terms.

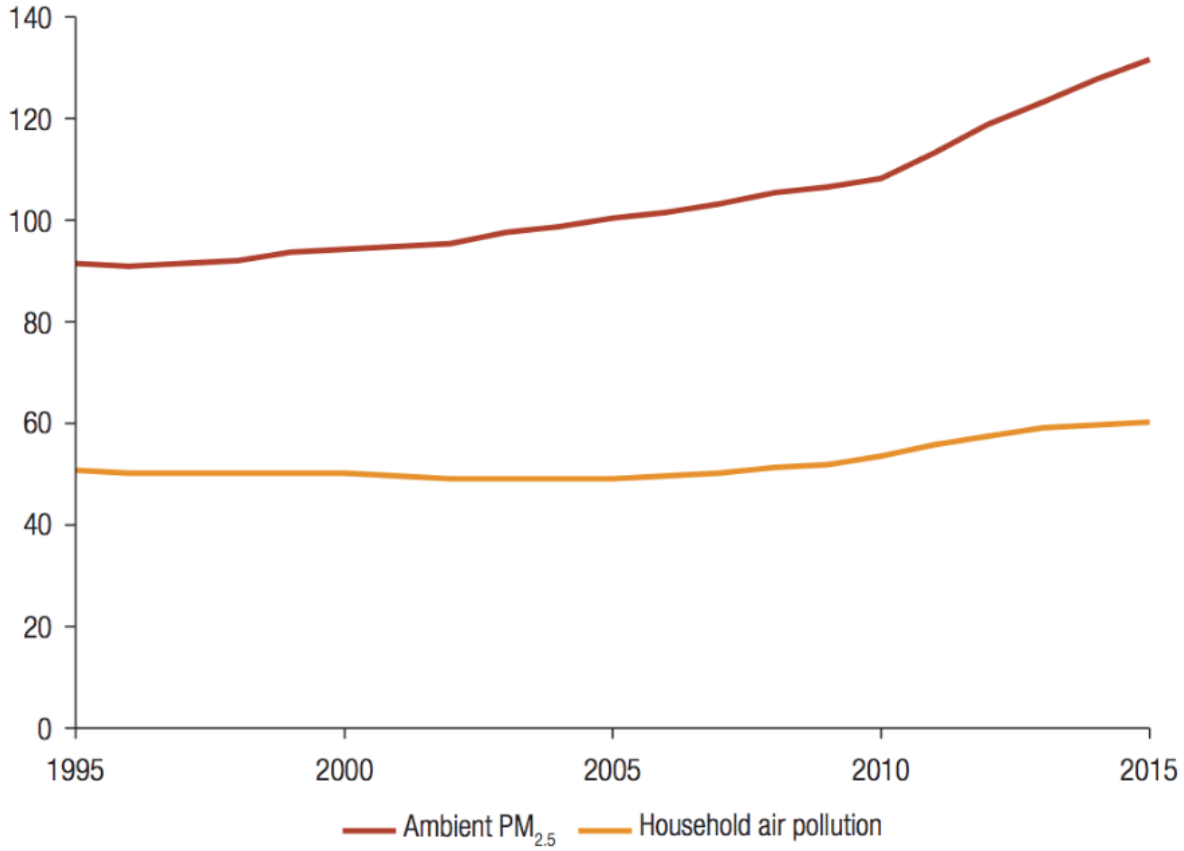
Labor Income Losses from Air Pollution, by Region, 1995-2015 (billion USD)

Region	1995	2000	2005	2010	2015
East Asia and Pacific	29.9	35.3	40.3	47.9	62.0
Europe and Central Asia	31.0	26.2	26.7	25.4	26.3
Latin America and the Caribbean	15.0	12.4	10.1	9.1	9.2
Middle East and North Africa	4.6	4.5	4.4	5.3	6.5
North America	15.9	17.8	20.8	19.0	20.7
South Asia	19.6	21.1	21.1	25.3	32.7
Sub-Saharan Africa	15.4	15.4	15.8	18.2	21.3
Total	**131.4**	**132.6**	**139.0**	**150.2**	**178.7**

Source: World Development Indicators database (http://data.worldbank.org/indicator/NY.ADJ.DPEM.CD).

APPENDIX C. From household air pollution alone, the world economy has lost $60 billion USD in forgone labor output in 2015.

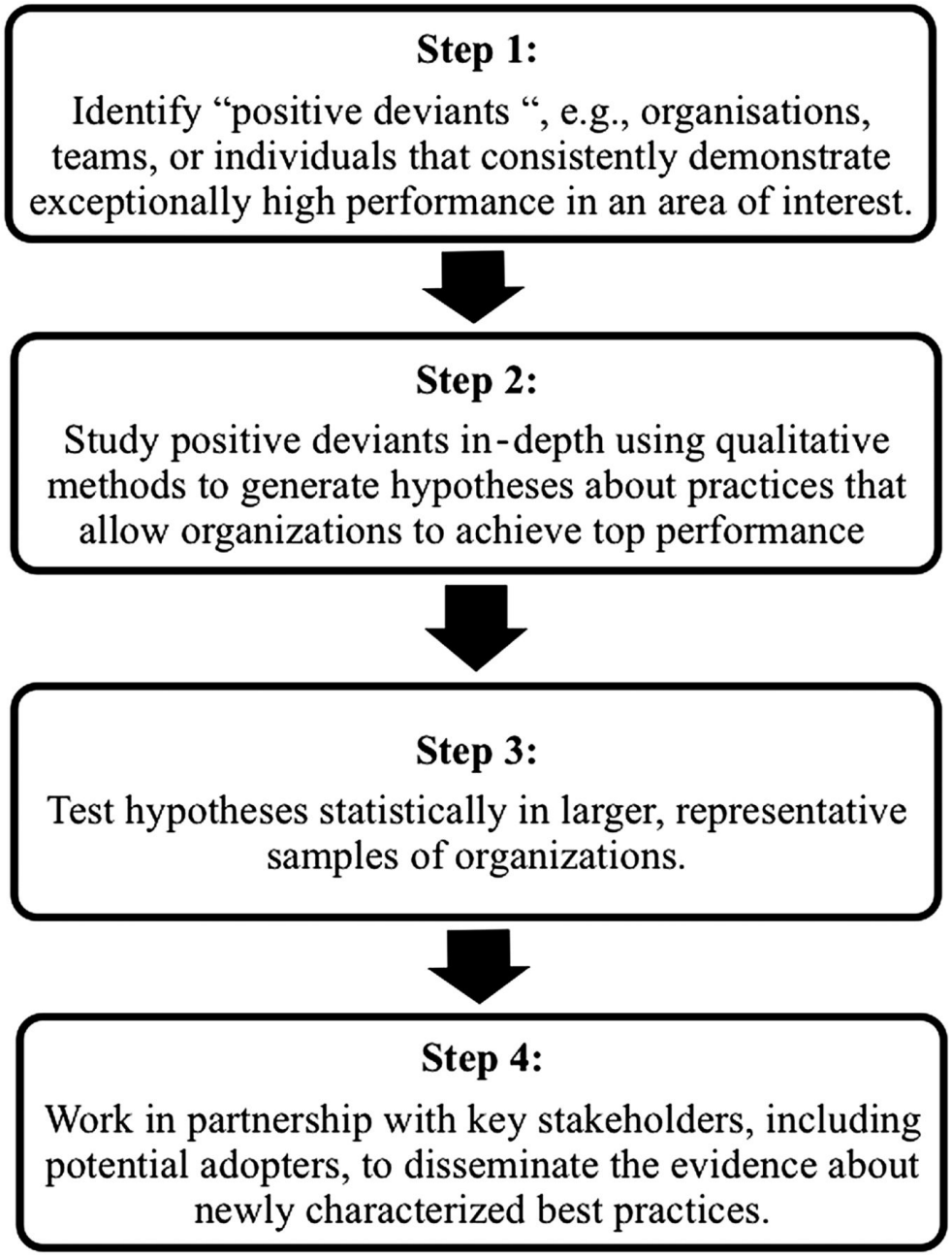
Global Labor Income Losses from Ambient PM2.5 and Household Air Pollution, 1995-2015 (billion USD)



Sources: IHME and GBD, 2016

APPENDIX D. Positive deviance framework.

Steps to the Positive Deviance Approach



Source: Bradley et al., 2009

APPENDIX E. Percentage Allocation of Total Cost in West Bengal, India. Total cost (Indian Rupees) for implementing positive deviance approach in a district in West Bengal, India, by input category.

Total Cost for Implementing Positive Deviance Approach in a District by Input Category (Indian Rupees)

	Input Category	Total Cost in Purulia District		Total Cost in Murshidabad District		Total Cost Per District (Average TC)	
		Amount (Rs.)	%	Amount (Rs.)	%	Amount (Rs.)	%
	CAPITAL						
1	Equipment	1,525,082	7.6	1,164,695	8.3	1,344,889	7.8
2	Training — Non-recurrent	186,970	0.9	82,770	0.6	134,870	0.8
	Subtotal Capital	1,712,052	8.5	1,247,465	8.9	1,479,759	8.6
	RECURRENT						
3	Human resources	13,078,941	64.6	7,709,256	54.8	10,394,099	60.6
4	Office space	2,467,609	12.2	1,911,580	13.6	2,189,595	12.8
5	Training — Recurrent	1,879,720	9.3	1,764,773	12.5	1,822,247	10.6
6	Community mobilisation	465,000	2.3	888,000	6.3	676,500	3.9
7	Transportation	117,600	0.6	117,600	0.8	117,600	0.7
8	Office operations	514,164	2.5	438,954	3.1	476,559	2.8
	Subtotal Recurrent	18,523,034	91.5	12,830,163	91.1	15,676,599	91.4
	TOTAL	20,235,086	100.0	14,077,628	100.0	17,156,358	100.0

Source: Data from USAID 2012; Sodani et al., 2012

APPENDIX F. Administrative Breakdown of Ulaanbaatar.

Levels of Governance in Ulaanbaatar, Mongolia

GOVERNMENT	DIVISION	QUANTITY	APPROX. POPULATION	RESPONSIBILITY	BUDGET (MILLION TG)	REPRESENTATION, FREQUENCY OF NEW APPOINTMENT
Capital (Ulaanbaatar)	City	1	1,025,174	Budget allocation, services, maintenance	33,502	Citizen's Khural (4 years), which selects the Mayor (4 years)
Düüreg	District	9	113,908	Infrastructure, tax collection, services	754	2–4 representatives per Düüreg elected to State Great Khural (4 years), Düüreg Governor (4 years)
Khoroo	Sub-district	132	7,766	Registration, census, voting, community outreach	Salaries and office maintenance only	Citizen's Khural Representative (4 years); *Khoroo* Governor selected by community meeting (4 years)
Kheseg	Micro-district	ca. 8–13 per *Khoroo*	ca. 597–970	Registration, community outreach	Part-time stipend	Kheseg Leader

Source: Japan International Cooperation Agency, Master Plan, 2008

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