

LEAPFROGGING TO A GREEN BUILDING CODE IN BOLIVIA: A POLICY ANALYSIS

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Table of Contents

EXECUTIVE SUMMARY	6
1. INTRODUCTION	8
1.1 Background	8
1.1.1 Country background	8
1.1.2 Client background	9
1.1.3 Project background	10
1.2 Research objectives	10
1.3 Framework	11
1.4 Methods	13
2. PROBLEM DEFINITION.....	18
2.1 Safety risks	18
2.2 Environmental risks.....	20
3. POLICY ALTERNATIVES	22
3.1 Status quo	22
3.2 The International Building Code (IBC).....	27
3.3 The International Green Construction Code (IgCC)	29
4. ANALYSIS	32
4.1 Status quo	32
4.1.1 Effectiveness	32
4.1.2 Economic impacts	36
4.2 International Building Code	37
4.2.1 Effectiveness	37
4.2.2 Economic impacts	38
4.3 International Green Construction Code.....	39
4.3.1 Effectiveness	39
4.3.2 Economic impacts	40
4.4 Stakeholder analysis of Bolivian water privatization policies.....	43
4.4.1 National level stakeholder analysis.....	45
4.4.2 City-level stakeholder analysis.....	47
4.4.2.1 Cochabamba	47
4.4.2.2 La Paz	53
4.4.2.3 Santa Cruz	58
4.5 Political and implementation feasibility of new building codes	63

4.5.1 Status quo political feasibility	63
4.5.2 Status quo implementation feasibility	64
4.5.3 IBC and IgCC political and implementation feasibility	65
5. DISCUSSION.....	69
5.1 Summary of results	69
5.2 Additional considerations	71
6. RECOMMENDATIONS.....	73
6.1 Policy design.....	73
6.2 Political strategy.....	74
6.3 Timeline.....	75
6.4 Conclusion and future directions.....	76
REFERENCES.....	78
APPENDICES	81

List of tables

Table 1: Sample effectiveness metrics.....	12
Table 2: Sample economic impact metrics	12
Table 3: Comparison of earthquake impacts in Paso Robles, California and Bam, Iran	19
Table 4: Existing Bolivian Guide to Building Construction policy elements.....	24
Table 5: Policy alternatives summary	31
Table 6: Effectiveness and economic impacts summary for all policy alternatives	42
Table 7: Cochabamba stakeholders importance and influence rating	51
Table 8: La Paz stakeholders priority and influence rating	57
Table 9: Santa Cruz stakeholders priority and influence rating.....	62

List of figures

Figure 1: Perceptions of current building code effectiveness in Bolivian cities (Bolivian stakeholders, n=16).....	32
Figure 2: Perceptions of current building code industry compliance in Bolivian municipalities (Bolivian stakeholders, n= 17)	33
Figure 3: Attitudes toward current building codes in Bolivia (Bolivian stakeholders, n =17).....	35

Figure 4: Most referenced factors impacting compliance with current building codes (Bolivian stakeholders, n=23)	36
Figure 5: Perceptions of economic benefits and challenges of current building codes (Bolivian stakeholders, n=23)	37
Figure 6: Graphical explanation of stakeholder categories based on level of influence and interest	52
Figure 7: Cochabamba stakeholders priority and influence matrix.....	52
Figure 8: La Paz stakeholders priority and influence matrix.....	57
Figure 9: Santa Cruz stakeholders priority and influence matrix.....	62
Figure 10: Perceptions of challenges and benefits of current Bolivian building codes (Bolivian stakeholders, n=23)	64
Figure 11: Perceptions of challenges and benefits of adopting a green building code in Bolivia (Bolivian stakeholders, n=23)	66
Figure 12: Perceptions of challenges and benefits of adopting a green building code in Bolivia (USA stakeholders, n=23)	66

List of appendices

Appendix 1: Online survey for USA Stakeholders and codebook for transcription.....	81
Appendix 2: Online survey for Bolivian stakeholders and codebook for transcription	85
Appendix 3: Informed consent forms (English and Spanish versions).....	90
Appendix 4: Classification sheet for survey participants (USA and Bolivia)	92
Appendix 5: Node structure for NVivo analysis	93
Appendix 6: Potential annual GDP supported by IgCC implementation in Bolivia’s 3 principal cities	96
Appendix 7: Potential annual jobs supported by IgCC implementation in Bolivia’s 3 principal cities	97
Appendix 8: Potential annual resource cost savings generated by IgCC implementation in Bolivia’s 3 principal cities.....	98
Appendix 9: La Paz stakeholder analysis.....	99
Appendix 10: Cochabamba stakeholder analysis	101
Appendix 11: Santa Cruz stakeholder analysis	104
Appendix 12: National stakeholder SWOT analysis.....	106
Appendix 13: La Paz stakeholder SWOT analysis.....	109
Appendix 14: Cochabamba stakeholder SWOT analysis.....	112

Appendix 15: Santa Cruz stakeholder SWOT analysis..... 115
Appendix 16: National stakeholder priority and influence rating 117
Appendix 17: National stakeholder interest and influence assessment 118

EXECUTIVE SUMMARY

Commercial building codes set minimum quality standards for new commercial structures and their component systems. Such policies are ubiquitous in the developed world, but in Bolivia, South America's poorest country, building codes are a nascent development. Only the capital city of La Paz has a mandatory commercial building code, and this code fails to incorporate numerous best practices developed around the world. This presents an opportunity to learn from the international community, possibly even "leapfrogging" directly to a code that incorporates environmentally sustainable features.

On behalf of our client, Partners of the Americas, this report assesses the opportunity for Bolivian cities to adopt commercial building codes similar to those developed by the International Code Council. Specifically, we analyzed the International Building Code and the International Green Construction Code for use in Bolivia's three principal cities: La Paz, Cochabamba and Santa Cruz. We analyzed the policies' potential effectiveness at achieving building safety and environmental health improvements versus the status quo, as well as the potential economic impacts. We also evaluated how feasible it may be for each city to adopt a new commercial building code given its specific political context.

The first section of this report introduces the project, the client and some basic information about building codes. It also establishes our research objectives and outlines the framework and methods used in the remainder of the paper.

The second section details the problems created by inadequate building codes, including building safety and durability risks as well as contributions to environmental problems such as pollution, freshwater depletion and climate change.

The third section discusses the policy alternatives being analyzed, namely the status quo, the International Building Code (IBC) and the International Green Construction Code (IgCC). The status quo refers to the continued evolution of the current local codes in Bolivian municipalities. The IBC is a basic alternative to the status quo, focused primarily on building safety. The IgCC is the most advanced alternative, incorporating the latest green building techniques developed in the United States.

The fourth section analyzes each policy alternative according to its potential effectiveness and economic impact in Bolivian cities. Effectiveness refers to the ability to address the physical problems specified above. Economic impact refers to the financial costs and benefits associated with policy adoption, from the perspective of a municipal government.

The fifth section maps the major stakeholders in each city and assesses the feasibility of policy adoption given the local political climate. To help assess political feasibility, we used the World Bank's failed Bolivian water privatization efforts in the late 1990s as a case study.

The sixth section discusses the implications of our analysis, including a summary of results as well as additional considerations that were raised during the course of our research.

The seventh and final section lists our recommendations to the client as to whether and how to proceed with IBC and/or IgCC adoption in La Paz, Cochabamba and Santa Cruz.

Key findings and recommendations include:

- The ICC's model codes have the potential to be sound financial investments for Bolivian municipalities, and could drive substantial improvements in public safety and, to a lesser degree, environmental impacts.
- For all cities, it is better to start with the International Building Code than to leap directly to the International Green Construction Code. However, a hybrid codes that incorporates basic water efficiency features may be possible, especially in Cochabamba and La Paz. The International Code Council is ready and willing to help Bolivian stakeholders develop a comprehensive regulatory framework specific to the needs of each city.
- Building codes without uniform enforcement are not only ineffective; they are counterproductive. If resources are constrained, it is better to invest in enforcement of existing codes than to adopt a new code without performing due diligence in terms of stakeholder engagement and education.
- The stakeholders to be engaged first include municipal governments, construction industry groups and local citizens. Public awareness campaigns using social media should be started even before stakeholder meetings and should use a messaging approach centered on human rights and the rights of the environment.
- Any code, existing or new, should be reassessed periodically. Only when a basic commercial building code is in place and functioning well should additional green building features be incorporated.

1. INTRODUCTION

1.1 Background

Building codes were designed to “safeguard the public health, safety and general welfare... from hazards attributed to the built environment” (Insurance Institute for Business and Home Safety, 2015). The idea of a building code dates back over 3,000 years to the Babylonian Empire’s Code of Hammurabi, which imposed on builders the responsibility for structural soundness. Over time, codes throughout the world have expanded to include additional responsibilities like fire and earthquake prevention—and more recently, “green” building features, which ensure energy and water efficiency or healthy indoor air quality (US Green Building Council, 2011).

The country of Bolivia so far has not adopted any internationally recognized building codes. This presents an opportunity to “leapfrog” directly to a code that includes the latest best practices in green construction. Leapfrogging is a theory in international development that describes the relatively large jumps developing countries can make by learning from the many smaller, incremental changes developed economies made over time (Goldemberg, 1998). A classic example is the proliferation of cellular phones throughout the developing world, bypassing landlines. Clean energy technologies have also been proposed as a way to leapfrog dirtier stages of development such as fossil fuel dependence (Goldemberg, 1998).

Leapfrogging to a green building code, however, could pose major challenges for construction industry professionals and regulators alike, given their relative lack of experience in enforcing any type of building codes, much less ones covering environmentally sustainable features. On behalf of our client, Partners of the Americas, we evaluated the merits of both standard and green commercial building codes for use in Bolivia’s three principal cities: La Paz, Cochabamba and Santa Cruz. Specifically, we evaluated these cities’ existing efforts to develop their own codes against the option to adopt codes already developed by the International Code Council.

1.1.1 Country background

Bolivia is a developing nation with a population of roughly 10 million (World Bank, 2015). It is the poorest country in South America, with an indigenous population of over 50% and a per-capita income of roughly US\$5/day in purchasing power parity terms (World Health Organization, 2015). The country is divided into three quite distinct geographical zones: the high mountains and plateaus, including peaks reaching over 21,000 feet in elevation; the intermediate valleys, with moderate climates; and the eastern lowlands, situated in the tropical Amazon basin (Nations Encyclopedia, 2015). The three

principal cities, La Paz, Cochabamba and Santa Cruz, are located in each geographical zone, respectively. Our analysis focused on these three cities, which served as examples of the major population centers and climate zones throughout the country.

The country is divided into nine administrative regions called departments, which are roughly akin to states or counties in the United States (Nations Online, 2015). La Paz, Cochabamba and Santa Cruz all comprise their own departments, which encompass the cities that share their namesake as well as several smaller ones. The twin cities of La Paz and El Alto together house approximately 1.6 million people (La Paz alone has roughly 750,000 as of the 2012 census); Santa Cruz has over 1.4 million inhabitants, while the third-largest city of Cochabamba is home to roughly 630,000 (City Population, 2012). Our project targeted municipal governments for building code policy adoption, specifically the governments of La Paz, Cochabamba and Santa Cruz. However, we were also in contact with officials at the departmental and national level, as our client was interested in advancing the policy at any level possible.

1.1.2 Client background

Partners of the Americas (Partners) was founded in 1964 on the idea of “people-to-people diplomacy” (Partners of the Americas, 2015). Originally conceived as part of President John F. Kennedy’s Latin American aid efforts, Partners has since spun off and become its own non-profit organization with a mission to “connect, serve, and change lives” (Partners of the Americas, 2015). Partners now has over 80 chapters across the United States and 27 Latin American countries. Chapters in each state in the U.S. are partnered with specific countries or regions in Latin America to develop long-standing collaborations in program areas such as Climate and Energy, Agriculture and Food Security, and much more (Partners of the Americas, 2015).

North Carolina is partnered with the city of Cochabamba, Bolivia. Bolivia is also host to two additional chapters in La Paz and Santa Cruz, which provided our project team access to a broad and enduring network of civic leaders throughout the country. Our primary point of contact was Ursula Bustillos Daza, Environment Subcommittee Chair of La Paz Partners and president of Portal Urbano, an interdisciplinary sustainability think tank based in La Paz. We also worked closely with Rosario Claros and César Perez, the Environment Subcommittee Chairs of Cochabamba and Santa Cruz Partners, respectively, as well as Liez Gutierrez, Lupe Buendía and Modesto Saldaña, the presidents of the La Paz, Cochabamba and Santa Cruz chapters, respectively.

1.1.3 Project background

Group member Darren Legge traveled to Bolivia on a Partners travel grant in 2013 to speak about green building techniques at various government offices, universities, trade associations and non-governmental organizations. As a result of these visits and subsequent conversations, stakeholders including the mayor of La Paz, the Green Building Council of Bolivia and the Bolivian Institute of Architects expressed interest in promoting green building codes in local governments throughout the country. Partners of the Americas was identified as the appropriate body for convening the interested parties and advancing the policy through the appropriate political channels.

Two more group members, Darius Stanton and Theodora Tran, joined the Duke University Master's Project team in the spring of 2015. In March of 2016, Darius Stanton traveled to Cochabamba, La Paz and Santa Cruz, where he presented project findings to local universities and municipal governments. Theodora Tran also traveled in March of 2016, and identified and organized local stakeholders within La Paz, the capital city of Bolivia. Nicholas School of the Environment Professor Dr. Elizabeth Albright, an expert in local environmental policy adoption, was the group advisor. The North Carolina chapter of Partners of the Americas supported the project in any way possible, as did Duke's Center for Latin American and Caribbean Studies. We are thankful for the support of each of these participants.

1.2 Research objectives

As a cross-continent "people-to-people exchange" organization, Partners is interested in how developing countries can learn from the United States and vice versa (Partners of the Americas, 2015). Several prominent Partners members in North Carolina and Bolivia are interested in green building code advancement thanks to their professions as architects and green building professionals. The purpose of our analysis was to inform Partners of the Americas of the best course of action to achieve its objective of creating safe and sustainable commercial building codes in Bolivian cities. Specifically, the client wanted to focus on the three principal cities to serve as examples for other municipalities throughout the country.

As such, this paper explored two primary questions:

1. Should the municipal governments of La Paz, Cochabamba and Santa Cruz adopt commercial building codes based on the model codes developed by the International Code Council?
2. If so, should they incorporate green building features at the outset, or wait to develop these over time?

These are important questions for developing economies like Bolivia because of the long life span of commercial buildings. Construction project decisions today may impact generations to come, and as urbanization and environmental challenges accelerate, it becomes increasingly important to get these decisions right the first time. In our exploration of these questions, we used a policy analysis framework as described below. We also drew upon a variety of methods, as described in Section 1.4, to make educated inferences about the potential effects of each policy option for Bolivian municipalities.

1.3 Framework

We used a policy analysis framework adapted from the work of MacRae (1979). MacRae’s framework outlines four aspects of policy analysis: definition of the problem; criteria for choice; alternatives, models, and decisions; and political feasibility. These steps guided our general approach to policy analysis. However, MacRae assumes some level of modeling based on an experimental or quasi-experimental research design. Given the very new and uncertain landscape for building code adoption in Bolivia, we used a simplified version of MacRae’s framework that we deemed more appropriate for qualitative inferences.

Our framework is as follows:

- I. **Problem definition:** Policies must be evaluated with respect to a problem rather than in a vacuum.¹ The problems associated with insufficient building codes are outlined in Section 2, Problem Definition.
- II. **Alternatives:** We evaluated three policy alternatives: the status quo (the continued evolution of locally developed commercial building codes); commercial building codes based on the International Building Code; and green commercial building codes, based on the International Green Construction Code. These options are described further in Section 3, Policy Alternatives.
- III. **Analysis:** For Section 4, Analysis, we selected three policy evaluative criteria from among those identified by MacRae (1979), Haskins & Gallagher (1981), and Kotch, Ossler, & Howze (1984):
 - a. **Effectiveness:** a policy’s ability to address the specified problem(s). Nagle (1986) defines policy effectiveness as the degree to which policies achieve their expected outcomes, in addition to any ancillary benefits. In our case, impact categories included improved

¹ MacRae admits that “skill or art predominates over formal methodology” in problem definition and emphasizes the importance of listening (MacRae, 1979). Our client specified the policies for us to analyze. Some consider this approach less “pure” from an academic perspective than starting with a problem and then searching for relevant policy solutions, but in this way we met our client’s stated need.

durability of the built environment, healthier outcomes for building occupants, and reductions in environmental impacts. Table 1 summarizes the effectiveness metrics we seek to analyze.²

Table 1: Sample effectiveness metrics

Metric	Units
Reduction in losses after natural disasters	% of buildings or % of GDP
Reduction in building water use	% reduction versus the status quo
Reduction in building energy use	% reduction versus the status quo

- b. **Economic impacts:** the costs and benefits of a policy in financial terms. As data availability allows, we estimated the financial requirements of establishing and implementing each policy from the perspective of a municipal government. We then considered the economic benefits, namely increased tax revenue. We did not directly weigh these costs and benefits against each other, due to inconsistencies in the types of data we were able to gather. However, we reviewed third-party studies of the costs and benefits of the IBC and the IgCC. Table 2 summarizes the economic metrics we sought to analyze.

Table 2: Sample economic impact metrics

Metric	Units
Capital cost to city government to design and implement policy	US\$ or Bolivianos
Recurring cost to city government to enforce policy	US\$ or Bolivianos
Capital cost to builders to adhere to policy	US\$ or Bolivianos
Recurring resource cost savings to builders	US\$ or Bolivianos
Increased tax base (GDP) or tax revenue to city government	US\$ or Bolivianos
Jobs created or supported	Number of jobs per year
Return on investment	%

- c. **Political feasibility:** a policy’s likelihood of being adopted by the municipal government. We followed three major steps as outlined by the Department for International Development (2003):
- i. **Identify main stakeholders:** identified major stakeholders at the national and city levels, determined their interest in the policy in question, and classified

² These are our *a priori* choices of metrics. Metrics evaluated may differ, depending on data availability.

their interest as “in support of,” “against,” or “neither for nor against” the policy.

- ii. **Identify influence and priority of each stakeholder:** we defined “influence” to be a stakeholder’s ability to advance or hinder an activity, whereas “priority” is the order of importance given to satisfying a stakeholder group’s needs (Department for International Development, 2003).
 - iii. **Identify the risks that may affect the political feasibility of infrastructure development policies:** based upon the unique influence and importance matrix developed in the step above, we determined potential sources of conflict and developed a strategy to address the concerns of each different type of stakeholder. Particular attention was paid to groups of stakeholders that are likely to resist policy adoption.
 - d. **Implementation feasibility.** We also briefly discussed the feasibility of effective implementation for each policy once adopted. This is an important distinction, since policies with broad citizen appeal may be politically feasible and yet difficult to implement if stakeholders lack sufficient knowledge or resources to implement the policies.
- IV. **Discussion:** Conclusions based on our analysis, as well as additional inferences we felt were important to convey to the client. These are outlined in Section 6, Discussion.
 - V. **Recommendations:** Details about the preferred policy option, as well as specific steps our client can take to advance said policy. These are discussed in Section 7, Recommendations.

1.4 Methods

To help analyze whether Bolivia should adopt new commercial building codes, we first collected data on the existing building codes in place in the country’s three principal cities: La Paz, Cochabamba and Santa Cruz. We conducted surveys of stakeholders in Bolivia and the United States as well as in-depth interviews with key stakeholders. We also reviewed existing studies on building codes’ physical and economic impacts, and analyzed Bolivia’s water privatization efforts in the late 1990s as a case study for what may or may not be possible for new building code adoption.

This project used a mixed methods approach, which combined both quantitative and qualitative data collection and analysis. Specifically, we used a concurrent triangulation strategy, meaning we collected qualitative and quantitative data simultaneously and assigned equal priority to each. A combination of

interviews, surveys and literature reviews was used to inform various parts of our analysis, from the details of Bolivia's existing building codes to the evaluation of alternatives. We also used a case study to inform our feasibility analysis.

First, we conducted semi-structured interviews with key stakeholders as a pilot study in order to refine our questions for a more in-depth study with a larger sample size. Normally, it is customary to conduct a pilot study of at least 30 samples (Lancaster, Dodd, & Williamson, 2004). Unfortunately, the pool of people familiar enough with building codes in Bolivia to provide sufficient guidance is quite small. In our pilot study from October to December 2015, we interviewed six individuals using a combination of phone, Skype and email communication. We do not disclose the names of these respondents per Institutional Review Board requests.

For our data collection, we developed two surveys, one in Spanish for stakeholders in Bolivia and another in English for building and design professionals in the United States. In Bolivia, professors, architects, engineers, lawyers and community leaders completed the online surveys. Many of these Bolivian participants were also members or affiliates of Partners of the Americas. Our response rate from Bolivian participants was 28% (23 out of 83). In the United States, members of the U.S. Green Building Council, architects, engineers and building professionals staffed by city governments, completed the online surveys. Our response rate from United States participants was 77% (23 out of 30). These surveys consisted of 15 to 18 short answer questions (see Appendix 1 and Appendix 2). Together, with an Informed Consent Form (Appendix 3), these were disseminated to key stakeholders via email with a link to a Qualtrics web page. We then used respondent-driven sampling, otherwise known as "snowball sampling," to identify and contact additional stakeholders (Appendix 4).

This approach has potential bias because it is likely that respondents share similar viewpoints as the people who referred them. The stakeholders our client identified were almost exclusively in favor of changing the status quo. Further, those who responded to surveys and interview requests were likely those with especially strong opinions or experience in building or design policy. We sought opposing viewpoints whenever possible, but our results should be interpreted with the understanding that this project was not intended to be a purely objective analysis. Rather, it aimed to inform strategy for a client interested in updating building code policies.

After receiving survey responses, the results were analyzed using a constant comparative approach. We compared the perceptions of Bolivian respondents with perceptions of United States respondents. The

comparative analysis approach was completed using NVivo qualitative analysis software. NVivo software supports the organization and analysis of qualitative research. This software is used to maximize consistency of coding and analysis to examine variations and similarities among survey subjects and themes (Crow, Albright, & Koebele, 2015). All transcribed interviews and open-ended survey responses were uploaded to NVivo. The surveys from Bolivian respondents were translated from Spanish to English by group member Darren Legge prior to analysis.

After data was compiled into NVivo software, we created a node structure. Node structures are systems that help identify and organize themes found within survey responses. “Nodes” are themes used to tag data in order to find and analyze patterns within qualitative data (Columbia University Digital Social Science Center, 2016). After identifying the node structure and nodes, we coded each response with respect to the nodes (Appendix 5), meaning that we categorized survey responses under pre-determined themes. Analysis of the survey responses helped us learn about existing building codes in Bolivia; how feasible it might be to transition to an alternative policy; and how, specifically, this could be achieved.

Throughout this project, the interviews and survey responses were referenced by country, survey/respondent number and city. For example, BL-9-C represents Bolivian respondent number nine who resides in Cochabamba. This same reference structure was applied to survey respondents and interviewees from the United States; however, in this case we also identified his or her state if he/she was not a resident of Washington, D.C. For example, USA-4-CA represents the United States of America, respondent number four, who resides in California.

Information on the effectiveness and economic impacts of both standard and green building codes was gathered through a literature review. This was not intended to be an exhaustive study, but rather a review of academic and gray literature found with the guidance of key stakeholders. Sources included peer-reviewed academic journals as well as numerous reports from institutions such as the World Bank and stakeholder groups like the U.S. Green Building Council. We also used online resources like the World Bank’s World Development Indicators for demographic data, as well as online newspaper articles for information on Bolivian history and current events.

In our review of economic impacts, we searched for several types of data. First, we sought information on costs to municipal governments: the cost of designing and implementing new building code regulations, as well as cost premiums for green construction over standard building techniques. Second,

we sought information on economic benefits—how much money green buildings save in up-front construction costs, ongoing energy and water costs, and operations and maintenance costs. In particular, we looked for benefits that quantifiably accrue to municipal governments, such as increased economic activity (tax base or tax revenue). Finally, we reviewed studies on building codes’ return on investment (in other words, how many dollars can the government expect to save per dollar of investment in standard or green building codes?). We did not conduct our own return on investment calculations due to insufficient data; rather, we reviewed existing studies from the United States and elsewhere in order to make educated inferences about the potential return on investment for new commercial building code adoption in Bolivia.

Political context plays a key role in how likely policies are to be adopted or implemented and informs policy makers about how effective or appropriate different actions are (Nash et al, 2006). We examined political context through the distribution of power of organizations involved and their positions on the topic at hand. Evidence and Lessons from Latin America (ELLA)’s policy brief about green buildings in Latin America identifies support from key industry stakeholders (namely government, international organizations, and development banks) as a necessary prerequisite for successful implementation of green building strategies in Latin America (2013). Given the scope of our project, we analyzed the political feasibility of the policy alternatives by way of a stakeholder analysis at the country and city levels. A stakeholder analysis maps the power and positions of stakeholders who have an interest in or will be affected by a specific policy (Buse et al, 2005).

To determine the political feasibility of implementing green building codes in La Paz, Cochabamba and Santa Cruz, we conducted political position maps as defined by May (1986) at a city level, which served to clarify the levels of support as well as the levels of influence and power of relevant stakeholders in each city. Drawing upon previous research from journal articles and in-field interviews, we mapped stakeholders on a matrix of interest (the degree to which they will be affected by the policy) versus power (the ability the stakeholder has to advance or hinder the policy) in order to provide insight into potential sources of support for and resistance toward implementing the IBC and/or IgCC in Bolivia (DFID/World Bank, 2005).

On a scale of 1-5 (1 = least influential/lowest priority, 5 = most influential/highest priority), we ranked stakeholders on both influence and priority, and displayed them on a matrix. “Influence” is defined to be a stakeholder group’s ability to advance or impede an activity, whereas “priority” is the order of importance given to satisfying the group’s needs (Department for International Development, 2003). A

score of “5” indicated the highest ranking of influence (representing the stakeholder with the greatest power to facilitate or impede the policy’s objectives), and a score of “1” indicated the lowest ranking of influence. Likewise, a score of “5” indicated the highest ranking of priority (representing the stakeholder whose interests should be addressed first), whereas a score of “1” indicated the lowest priority ranking.

Typically, this portion of the analysis is conducted with all stakeholders at the table (with each stakeholder conducting his or her own ranking system of influence and priority of each of the stakeholders present at the meeting), with the final stakeholder rankings determined by the average of every stakeholder’s ranking systems. Due to limitations on our ability to gather all stakeholders together to inform our understanding of the stakeholder influence and priority landscape, we instead utilized a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis to prioritize and analyze stakeholders (Nash et al., 2006).

Stakeholders were identified to be inclusive of central and municipal governments and included different levels of government officials. To determine rankings based on influence, we assigned a “5” to the stakeholder who was identified from the SWOT analysis to have influence over the greatest number of stakeholders, and assigned the next highest score to the next most influential stakeholder. Likewise with determining rankings based on priority, we assigned a “5” to the stakeholder whose interests were determined to be the most urgent from the SWOT analysis (based on opportunities and threats identified), and assigned the next highest score to the next most prioritized stakeholder group until we either ran out of stakeholders or ranking positions. From our analysis, we did not identify more than 5 stakeholder groups. However, had there been more than 5 stakeholders, ties would have been allowed.

To better inform our stakeholder analysis, we also reviewed the highly documented water privatization policy of the 1990’s in La Paz, Cochabamba and Santa Cruz in Section 5, Analysis. This is not a perfect analogue to building codes, but it is at least instructive in characterizing the stakeholders at play. Whether or not these stakeholders would be divided along similar lines in the building code adoption process is a subjective matter. However, there are several similarities that made this exercise worthwhile, as described in Section 4.4, Stakeholder analysis. Most notably, both efforts are characterized by bringing in an externally developed idea and trying to implement it in each of Bolivia’s major municipalities.

The World Bank identifies strategic communication and stakeholder engagement as key strategies to achieving social and political sustainability in privatization and public-private initiatives (Calabrese,

2008). Analyzing how stakeholders were engaged during the government's attempt to adopt privatization policies in the Bolivian water wars helped us understand the challenges to policy adoption in each of the three Bolivian cities and informed our expectations about the political feasibility of the IBC and IgCC policy alternatives in each of the three cities.

2. PROBLEM DEFINITION

The absence of internationally recognized commercial building codes in Bolivian cities creates two types of problems: physical safety risks and environmental sustainability risks. We examined each category in turn.

2.1 Safety risks

Poorly constructed buildings pose a danger to occupants, particularly during natural disasters. According to the World Bank, disasters and natural hazards have afflicted 4.4 billion people throughout the past 20 years, claiming 1.3 million lives and causing US\$2 trillion in economic losses globally. These losses are accelerating, and the number one cause of expanding disaster risk is poor-quality construction (World Bank Group, 2015).

Furthermore, these disasters disproportionately affect poor countries (World Bank Group, 2015). Although they experienced roughly half of all natural disasters over the past 10 years, low- to middle-income countries suffered a staggering 85% of total global fatalities. Nations with well-established building codes, on the other hand, experienced 47% of all disasters but only 7% of global fatalities. Additionally, due to their smaller economies, developing countries take a hit to GDP in the wake of a disaster that is on average 20 times higher than in developed countries (World Bank Group, 2015).

To illustrate the gravity of this difference, we considered the case of two earthquakes that struck in December, 2003: one in Paso Robles, California (USA) and one in the city of Bam, Iran (Table 3). The earthquakes were of nearly identical magnitudes and affected cities of comparable size in terms of both population and land area. In California, a region with strong commercial building codes, just two people were killed and 46 buildings damaged. Bam, with no building codes, suffered over 30,000 fatalities and the near destruction of the city (World Bank Group, 2015).

Table 3: Comparison of earthquake impacts in Paso Robles, California and Bam, Iran

	Earthquake 1	Earthquake 2
Date	December 26, 2003	December 23, 2003
Location	Paso Robles, California (USA)	Bam, Iran
Population	30,000	40,000
Magnitude (Richter)	6.6	6.5
Presence of building codes	Yes	No
Fatalities	2	30,000+

Similarly, the 2010 earthquake in Haiti killed over 300,000 people, while neighboring Dominican Republic suffered zero casualties. One of the reasons for this stark difference is that Haiti's building codes were outdated and not enforced (DesRoches, Comerio, Eberhard, Mooney, & Rix, 2011).

Bolivia's largest natural disaster risks include earthquakes, fires, floods and landslides. In 1994, Bolivia suffered what was at the time the largest deep earthquake ever recorded, a magnitude 8.3 (Wakefield, 2013). Although this earthquake did not affect populated areas on the surface, there is no way to know that this will be the case in the future, as demonstrated by Ecuador's recent 7.8-magnitude quake that killed hundreds (Elgot & Rawlinson, 2016). Also, in 2010, the country declared a state of emergency over fires that destroyed more than 60 homes (BBC News, 2010). More recently, flooding in Cochabamba in 2014 killed over 40 people, including 14 in a mudslide (Agencia EFE, 2014). Each of these events affected mainly residential areas, but they could be devastating to commercial buildings and their occupants if they were to strike any of the major city centers in the future. For reference, in 2011 a 10-story building collapsed in Santa Cruz, leaving 18 dead and 16 missing (WorldStatus, 2016). With a stronger building code, a collapse of this magnitude may have been prevented.

Moreover, disaster risk is intensifying as a result of several factors. First, population growth and urbanization increase the number of individuals potentially affected by a disaster. Nationwide, population growth remains steady at 2.2% (World Bank, 2015), but projections of over 4% for Santa Cruz place it among the 15 fastest-growing cities in the world (City Mayors, 2014). Already, 65% of Bolivians live in urban areas, with many having migrated from the mountainous regions to the eastern lowlands (Nations Encyclopedia, 2015). This represents a doubling of the urban share of the population since the late 1970s (Campbell-Page, 2002).

Urbanization increases disaster risk not only because of the number of people exposed, but also because the rural-urban migration process typically takes place in the context of ineffective building and land-use regulations. Unplanned and unregulated urbanization, as seen in developing countries, is far more

dangerous than urbanization within industrialized countries. Due to a lack of land rights and a dearth of building codes, new arrivals into developing-country cities are particularly vulnerable to natural hazards (World Bank Group, 2015).

Additionally, disaster risk is increasing as a result of climate change. Globally, annual losses to the built environment from disasters are projected to rise from US\$300 billion in 2015 to US\$415 billion by 2030, adjusted for inflation (World Bank Group, 2015). Much of this rise is due to the increasing intensity and severity of hurricanes, as rain-driven events tend to cause the highest levels of damage (Buildstrong Coalition, 2015). Bolivia does not lie directly in the path of hurricanes, as it is landlocked, but it could nevertheless see higher damages from floods and mudslides caused by increasing storm intensity. It could also see intensified forest fires as a result of rising temperatures. Finally, climate change could exacerbate water scarcity in Bolivian cities—which brings us to environmental risks.

2.2 Environmental risks

The dearth of internationally recognized best practices in Bolivia's building codes also contributes to problems for the country's natural environment. When buildings are destroyed by natural disasters, they must be rebuilt, which comes at a cost to the environment as well as to the economy. Moreover, poorly constructed buildings use more resources like energy and water during operations, leading to issues such as pollution, natural resource depletion, conversion of forest land and a changing climate (World Bank Group, 2015).

Air pollution is a major problem for Bolivian cities. Cochabamba recorded the third-worst levels of both particulate matter and ground-level ozone pollution among Latin American cities in 2012. La Paz was among the top 15 particulate matter offenders as well, exceeding the World Health Organization standard of 20 micrograms per cubic meter by over 50% (Clean Air Institute, 2012). This is not a trivial matter; according to the OECD, air pollution, namely particulate matter, is on track to become the world's leading cause of premature death (Clean Air Institute, 2012). Air quality measures can be addressed through building codes, to ensure human safety and decrease air pollution.

Water pollution and water scarcity are also famously problematic in Bolivia, particularly in Cochabamba. In the late 1990s, the city's water resources were privatized at the behest of the International Monetary Fund and the World Bank (Salzman, 2006). This reform was intended to improve operational efficiency and access for the residents of Cochabamba, many of whom lived in illegal settlements that lacked connectivity to the municipal water supply network. However, privatization incurred substantial costs

for new infrastructure, which raised prices for existing customers, forcing many to spend more than 20% of their income on water (Salzman, 2006). In 2000, a broad coalition of protesters organized and demanded that water be treated as a human right, not an economic good (Salzman, 2006).

This conflict, which spread nationwide and became known as the Water Wars, resulted in the reversal of privatization just four months later. It also helped catapult then labor leader Evo Morales into power, along with his Movement Toward Socialism party (Achtenberg, 2013). Needless to say, water retains a special significance in Bolivian politics today. Many Cochabamba residents still lack access to municipal water. Those that have it find the service intermittent and the water heavily contaminated. Only 27% of residents have access to sanitary restrooms, leading to contamination of surface waters (Achtenberg, 2013). The region's aquifer is also contaminated and is being rapidly depleted (Wolf, Kramer, Carius, & Dabelko, 2005). In response, residents of Cochabamba and Santa Cruz have developed some of the world's most extensive urban water cooperatives in an attempt to bypass water authorities altogether.

Meanwhile, La Paz finds its water supply dwindling as a result of retreating glaciers and high consumption, and the government is caught in a long struggle to reform the La Paz water utility (Achtenberg, 2013). In December of 2015, Bolivia's second-largest lake was officially declared evaporated (Associated Press, 2016). The country's largest lake, Lake Titicaca, is also drying, which in turn reduces lake effect rainfall even further. If climate change continues as projected, the resulting drought will have "profound implications for the citizens of the Bolivian capital" as the region transforms from agrarian to "inhospitably arid" (Bush, Hanselman, & Gosling, 2010). Citizens must therefore find new ways to use water efficiently, which commercial building codes can help accomplish.

The ongoing conversion of forest land to other uses exacerbates Bolivia's concerns over water scarcity and quality. NASA data reveal that Bolivia's deforestation is accelerating rapidly (Los Tiempos, 2014). The results of this deforestation include increased erosion, decreased rainfall and slowing rates of aquifer recharge (Muller, Pacheco, & Montero, 2014). Likewise, climate change will continue to exacerbate water stress and other environmental problems. In fact, Bolivia takes climate change seriously enough that it hosted an alternative to the 2010 international climate negotiations called the World People's Conference on Climate Change and the Rights of Mother Earth (Schipani & Vidal, 2010). Actions that conserve water, limit pollution or curb climate change, therefore, are of particular interest to the citizens of Bolivia.

3. POLICY ALTERNATIVES

3.1 Status quo

To assess the feasibility of implementing a new building code in the three most populated municipalities in Bolivia, it is imperative to understand what codes and policies currently exist. This section describes the status quo of national and municipal codes in Bolivia and its three largest cities, as well as the process undertaken to gain code approval.

The political mobilization for the creation of building codes is a recent development for Bolivian governments. In 2006, the central government's Ministry of Public Works, Services and Housing (MOPSV) began developing a proposed code named Bolivian Rules of Construction (Norma Boliviana De Construcciones). In September 2007, MOPSV created a Technical Committee to create a national building code. Unfortunately, the Technical Committee's operations were discontinued until July 2010. It was not until January, 2011, after the collapse of a multi-family building Malaga in the city of Santa Cruz, that then Minister of MOPSV, Walter Delgadillo III, instructed the Deputy Minister of Housing and Urban Development, Bony Morales Villegas, to revive the meetings of the Technical Committee through the Policy Unit Construction to complete the national building code. After several meetings in 2012, the rule was officially retitled Regulations for Bolivian Building Construction (Reglamento Boliviano De Construcción De Edificaciones) (Bolivian Ministry of Public Works, Services and Housing, 2014).

The Technical Committee drafted the final document of Regulations for Bolivian Building Construction on April 26, 2013. In order No.31, Framework Law of Autonomy and Decentralization ("Andrés Ibáñez Law") and in consultation and coordination with the Ministry of Autonomy, the scope of the Reglamento Boliviano De Construcción De Edificaciones was changed. Instead of serving as a Regulation Guide, the national government decided that at the national level, it would issue technical guidelines rather than mandatory regulations pertaining to construction. Thus, a new final document known as the Bolivian Guide to Building Construction (Guia Boliviana De Construcción De Edificaciones), which was approved by the MOPSV in Ministerial Resolution No. 186 on July 17, 2014 (Bolivian Ministry of Public Works, Services and Housing, 2014).

Bolivian Guide to Building Construction (Guia Boliviana De Construcción De Edificaciones)

The Bolivian Guide to Building Construction (Guia Boliviana De Construcción De Edificaciones) is the first national document in Bolivia that addresses all commercial and residential construction and building

projects. This document serves only as a guide and is not mandatory for commercial or residential buildings. This guide provides municipal governments sample building code provisions that they can choose to adopt, while allowing freedom to make amendments specific to their city. The Bolivian Guide to Building Construction applies to new commercial and residential building projects and considers the constituent materials and building systems. It also serves as a guide for the expansion, modification, installation, repair or rehabilitation, demolition, or altering of the architectural design of buildings (Bolivian Ministry of Public Works, Services and Housing (MOPSV), 2014). The guide consists of ten different sections, each pertaining to different stages of the construction process (Table 4). These guidelines are available to help municipalities update existing building codes as well serve as a foundation for municipalities without current building codes.

Table 4: Existing Bolivian Guide to Building Construction policy elements

Section	Section Title (Spanish)	Section Title (English)	Description
1	DISPOSICIONES GENERALES	General Description	<ul style="list-style-type: none"> Objectives, reasons for application, and classification of building types.
2	PARTICIPANTES EN EL PROCESO DE DISEÑO Y CONSTRUCCIÓN	Participants in the Design and Construction Process	<ul style="list-style-type: none"> Responsibilities for building owners, designers, construction managers, and the local municipal government
3	ESPACIOS Y OTROS BIENES DE USO PÚBLICO	Public Spaces and Other Public Goods	<ul style="list-style-type: none"> Processes for public spaces (streets, numbering properties, naming of streets, parks, gardens, city squares)
4	AUTORIZACIONES, RESTRICCIONES Y OCUPACIÓN	Authorizations, Restrictions and Occupations	<ul style="list-style-type: none"> Licenses and certificates required to begin building projects.
5	REQUERIMIENTOS DEL PROYECTO ARQUITECTÓNICO	Architectural Requirements of Projects	<ul style="list-style-type: none"> Guideline for technical aspects of the design and construction of buildings.
6	PROYECTOS DE INGENIERÍA	Engineering Requirements	<ul style="list-style-type: none"> Minimum engineering specifications for concrete and other building components
7	SEGURIDAD ESTRUCTURAL DE LAS CONSTRUCCIONES	Structural Safety of Buildings	<ul style="list-style-type: none"> Minimum requirements for structural security and stability
8	PROCESO DE LA CONSTRUCCIÓN	Construction Process	<ul style="list-style-type: none"> Optimal day-to-day building construction practices
9	DEMOLICIONES	Demolition	<ul style="list-style-type: none"> Precautionary measures Safety procedures Removal of debris
10	INSPECCIONES Y SANCIONES	Inspections and Sanctions	<ul style="list-style-type: none"> Procedures for building inspections Disciplinary actions

Municipal Codes

The Bolivian Guide to Building Construction is intended to be a guideline for municipal governments to propose laws pertaining to building and construction projects. Municipal governments are responsible for the implementation and enforcement of codes specific to their city's needs. Autonomous municipal governments are encouraged to design the technical and legal components of a city's building codes, taking into account any unique regional characteristics. The building provisions and codes set forth by the municipal governments of Santa Cruz, Cochabamba and La Paz are explored in the following sections.

Santa Cruz

Santa Cruz has an urban planning policy, “Restraint Plan of Santa Cruz” (Plano de Mesura Santa Cruz), which was designed by the Administrative Office of Planning. This planning policy specifies the parameters for each zone within the city of Santa Cruz. There are five different planning zones mandated by Santa Cruz’s municipal government. These zones include the following: Z1 – Historical Center, Z2 – Center Zone, Z3 - 1° and 2° ring, and Z4 - 2° and beyond. After specifying each zone, the zones regulate sidewalk space, frontal retreat, public or private space, front retreat, maximum height, index of approval, required permits, supporting boundaries and height variation. This document also serves as an implementation plan for future projects, detailing the required documentation and guidelines to building structures within each zone area of Santa Cruz. Notably, however, this document covers city planning protocols rather than specifics of building processes (Santa Cruz Administrative Office of Planning, n.d.).

Cochabamba

Cochabamba’s first building code was introduced in 1991. Known as the General Building Regulations or Municipal Ordinance No.4100, these regulations were based on the municipal strategic development plan (BL-2-C, BL-4-C). The General Building Regulations do not make distinctions between commercial or residential buildings; however, in 1992, a policy was enacted regarding restrictions on the construction of shopping centers (BL-4-C). The Strategic Development Plan of Cochabamba was closed between July 2000 and March 2001, and all building regulations moved under the municipal planning authorities (BL-3-C).

Today, Cochabamba has no formal building codes, but rather a planning code that was implemented in 2010. The Supplementary Regulations of Urban Cochabamba (Reglamento Complementario A La Normativa Urbana Cochabamba) has zoning requirements with restrictions on lot space and building height standards (Municipal Government of Cochabamba, 2010). As a reference, the Supplementary Regulations of Urban Cochabamba applied the urbanized areas defined in the Master Plan 1981 as an extension of the urban area of the Master Plan of 1961 and the General Plan of the City of Cochabamba. The following planning code maps the city in accordance to the following zones: Zone of Conservation of Urban Areas, Zone of Renovation of Urban Areas, Zone of Consolidation of Urban Areas, Zone of Reservation for Rural Areas, and Zone of Urban Transition (Municipal Government of Cochabamba, 2010). While these zones outline city structure planning, they do not provide specific building restrictions other than space and height limitations.

La Paz

Unlike Cochabamba and Santa Cruz, Bolivia's capital city of La Paz has imposed mandatory conditions on the construction of buildings as outlined in Annex VI of the Regional Laws of La Paz. Outlined in Annex VI of these regional laws are authorizing permits, structural stability, handicap accessibility, building safety, seismic composition, sanitation and green space. The municipal government of La Paz created this document in 2012. Within Annex VII of the same Regional Laws of La Paz are safety regulations of public buildings, public spaces such as squares, parks and gardens, and the colors, textures and surfaces in relation to signs and symbols. This document was specialized for handicapped citizens, with graphics of ramps, sidewalk space, railing and the basic dimension of wheelchairs. (Municipal Government of La Paz, 2012)

Also, in 2003, the Vice Ministry of Natural Resources and the Environment's Department of the Environment created a General Guide for completing the form of environmental data. This document, produced for public and private entities within La Paz, is a guide to completing an environmental impact statement for building projects, with environmental data to support the statement. Owners of construction companies must produce an environmental file including data on resource and energy efficiency, alternatives and technologies, total investment and activities of building projects. While this document was created before the National Guide, it is unclear if this guide was mandated nationally or solely for the city of La Paz (Ministry of Sustainable Development, Vice Ministry of Natural Resources and Environment, 2003).

Although La Paz is the only municipality out of the three cities discussed with a code exclusively for building and construction, it is not in alignment with the provisions mandated by the International Building Code. Cochabamba and Santa Cruz currently only have planning codes, which provides limitations to building but with more emphasis on surface area and space rather than construction specifics regarding building safety, public health and energy efficiency measures. The distinction between commercial and residential buildings is not specified in any documents. This lack of distinction has provided the opportunity to propose a code that specifically addresses commercial buildings.

In sum, La Paz, Cochabamba and Santa Cruz currently operate under their own municipal building or planning regulations, with guidelines provided by the national Bolivian Guide to Building Construction. However, neither the national nor the municipal codes have received approval from an accredited international organization such as the International Code Council. There were previous codes that were

passed by municipalities in 1986, 1991 and 1992 but did not become enforced until just a few years ago (BL-1 / BL-8-C). Cochabamba and Santa Cruz both currently have planning codes that regulate the types of buildings that can be constructed in a given location according to its zoning district. Both of the planning guides from Cochabamba and Santa Cruz lack components of structural safety, fire safety, electrical safety or the management of raw materials and natural resources.

La Paz has a building code that is administered by the municipal government, with a more in-depth analysis of building provisions such as geotechnical studies, architectural plans and structural calculations. However, the effects of this code on building safety are unclear because while the city reviews the plans, it does not inspect the actual building. The Municipal Autonomous Government of La Paz gives full responsibility to project designers and/or owners for a building's interior habitability, comfort, security and accessibility. The absence of regulations for the interior design of building structures can pose health and safety hazards. Another unclear component to La Paz's building code is whether the building parameters refer to residential, commercial or all buildings types. Without clear distinctions between the two types of buildings and their respective building regulations, the guidelines can be convoluted, potentially diminishing the quality of projects and wasting upfront investments.

None of the policies regarding building construction in Bolivia have support or recognition from international building code organizations such as the ICC. Since there are many regional, geographical and climatic differences in Bolivia, a national mandate has been difficult to impose. However, the current approach of granting municipalities full political autonomy has deficiencies.

3.2 The International Building Code (IBC)

In the United States in 1994, three regional code organizations came together under the International Code Council to standardize best practices developed around the country. This gave rise to a set of model codes called the "International family of codes," or I-codes, as they are known in the industry (International Code Council, 2015a). These model codes were developed using a consensus-based process by ICC Members including officials at all levels of government as well as architects, engineers, construction industry groups and more. The I-codes are not policies in and of themselves; they are models which governments can choose to adopt as-is or to modify to suit their needs. As of today, all 50 states in the U.S. have signed some form of the I-codes into law. Dozens of countries around the world have also used them as the basis for their codes (International Code Council, 2015a).

The International Building Code, or IBC, is the most fundamental of the International family of codes. It outlines minimum safety features for new commercial buildings as well as for substantial additions to existing commercial buildings. Commercial buildings include such uses as offices, schools, factories, hospitals, prisons, airports, hotels, stadiums and places of worship—essentially any place of assembly other than private dwellings. High-rise residential buildings may also fall under the IBC (International Code Council, 2012). The IBC has been adopted in all U.S. states and territories (International Code Council, 2014).

Single-family and low-rise residential buildings are not considered in the IBC; they are covered in a separate “overlay code” called the International Residential Code, or IRC. Overlay codes provide lawmakers with a range of options to add provisions onto the IBC (American Institute of Architects, 2012). The IBC, however, remains the staple of the I-codes. Core elements of the IBC include structural integrity, fire prevention and accessibility for disabled persons. Additional features referenced by the IBC include standards for plumbing, mechanical and electrical design, as well as basic energy efficiency measures like insulation.

Buildings regulated under the IBC must conform to design specifications that help ensure the structure is able to withstand expected snow loads, wind loads, soil movement, flooding, and seismic activity. These specifications include requirements for foundation thickness, framing design, and water deflection, among others. Additionally, they must install fire protection systems, which include sprinklers, alarms and fire extinguishers, as well as fire escapes and wall assemblies that prevent the rapid spread of fire across adjacent areas of a building. Finally, IBC-compliant buildings must allow for accessibility by wheelchair (International Code Council, 2012).

The IBC is designed to be a basic guideline; other regulations support the IBC whenever appropriate. To properly control disaster risk, the IBC references several other standards that regulate component systems (i.e. plumbing, wiring, etc.). Plumbing components must satisfy the International Plumbing Code, and sewage systems must meet the International Private Sewage Disposal Code, both of which are overlay codes developed by the ICC. Similarly, mechanical equipment must be installed and maintained according to the International Mechanical Code and the International Fuel Gas Code. Adopting the IBC is therefore tantamount to adopting portions of these overlay codes as well. Finally, electrical wiring must meet specifications of the National Electric Code, which is promulgated by the National Fire Protection Agency of the United States (International Code Council, 2012).

The International Building Code also includes basic energy efficiency features by referencing the International Energy Conservation Code. The IECC includes provisions on insulation; air leakage; window performance; water heating; and heating, ventilation, and air conditioning (HVAC) design and performance. The IECC is in use in 46 U.S. states (International Code Council, 2014). Because the IBC is built upon the IECC, a municipality adopting the IBC is essentially also adopting the IECC unless they opt out of these provisions. Builders can choose to comply with energy efficiency provisions either by meeting a set of prescriptive requirements such as insulation thickness, or by demonstrating through testing and software modeling that the overall building is expected to perform at least as well as each of the prescriptive requirements would accomplish independently. The latter approach allows builders the flexibility to trade off certain features while still meeting the intent of the law (International Code Council, 2015c).

3.3 The International Green Construction Code (IgCC)

“Green” building codes and rating systems represent an evolving perspective on public safety and welfare that acknowledges the human health impacts of exposure to indoor toxins and/or the threat to human societies caused by environmental degradation (US Green Building Council, 2011). Green or “sustainable” buildings aim to utilize resources like water, energy, building materials and land far more efficiently than those built to standard codes (Kats et al., 2003). Green building codes mandate compliance with baseline codes plus several additional requirements.

The International Green Construction Code, or IgCC, is the most recent addition to the International family of codes. It is the uppermost layer among the overlay codes published by the ICC and is designed to integrate seamlessly with the IBC as well as any of the other I-codes. Like the IBC, it applies only to new commercial buildings and to substantial additions to existing commercial buildings; low-rise residential structures are not considered. The IgCC is quite new (the first edition was issued in 2012) and is currently adopted in the states of Rhode Island, Maryland and Oregon as well as in a number of cities across the country, including Phoenix, Arizona and a handful of smaller cities (International Code Council, 2015c). The IgCC includes sections on energy; water; site development and land use; construction material waste; indoor air quality and comfort; and commissioning, operations and maintenance.

Energy-related provisions in the IgCC build on those found in the IBC, amounting to at least a 5% improvement in energy efficiency compared to standard codes. Like the IECC, the IgCC allows builders to choose to comply using prescriptive- or simulated performance-based pathways; it also offers an

“outcome-based” option, meaning the building’s actual energy use must be monitored over time. The IgCC also introduces a responsibility to reduce the building’s carbon emissions. This is done through software modeling that compares the proposed building to a reference design based on established benchmarks. Additional prescriptive-path requirements include variable-speed fans for large motors; occupancy and daylight sensors for lights; and demand-response capabilities for HVAC equipment. Finally, energy loads must be metered at a disaggregated level, meaning that certain highly water-consuming equipment types must be sub-metered in addition to whole-building metering (International Code Council, 2015c).

Water conservation measures in the IgCC include minimum water efficiency requirements for plumbing fixtures, appliances and HVAC cooling towers. Hot water piping must be limited in length or volume to prevent the water loss associated with waiting for hot water to arrive at the tap. The IgCC also provides specifications for alternative water supply sources such as rainwater collection, reclaimed water and “gray” water reuse systems. Finally, the IgCC requires disaggregated water metering for certain components in addition to facility-level metering (International Code Council, 2015c).

Site development and land use regulations embedded in the IgCC include provisions for stormwater management, erosion control, invasive species removal, and the preservation of natural resources, among others. For example, under the IgCC jurisdictions can choose to ban new construction in floodplains or wetlands (International Code Council, 2015c). Construction material waste must be monitored, and 50% of it must be diverted from landfills. 55% of building materials must be either recycled, recyclable, bio-based or indigenous. Ventilation requirements ensure healthy indoor air, as do limits on the toxic emissions of certain building materials. Occupants must also be prohibited from smoking in IgCC-compliant buildings. There are minimum daylighting requirements, intended to make occupants of green buildings happier, healthier and more productive. Finally, buildings subject to the IgCC must be commissioned, meaning their performance must be verified and monitored (International Code Council, 2015c).

Like all I-codes, the IgCC is designed to be mandatory. This sets it apart from voluntary green rating systems like the Leadership in Energy and Environmental Design (LEED) rating system promulgated by the US Green Building Council. However, some jurisdictions have chosen to adopt the IgCC on a voluntary basis in order to facilitate the transition to mandatory regulation. Many jurisdictions that adopt the IgCC on a mandatory basis will accept LEED certification in place of IgCC compliance. This is because voluntary rating systems include many of the same components as the IgCC, plus additional

best practices. The IgCC also offers additional features for jurisdictions looking to set higher minimum levels of performance (International Code Council, 2015c). This is consistent with the ICC’s approach that allows governments to customize the model codes to suit their needs.

Table 5 summarizes the major features of each of the policy alternatives described in this section.

Table 5: Policy alternatives summary

	Status Quo	IBC	IgCC
Description	No mandatory national commercial building code. La Paz has an internally developed municipal building code, passed originally in 1986 but not enforced until recently. Santa Cruz adopted a building code in 2015 and is still working on enforcement. Cochabamba has a zoning code only. No cities conduct on-site inspections, only plan reviews	The most fundamental of the ICC’s model codes. Outlines minimum standards for new commercial buildings. Mainly focused on safety, with some references to basic energy efficiency features	The newest ICC model code. Includes sections on energy, water, land use, construction material waste, indoor air quality and comfort, and ongoing building operations
Major features	<ul style="list-style-type: none"> • Earthquake resistance (national) • Structural engineering specifications (La Paz and Santa Cruz, at planning stage only) • Handicapped accessibility (La Paz) • Fire prevention (Santa Cruz) • Height and land use restrictions (Cochabamba) 	<ul style="list-style-type: none"> • Structural requirements, including earthquake resistance • Fire prevention • Handicapped accessibility • Plumbing, electrical & mechanical design & installation • Energy efficiency at the building shell level (e.g. insulation, air sealing, windows) 	<ul style="list-style-type: none"> • Energy efficiency at a disaggregated level (e.g. submetering for HVAC equipment), plus carbon emissions reduction • Water efficiency • Land use • Building material waste reduction • Use of recycled content • Daylighting

4. ANALYSIS

We analyzed the policy alternatives according to each of our evaluative criteria, namely effectiveness, economic impacts and feasibility (see Section 2.2 for definitions). We started by analyzing the status quo option of continuing to develop commercial building codes domestically, i.e. without input from the International Code Council. We then analyzed the International Building Code (IBC) and the International Green Construction Code (IgCC).

4.1 Status quo

4.1.1 Effectiveness

The United Nations Environment Programme states that policy effectiveness judges “how the actual effect measures up to the policy objective. This is a performance assessment of the policy (United Nations Environment Programme, n.d.).” In this section, we analyzed the effectiveness of the current building codes in Cochabamba, La Paz and Santa Cruz by characterizing and summarizing the survey responses of Bolivian stakeholders.

Perceptions of current code effectiveness

Due to governments’ lack of capacity and industry’s disregard for code compliance, Bolivian stakeholders did not view the current building codes in Bolivian municipalities to be very effective. 50% of stakeholders said the current codes were either not very effective or not effective at all, versus only 6% who said they were effective or very effective (Figure 1). Similarly, 53% said industry compliance was either low or non-existent, versus only 6% who said compliance was favorable (Figure 2).

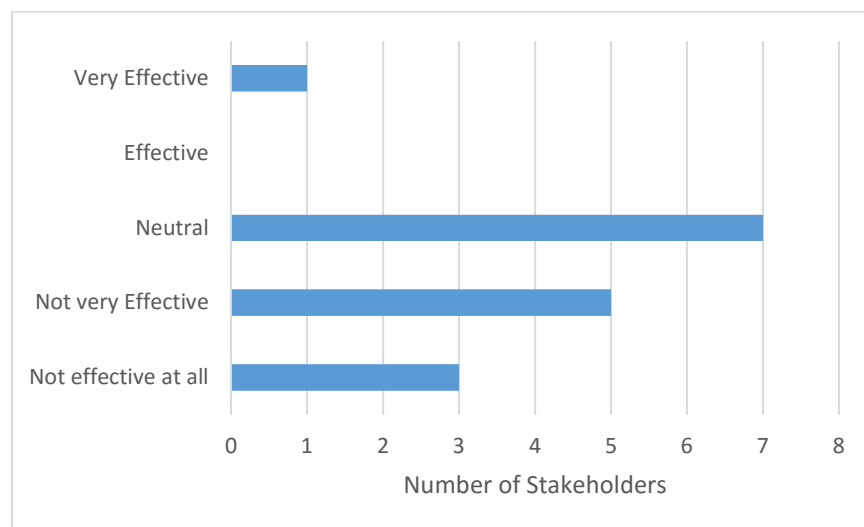


Figure 1: Perceptions of current building code effectiveness in Bolivian cities (Bolivian stakeholders, n=16)

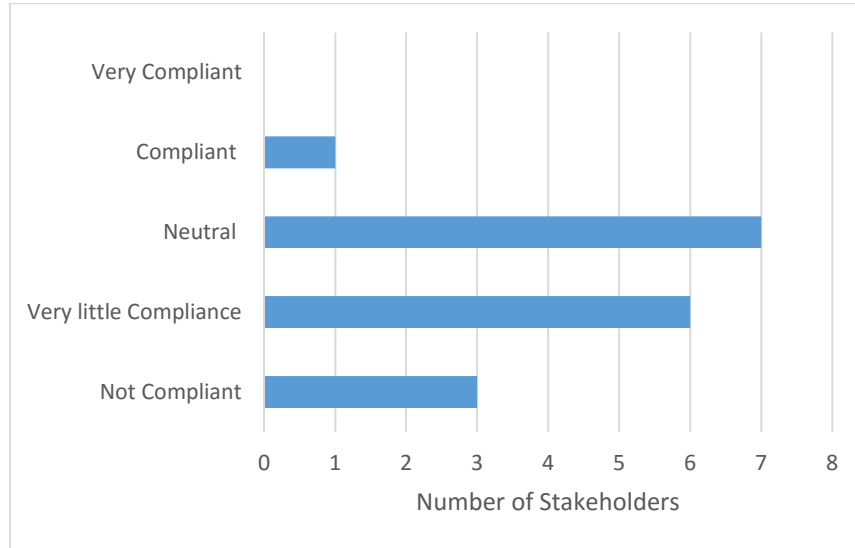


Figure 2: Perceptions of current building code industry compliance in Bolivian municipalities (Bolivian stakeholders, n= 17)

To gain a better understanding of why building codes were perceived as ineffective, we asked stakeholders if the codes were designed based on existing codes in surrounding cities and/or countries. Overall, building codes in Bolivia appear to draw upon current building codes from a range of different countries. For example, a stakeholder from La Paz stated that the municipal government referenced policies from Rome, Mexico, Argentina and Brazil to create the current building code (BL-9-L). It is interesting to note that despite being located in different climate zones, both Cochabamba and La Paz used Mexico and one European code for guidance (BL-9-L).

One Bolivian architect expressed that codes in Cochabamba were created using building codes from Honduras, Mexico, Peru and Spain as references (BL-2-C). These countries offered guidance on developing residential codes, accounting for climatic differences, and enforcing policies. Although some codes, such as Mexico’s building codes, are developed according to international standards, other country codes did not utilize international standards. Therefore, one reason that Bolivian codes are perceived as ineffective may be that they were based off of ineffective or outdated building codes in other countries. The following paragraphs further explain the weaknesses of referring to building codes of fellow developing countries.

While La Paz and Cochabamba drew upon a variety of international building codes, they both referenced Mexican building codes, which were based on international standards. Mexico and Honduras were recognized by the ICC for implementing its International Residential Code, or IRC (International Code Council, 2015). Although Bolivian municipalities referenced the I-Codes in both Mexico and Honduras, it is important to note that these codes were strictly residential. Therefore, construction elements specific to commercial buildings were overlooked. Another key difference to note is the mandatory versus voluntary status of building codes in each of these countries. While Bolivia references the mandatory Peruvian, Brazilian and Argentinian codes, the Bolivian Guide to Building Construction remains optional. Compared to a mandatory building code, a voluntary code is difficult to measure and enforce, leading to questionable effectiveness.

Useful features of other international building codes include climate-zone-specific policies. In 2003, Peru published a national building code that is divided into three geographical zones and includes specific information about earthquake-resistant design (Peru Japan Center of Seismic Research and Disaster Mitigation, 2003). Argentina has a National Construction Standard for Earthquake Restraint that includes regional zoning and building classifications (Center of Investigation of National Regulations of Security for Civil Works, 1991). While these codes take into account regional characteristics, they are not without their weaknesses—for example, Argentina’s national code has not been updated since 1991 and is likely obsolete (Center of Investigation of National Regulations of Security for Civil Works, 1991). In Brazil, periodic updates of codes are also not required, which leaves codes vulnerable to becoming outdated (Brazilian Standards Association, 2002). While it is good that Bolivia has referenced codes from other South American countries, the effectiveness of these codes is difficult to measure due to the lack of available data and lack of periodic updates.

When asked about ways to improve the current building codes, stakeholders responded with various suggestions. One architect responded by saying:

“Update the code in the light of the new contemporary problems of cities. Introduce environmental aspects. Change regulations for apartment buildings. Modify indexes of land use. Promote collective ownership of land. Create land banks or reserve projects for public spaces. etc. etc.” (BL-4-C).

Another architect proclaimed that governments must “visualize the city in 5, 10, 20 years into the future; investment must be mutually beneficial to the public and the government” because currently, “institutions work without a common goal of population growth” (BL-5-C). When stakeholders were asked if the current building codes within their cities had a negative or positive effect on their respective city, only one person gave a positive response. 23% of respondents had a neutral perspective about the current building code, while 71% of survey respondents believed the current building codes have a negative effect on their respective cities (Figure 3).

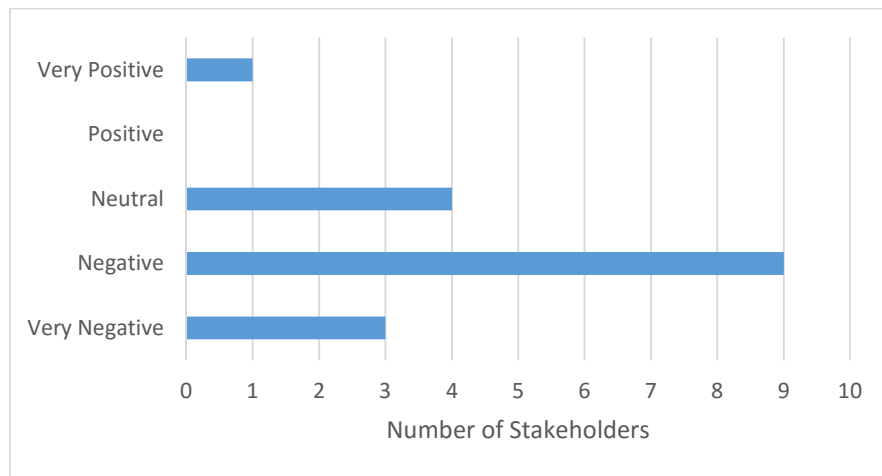


Figure 3: Attitudes toward current building codes in Bolivia (Bolivian stakeholders, n =17)

Other potential reasons for the negative perceptions associated with the current building codes include rapid urbanization, the lack of education and compliance of codes, corruption, and environmental deterioration. Governments, unprepared to handle the pressures of population increases and migration patterns contributing to urban sprawl, have failed to ensure efficient city planning and development. An architect from Cochabamba noted that “urban development is not homogeneous, it is chaotic” and “has no architectural identity” (BL-6-C). Engineers in La Paz are worried about city development at this rate, explaining that “vertical construction permits are unconscionable and city services do not supply the demand. There are no clear regulations on industrial safety or the usage of wood” (BL-10-L). The ineffectiveness of the current building codes, due to the inability to prepare for the insurgence of citizens from rural to urban areas in recent decades, is evident.

Corruption

Corruption can have an impact on the political landscape of any municipality in a developing nation. When a matrix-coding query was conducted to view the themes associated with building code

compliance, themes of corruption and politics are the most noted themes (Figure 4). Political figures, in hopes of keeping their positions, must appease their supporting constituents. In Cochabamba, the politicians “use regulations and codes to meet their voters. Time and time again, social pressures are placed on political figures to review codes to meet interests of certain public sectors” (BL-6-C). Most politicians want to be re-elected and will work to gain the favor of the private-sector stakeholders who make re-election possible. In a country where 45% of the population lives below the poverty line, the power and wealth associated with land procurement can entice private industries and local government authorities to work together unconventionally (Central Intelligence Agency, 2016).

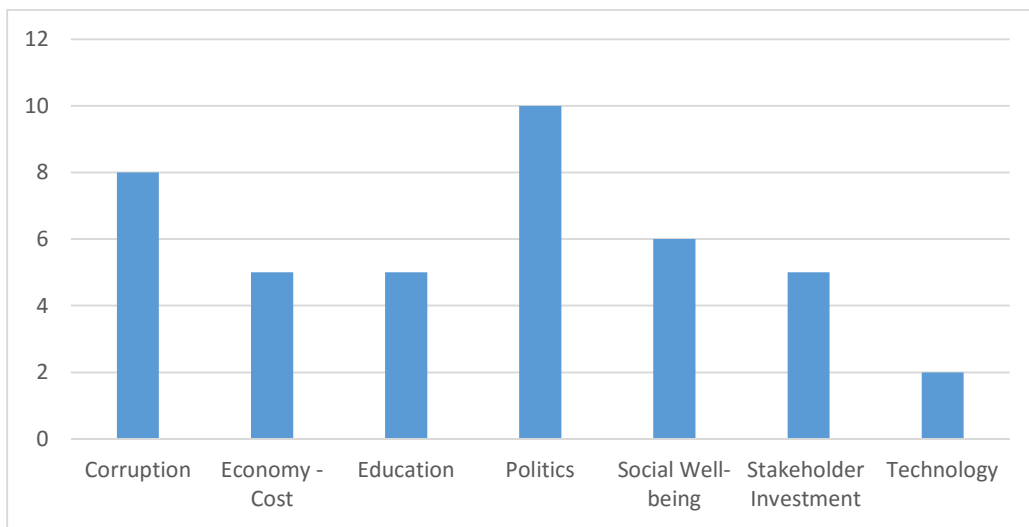


Figure 4: Most referenced factors impacting compliance with current building codes (Bolivian stakeholders, n=23)

4.1.2 Economic impacts

To compare the benefits and challenges of current building codes with reference to the economy or cost, we used a matrix-coding query. The query found two examples of the current building codes benefitting the economy and seven examples of how the current building code presents challenges to the economy (Figure 5). The majority of stakeholders did not feel capable of providing information or data about costs, yet a few expressed negative perceptions about the economic impacts of building codes. One architect from Cochabamba suggested that “current codes benefit more commercial activity. While encouraging more private investment, these codes do not favor the majorities” (BL-6-C). According to a professor in Cochabamba, the current building codes have “exaggerated the price of land and buildings” (BL-7-C).

On the other hand, another architect believed that if industries were to comply, or municipal authorities were able to efficiently enforce the current code, these codes could “generate resources for the institution” (BL-9-L). In light of the conflicting perceptions of stakeholders, gaining an estimate of the overall economic impact that the current building codes have had on the municipal government has been challenging. In sum, we were unable to determine whether or not the current building codes have been more economically beneficial than costly.

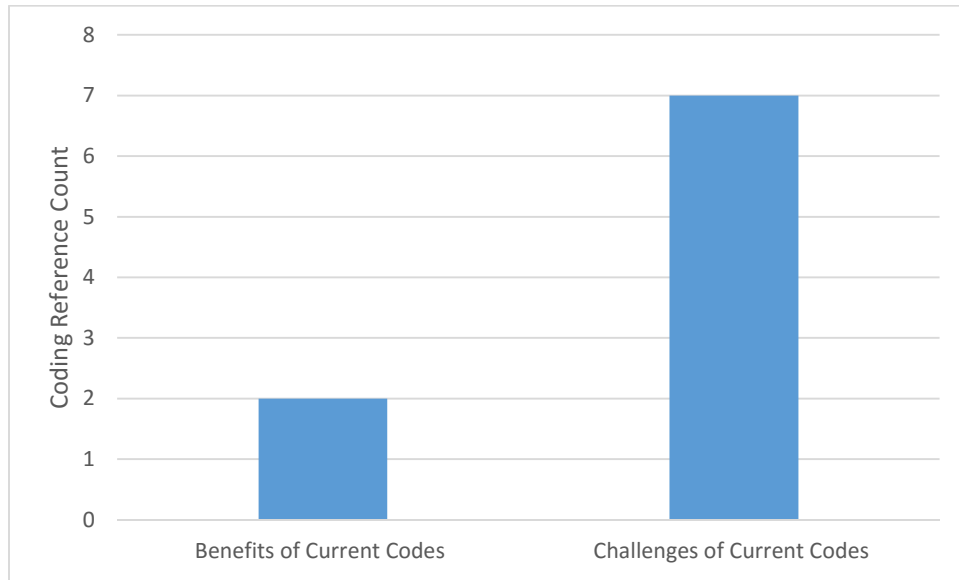


Figure 5: Perceptions of economic benefits and challenges of current building codes (Bolivian stakeholders, n=23)

4.2 International Building Code

4.2.1 Effectiveness

The International Building Code has been shown to substantially mitigate safety and health risks in the face of natural disasters. According to the World Bank, “building and land use regulation have proven the most effective tools to limit chronic stresses such as structural failure, fire, spontaneous collapses and unhealthy conditions” (World Bank Group, 2015). In one analysis done after Hurricane Charley that hit the Caribbean and the southeastern United States in 2004, it was estimated that building codes reduced the severity of losses by 42% (World Bank Group, 2015).

A recent report by the BuildStrong Coalition, a consortium of businesses, trade associations and emergency management officials, agrees. They conclude that “the best way to facilitate resilient construction is through strong and enforced building codes” (Buildstrong Coalition, 2015). For example, they cite a Louisiana State University study which estimates that strong building codes could have

reduced wind damage by 80% during Hurricane Katrina (Buildstrong Coalition, 2015). However, because building codes are seen as a relatively mundane topic, they are often overlooked.

In addition to mitigating disaster risk, the IBC helps combat air pollution and climate change by mandating basic energy efficiency measures. The management consulting firm McKinsey & Company recommends mandatory building codes as one of the most important areas for near-term government action to reduce energy use and carbon emissions (Granade et al., 2009). The reason building codes are so effective is that they force builders to consider energy efficiency up front rather than after the fact. This distinction is crucial, as it costs five times more to install energy efficiency measures as a retrofit than it does to incorporate them during initial design (Granade et al., 2009).

4.2.2 Economic impacts

The total cost to implement the IBC in Bolivian cities is difficult to predict. We have as a starting point a preliminary estimate of how much the International Code Council would charge in consulting fees to assist in the code development process. A project manager for the ICC predicts that a first phase of code development proceedings in Bolivia (nationwide) would cost municipal governments between roughly US\$500,000 and \$5 million, depending on the scope of the engagement and other factors. This would include an analysis of the existing regulations, a draft of the proposed building code, assistance in drafting any supporting legal frameworks, and a proposed work plan with timelines and budgets. It is unclear whether these fees could be scaled down if working at the municipal level or if they are fixed. Additionally, there would be costs associated with Bolivian officials' time and resources. The overall cost, therefore, cannot be estimated at this stage with any reasonable certainty.

We do know, however, that investments in commercial building codes in United States have been highly economically beneficial. Federal dollars spent on building codes demonstrate a 400% return on investment (Multihazard Mitigation Council, 2005). These results are not entirely representative of the figures that Bolivian governments can expect because in the United States, the federal government often steps in to provide emergency relief following natural disasters (Buildstrong Coalition, 2015). In Bolivia the government may not do this, in which case disaster mitigation efforts do not directly result in a reduction of future government outlays. Nevertheless, when buildings are destroyed, owners are less able to pay taxes and contribute to economic productivity, so in the long run, the government's revenue declines. Therefore, codes such as the IBC that promote basic building safety are typically a sound financial investment for city governments.

Additionally, numerous studies suggest that the energy efficiency measures referenced in the IBC are highly NPV-positive, meaning that they save more money than they cost even after discounting future savings back to present-year dollars. Every dollar spent on basic building code compliance and enforcement by local jurisdictions in the United States returns six dollars in energy savings, equivalent to a 600% return on investment (World Bank Group, 2015). At the federal level, \$26 million in incentives for states to update commercial building energy codes would yield \$990 million in total present-value benefits to society over 10 years, according to one recent study (Gilbraith, Azevedo, & Jaramillo, 2014). This would amount to a 3,800% return on investment thanks to impact reductions in categories such as human health, climate change, and ecosystem services (Gilbraith et al., 2014).

4.3 International Green Construction Code

4.3.1 Effectiveness

The IgCC is capable of mitigating certain important types of environmental impacts. In a study by the National Institute of Standards and Technology, IgCC-compliant buildings in the U.S. performed an average of 14% better on environmental metrics than those built to standard codes like the IBC (Suh, Tomar, Leighton, & Kneifel, 2014). This analysis used an environmental life-cycle analysis methodology, which evaluates all types of environmental impacts. Global warming and respiratory health impacts, which are important to Bolivia as mentioned in Section 3, were each reduced by over 20% (Suh et al., 2014).

One way the IgCC does this is through stronger energy conservation requirements. By definition, the IgCC results in at least a 5% energy savings over the IBC (International Code Council, 2015b). In practice, green buildings as whole use 25-30% less energy than conventional code-compliant buildings in the United States (The U.S. Green Building Council, 2013). The USGBC figures include data from LEED-certified buildings as well as IgCC-compliant buildings. Notably, however, the IgCC and the supposedly more advanced LEED rating system showed no statistically significant difference in overall performance in terms of life-cycle environmental impacts (Suh et al., 2014).

IgCC-compliant buildings also use less water than IBC-compliant ones, since the IgCC is the only ICC code that incorporates water efficiency measures. Studies of water savings in IgCC-compliant commercial buildings range from 10% (Suh et al., 2014) to 39% (The U.S. Green Building Council, 2013). This results in less depletion of freshwater resources, which is important for Bolivian cities struggling to maintain reliable access to drinking water in the face of climate change.

On the whole, the IgCC's ability to improve human health and combat environmental degradation is more uncertain than the IBC's ability to mitigate disaster risk. Environmental problems stem from many more causes than just commercial buildings, so even substantial improvements to the buildings stock can have only limited effects on issues like pollution and less climate change. Also, green building codes are quite new, so there has been little opportunity to evaluate their impact. Nevertheless, the IgCC performs well on certain key metrics of environmental degradation such as air pollution, global warming and freshwater depletion.

4.3.2 Economic impacts

If green features are incorporated in the design phase, the cost premium (or extra cost associated with green buildings versus standard construction) is negligible, and the benefits are numerous and highly NPV-positive. Benefits include savings in future operational expenses, higher asset values, and health and productivity benefits (The U.S. Green Building Council, 2013). According to the state of California, an increase in up-front costs of roughly 2% for green building design would produce average life-cycle savings of roughly 20% of total construction costs—a 1,000% return on investment (Kats et al., 2003). Moreover, the 2% average cost premium is skewed upward by a small number of buildings striving to meet very aggressive targets.

Many builders find that they are able to build to green standards for no extra cost whatsoever, or in some cases, for less cost. A comprehensive literature review found actual green design and construction premiums in the range of -0.4% to 12.5%, meaning that some green buildings actually cost less than conventional ones, while very ambitious projects can cost up to 12.5% more. For the majority of green-certified buildings, the cost premium ranges from zero to 4%, and that premium is declining over time (The U.S. Green Building Council, 2013). Another study by a third-party consultant to the ICC found “no significant difference in average cost for green buildings as compared to non-green buildings” (Davis Langdon, 2007).

The financial benefits of green buildings include lower water and energy usage costs as well as reduced operations and maintenance costs, which are directly transferrable to Bolivia. For example, an efficient light bulb saves energy and must be replaced less often, leading to lower utility bills as well as reduced labor costs (The U.S. Green Building Council, 2013). These benefits greatly exceed the costs; in fact, the energy savings alone are more than enough to justify any increased up-front costs for green buildings in the U.S. (Kats et al., 2003).

Of course, the benefits described above accrue to private building owners and only indirectly to governments by way of an increased tax base. To examine the economic benefits of implementing the IgCC from the perspective of a municipal government, we were forced to use data from the green building industry in the United States as a proxy for what might be possible in Bolivia. Developing-country applications have many confounding factors which could make it more difficult to achieve the same level of economic impacts from green code development in Bolivia as have been seen in the U.S. Nevertheless, we used the data we had available to make educated inferences about the impacts on Bolivian cities. For simplicity, we assumed a one-to-one relationship between the benefits seen in the U.S. and those we projected in Bolivia. Although it is theoretically possible that Bolivia could achieve even better results than the U.S., for our purposes we used this analysis as an estimate of best-case-scenario results.

The IgCC's benefits for municipal governments include the provision of jobs driven by increased construction activity as well as gross domestic product benefits resulting from lower operational costs. We assumed that country-level benefits can be scaled down linearly, according to percentage of population, to arrive at city-level benefits. We felt this was a conservative assumption, given the relative ease of enforcing a policy in high-population centers versus rural areas. The cost of implementing the IgCC was not considered here due to lack of sufficient data on the incremental cost of adopting an overlay code.

From 2015 to 2018, the commercial green construction industry in the United States is projected to support 3.9 million jobs and \$303.4 billion in GDP (Booz Allen Hamilton, 2015). Of this amount, 1.4 million jobs and \$108.4 billion will be attributable to LEED-certified construction (Booz Allen Hamilton, 2015), and since no other green rating system has significant market share in the commercial sector (CBRE, 2015)³, we assumed the remainder will be attributable to the IgCC. However, these are not necessarily new jobs or new additions to GDP; they may be transfers from other parts of the economy. Only the direct resource cost savings mentioned above can be truly considered additional.

According to the assumptions above, if the IgCC were implemented effectively in all three of Bolivia's principal cities, it could support up to \$6.1 million in GDP (Appendix 6) and 289 jobs (Appendix 7) each year during the initial years of full implementation. This is in addition to roughly \$300,000 per year in

³ The CBRE report lists EnergyStar as a green rating system. However, EnergyStar is typically considered an energy efficiency standard, not a true green rating system. Booz Allen Hamilton does not count EnergyStar as a green rating system, leaving no other green building certification program besides the IgCC.

direct resource cost savings (Appendix 8). Resource cost savings are directly transferable to other contexts and therefore represent a low-end estimate of IgCC’s projected economic impacts in Bolivian cities, while the jobs and GDP figures represent additional potential benefits in a best-case scenario.

Table 6 summarizes the analysis presented for each policy alternative thus far.

Table 6: Effectiveness and economic impacts summary for all policy alternatives

	Status Quo	IBC	IgCC
Effectiveness			
<i>Safety</i>	When enforced, may reduce natural disaster losses to an unknown degree versus no codes	42-80% reduction in natural disaster losses versus no codes in the U.S. Likely comparable in Bolivia	Negligible improvement over IBC
<i>Environment</i>	No data available	Energy savings versus status quo in Bolivia likely significant but not known with certainty	10-39% water savings and 20% reductions in climate change and respiratory health effects versus IBC in the U.S. Likely comparable in Bolivia
Economic impacts			
<i>Costs</i>	No data available	~\$500k-\$5M in ICC consulting fees. Unknown additional costs for Bolivian officials to develop regulations and to train and deploy inspectors	Negligible additional code development costs above and beyond the IBC. Additional inspector and builder training required (cost unknown)
<i>Benefits</i>	No data available	Dollar amount of reduced disaster losses versus status quo in Bolivia likely significant but not known with certainty	\$300k/y in direct resource cost savings across the 3 cities versus IBC. Also could support up to \$6.1M/y in GDP and 289 jobs, but these may represent transfers from other industries
<i>Return on investment</i>	No data available	400%-600% for municipal governments and 3,800% for federal incentives in the U.S. Performance in Bolivia would depend on enforcement	600%-1,000% for builder in the U.S. (and indirectly to governments through added GDP.) Performance in Bolivia would depend on enforcement

In order to achieve these potential impacts, policies must be able to achieve adoption through the political system in each respective city. This means that a critical mass of stakeholders must support the policy, and those groups must have sufficient political influence. Moreover, to achieve maximal results, the policies must be implemented with fidelity the original intent of the codes—in other words, municipal governments must have the financial and human capital to implement and enforce them properly. Thus, we analyzed the feasibility of adopting and implementing new building codes, beginning with a review of the stakeholders in a previous infrastructure policy effort, the Bolivian “water wars.”

4.4 Stakeholder analysis of Bolivian water privatization policies

In order to understand the political feasibility of new commercial building codes in present-day Bolivia, it is key to first understand the outcomes of previous infrastructure development projects and the role that major stakeholders played in their overall outcomes. As mentioned in the Framework and Methods sections, our political feasibility analysis draws upon detailed documentation of the “water wars” in Bolivia during the late 1990’s to early 2000’s surrounding the various successes and failures of water privatization schemes. The water wars highlighted the tension between the municipal governments in Bolivia (which enforced a water privatization policy at the urging of international stakeholders) and the local stakeholders (who were not involved during the policy planning process, but were on the receiving end of high rate increases due to the privatization policies).

Analyzing how stakeholders were engaged during the government’s attempt to adopt privatization policies in the Bolivian water wars helped us understand stakeholders’ perceptions of international involvement and shed light on how to proceed with future infrastructure development projects. While various Bolivian stakeholder groups may differ in their stance on developing building codes versus water privatization (as evidenced by the support our project received from local stakeholder groups and think tanks during our visit to Bolivia in March 2016), the groups of identified stakeholders remains the same: central government, municipal government, international stakeholders, local stakeholders, and non-profit stakeholders. In the case of building codes, local stakeholders may be more supportive while government stakeholders may be more opposed due to the fact that the cost of developing and enforcing building codes would fall on the government (as opposed to the cost falling on the local stakeholders as seen in the water wars). The World Bank identifies strategic communication and stakeholder engagement as key strategies for achieving social and political sustainability in privatization and public-private initiatives (Calabrese, 2008).

Given that Bolivia is still largely financially dependent upon foreign aid for infrastructure development (CAF, 2015; Fritz, 2006), it is likely that the private sector will still play a primary role in infrastructure development projects, including the development of building code policies. Key funders, such as the World Bank, explicitly state their belief that private sector engagement is essential to promoting increased private investment in key infrastructure in Bolivia (The World Bank, 2015). This is particularly true because limited public funding will be unable to cover the costs of necessary repair and expansion needs, whereas the international private sector will be able to raise capital from private markets (Nellis, 2006).

Such development projects will also likely involve some form of public-private partnership, given that key funders such as the Inter-American Development Bank view this as necessary to develop a shared agenda with the private sector to incorporate green policies in industrial regulatory frameworks in Latin America (Inter-American Development Bank, 2015).

In light of the Bolivian government's dependence on foreign aid, we conducted case studies of privatization efforts of water infrastructure in Santa Cruz, La Paz and Cochabamba to better understand how stakeholders were or were not engaged in the development of privatization policies and how that led to the success or failure of privatization in each city. Understanding what groups of stakeholders are essential to a policy's political feasibility in La Paz, Cochabamba and Santa Cruz helps us develop a strategy to maximize the political feasibility of new commercial building codes in each city.

Water privatization efforts throughout Bolivia span a time period when the country transitioned from neoliberal to decentralized/socialist policies and highlight the role that politics played in infrastructure development. The success of water infrastructure development through cooperatives in Santa Cruz, compared to the failed privatization efforts in La Paz and Cochabamba, demonstrate that there is not a "one size fits all" strategy towards implementing infrastructure development policies. First, we conduct a stakeholder analysis on national players, followed by city-level stakeholders (Section 4.4). Our analysis of the political climate nationally as well as in each of the three cities helps us determine the political feasibility of the status quo, IBC and IgCC in each respective city (outlined in Section 4.5).

There are various strengths and weaknesses of comparing national- and city-level stakeholders in our analysis. Mapping stakeholders at both the national and city levels allows us to highlight the various local political climates (an important feature when examining a decentralized government) and map the levels of political power of local stakeholder groups. Not only will such information be useful for

understanding national stakeholders crucial to a policy's adoption across the country, but it also allows us to take a more granular look at the primary stakeholder groups that should be engaged in each city and analyzes how different groups may view and respond to a specific policy (Nash et al., 2006). Such a city-focused analysis can also enable us to identify the various stakeholder interests, potential conflicts and risks, opportunities and potential partnerships, and the groups likely to be impacted by a policy. Another strength of conducting stakeholder analyses at both the national and city levels is the ability to be repeated relatively quickly and easily. Stakeholder analyses are meant to be iterative. Their flexibility and simplicity help ensure that green building code policy makers will be able to utilize this methodology frequently at the national and city levels to understand how stakeholders have changed their political positions at each of the stages of policy making: identification, design and appraisal (Nash et al., 2006).

Comparing both national- and city-level stakeholders is not without its weaknesses. There is the possibility that not all of the stakeholders we identify at the national and city levels will be relevant to building code policy adoption (however, we do our best to identify stakeholder groups which are important to general policy adoption as opposed to water policy-specific stakeholders, and to draw general conclusions that inform our strategy and recommendations for stakeholder engagement). The national and city stakeholders we identify remain relevant only if the policy of decentralization still holds in Bolivia (which allocates decision making power to municipalities). In light of the recent failure of a 2016 referendum which would have allowed Evo Morales to remain in office for a fourth term, Bolivia will see new leadership in 2020 (Casey, 2016). The policies and political agendas of the next Bolivian president will affect the influence that stakeholders will yield in the future, and there is a possibility that the dynamics between central and municipal governments could change.

Overall, a stakeholder analysis at the national and city levels provides us with necessary insights to develop a stakeholder engagement plan under the current political conditions. Should the political dynamics change from the status quo, it will be imperative to conduct another stakeholder analysis.

4.4.1 National level stakeholder analysis

Before analyzing the implications of water privatization policies on a city level, an evaluation of the roles of national and international stakeholders whose actions have nationwide implications helps us understand Bolivia's overall political climate and allows us to develop a context for the political pressures placed on primary stakeholders in each city.

In 1982, Hernan Siles Zuazo assumed the presidency of Bolivia for a second time, yet again overthrowing the military dictatorship that had ruled Bolivia in the early 1980s (Holloway, 1996). Three years into Zuazo's presidency, Bolivia experienced hyperinflation with prices of its main export, tin, dropping from \$5 per pound to a few cents (Gumucio, 2005). Facing an economic crisis and political instability, Bolivia (over the course of several different presidencies) turned to the World Bank for help with designing a stabilization plan. During this period, the World Bank prioritized financing large infrastructure projects such as dams and highways in developing countries (Shultz, 2008).

Large infrastructure projects began gaining traction in Bolivia during Hugo Bánzer's presidency of 1997-2001; Bánzer followed a neoliberal approach and was financially backed by international donor agencies such as the International Monetary Fund in addition to the World Bank (Shultz, 2003). Neoliberal policies mandated the selling or leasing of public enterprises to private investors, who were typically foreign corporations. In 1997, the World Bank required that Bolivia privatize its potable water service in order to receive a \$600 million debt relief loan (Pineo, 2014; Schultz, 2003). Complying with the World Bank's directives, Bánzer sold the publically owned water systems in Cochabamba and La Paz to foreign corporations with the intention of converting water systems into efficient and profitable businesses. Santa Cruz was relatively unaffected by such policies as it already had an efficient water cooperative in place.

Following years of political unrest and over the course of several short-term presidencies, Evo Morales assumed presidency and has maintained the role of president to this day. Appealing to the populace, Morales transitioned the government from neoliberalism to decentralism. The transition to a decentralized government shifted political power and decision making from the central government to the municipal government (Appendix 13 and Appendix 14). A decentralized government that is still heavily dependent upon foreign aid presents a unique situation in which international stakeholders still yield a high level of influence on national policies but can be met with varying degrees of political acceptance or resistance according to the city-specific stakeholders involved (Appendix 9).

The following sections analyze the results of water infrastructure development efforts in Cochabamba, La Paz and Santa Cruz in light of the global aid pressures placed on the Bolivian government. This allows us to identify primary city-level stakeholders who might provide support for or opposition to future infrastructure policy projects such as the development of new commercial building codes like the IBC or IgCC.

4.4.2 City-level stakeholder analysis

Given the current emphasis on municipal governments as the main decision making entities, it is important to analyze Cochabamba, La Paz and Santa Cruz on a case-by-case basis to identify unique stakeholders in each city. Understanding the interests of stakeholder groups and the distribution of power between them informs us of the order in which stakeholder groups should be addressed during the infrastructure planning and development stages in order to maximize a project's political feasibility.

4.4.2.1 Cochabamba

The case of Cochabamba provides us with an example in which the Bolivian central government attempted to enforce privatization upon a public water infrastructure and was met with highly publicized local resistance and ultimately failure. Between the 1950s and early 2000s, Cochabamba's population grew about seven-fold, and heavy development led to a water scarcity problem that urgently needed to be addressed (Shultz, 2008). Reviewing the actions and interests of the involved stakeholders (Appendix 10), we develop an understanding of why efforts to privatize were unsuccessful, enabling us to design a stakeholder engagement plan to ensure that future infrastructure development projects are politically feasible. By understanding which stakeholders to engage during policy adoption and in what order, the client can attempt to maximize community buy-in and create a favorable political environment in Cochabamba for the adoption of new commercial building codes.

Central government stakeholders

Bound by Law 2029 (to privatize water service and legitimize the World Bank's mandates), Bánzer sold off Cochabamba's municipal water rights to U.S. Bechtel Corporation's Agua del Tunari (Pineo, 2014). Agua del Tunari's privatization transformations included raising water rates by as much as 200% (Shultz, 2003) and went as far as charging for rainwater collection or drawing water from personal wells (Pinero, 2014). In response to such drastic rate increases, the public mobilized and utilized pressure tactics such as protests and roadblocks to call attention to the injustice they were experiencing.

Countering the protests led by Cochabamba's citizens, Bánzer's administration retaliated with tear gas and military force, resulting in over a hundred locals wounded and one fatality (Shultz, 2008). There were a series of negotiations that followed the general of pattern of the government yielding to public pressure, failing to follow through with promised concessions, experiencing protests and blockades by the general public, and finally reacting with military violence against demonstrators (Shultz, 2003). It was the persistence of the coalition of local stakeholders, La Coordinadora, in protesting which ultimately ousted the Bechtel Corporation in 2000 in favor of a publically controlled water company.

In 2006, socialist Evo Morales assumed presidency under a campaign that represented the opposition to neoliberal policies and transnational corporations. His presidential regime focused on the delegation of authority to municipal governments, in an effort to decentralize power (Lozada et al., 2014).

Overall, while the central government initially was very influential in mobilizing infrastructure development programs, it lost its legitimacy through its refusal to serve the needs of its local stakeholders (Shultz, 2003). Currently under Morales' regime, the central government no longer holds as much decision making power as it once did and should not be considered the primary stakeholder to engage in future infrastructure development projects.

International stakeholders

In 1967, Cochabamba secured a US\$14 million water infrastructure loan from the Inter-American Development Bank (IDB) under the condition that the city set up the public water company Servicio Municipal de Agua Potable y Alcantarillado (SEMAPA) to manage the water infrastructure development (Shultz, 2008). SEMAPA was largely inefficiently managed and did not meet the needs of the growing population (see Municipal Stakeholders section below).

In 1997, the World Bank mandated the privatization of SEMAPA as a condition for \$600 million USD in foreign debt relief (Gerhardt, 2010). In 1999, the private enterprise Aguas del Tunari (owned by U.S. based Bechtel Enterprises and London-based International Waters Limited) was the only bidder for SEMAPA under a contract promising control of SEMAPA for 40 years with a 16% annual return (Ecole Superieure de Commerce de Pau, n.d.). The burden of generating such profits fell solely upon the water customers, and in light of subsequent protests, the World Bank urged Bánzer's administration to refrain from awarding subsidies for the increase in water rates (Pineo, 2014).

The ability of multilateral international organizations and private corporations to influence central government policies and mandate specific development projects attests to the donor-driven nature of infrastructure development in Bolivia (Molenaers et al., 2002). While Morales' current regime attempts to put power back in the hands of the people, the country's impoverished state requires that it continue to rely on foreign monetary aid (USA International Business Publications, 2008), giving international stakeholders a fairly high level of influence and power.

Municipal stakeholders

Before privatization efforts during Bánzer's administration, the Cochabamba city mayor acted as the head of SEMAPA. Consequently, SEMAPA was largely influenced by political interests and was rife with

corruption and mismanagement; any water expansion efforts that did occur happened to be concentrated in Cochabamba's wealthy neighborhoods, necessitating the development of independent water communities in the poorer neighborhoods (Shultz, 2008).

The public's antagonistic view of private corporations (developed after Aguas del Tunari's exorbitant rate increases and practice of disconnecting water services to non-paying customers) enabled Evo Morales' decentralization campaign to succeed in office. Currently, Morales' administration focuses on divesting power away from the central government and into the hands of municipalities. Under this current policy, municipal stakeholders are quite powerful in their ability to endorse infrastructure projects. Consequently, municipal stakeholders in Cochabamba should be treated as primary stakeholders and engaged early in the planning stages.

Local stakeholders

In opposition to the rapid water rate increase imposed by Aguas del Tunari, factory workers, farmers and environmental groups formed the Coalition for the Defense of Water and Life (La Coordinadora). La Coordinadora organized citywide strikes, blockaded two main highways and occupied the city's central plaza (Cadambi, 2010). Such pressure tactics were highly publicized by various media outlets such as the Pacific News Service, the San Francisco Chronicle and the New York Times (Sadiq, 2002). Although the press does not carry much monetary or political clout, it serves an excellent medium for increasing the influence and power of local stakeholders through its ability to engage the international community.

Local stakeholders generally hold little monetary power or political influence, but their strength in numbers and ability to mobilize into civil society organizations and employ pressure tactics demonstrates their ability to veto government and private sector decisions. Even though the local population was able to have the privatization efforts repealed, they still are facing water scarcity problems to this day (Forero, 2005). The uprisings in Cochabamba suggest that local stakeholders should be engaged early in the policy design and implementation phases. Had the central government and private corporations taken the needs of the citizens into account, they would have hedged themselves against failed investments.

Non-profit stakeholders

Non-profit organizations have the advantage of understanding the culture of the local community and have the ability to engage with communities that are otherwise neglected by the government or private sector. Examples of NGOs working in the space include Water for People, whose mission is to develop

permanent solutions to water and sanitation issues. Water for People has operated in Bolivia since 1997 and has developed partnerships with the Ministry of Environment and Water and the National Service for Basic Sanitation Sustainability (Multilateral Investment Fund, 2013). In Cochabamba specifically, Water for People has developed strategies to address water and sanitation needs and has set a goal of full water coverage (Water for People, 2016). While organizations such as Water for People do not wield power in the monetary sense, they have the potential to be very influential in connecting various stakeholders with similar interests, including local governments, communities, schools, and private and civic society organizations. Non-profits should not be the first stakeholder to engage in development projects (due to their lack of monetary or political power); however, they can act as powerful partners with subject matter expertise and local cultural knowledge, and they should be included in the initial planning stages of infrastructure projects.

Analysis of Cochabamba stakeholders

In order to understand who the primary stakeholders are in order of priority and influence, it is necessary to understand the strengths, weaknesses, opportunities and threats of each stakeholder group. Performing a SWOT analysis of Cochabamba's stakeholders enables us to understand which stakeholders to engage in which order during the planning and implementation process to maximize an infrastructure project's political feasibility (Appendix 14).

Looking at the stakeholders' actions and their resulting impacts during the Cochabamba water wars, we can determine their degree of influence and assign each stakeholder group a priority number.

"Influence" is defined to be the power a stakeholder holds to either facilitate or hinder an activity, whereas "priority" is the order of importance given to meeting the needs of a stakeholder group (Department for International Development, 2003). Ranking the stakeholder groups by their level of influence inferred from our case study (1 = least influential, 5 = most influential) and priority ranking (1 = lowest priority, 5 = highest priority) helps us understand which group of stakeholders to engage at which point in the project implementation process.

A score of "5" indicated the highest ranking of influence (representing the stakeholder with the greatest power to facilitate or impede the policy's objectives), and a score of "1" indicated the lowest ranking of influence. Likewise, a score of "5" indicated the highest ranking of priority (representing the stakeholder whose interests should be addressed first), whereas a score of "1" indicated the lowest priority ranking. Typically, this portion of the analysis is conducted with all stakeholders at the table (with each stakeholder conducting his or her own ranking system of influence and priority of each of the

stakeholders present at the meeting), with the final stakeholder rankings determined by the average of every stakeholder’s ranking systems. Due to limitations on our ability to gather all stakeholders together to inform our understanding of the stakeholder influence and priority landscape, we instead utilized a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis to prioritize and analyze stakeholders (Nash et al., 2006).

To determine rankings based on influence, we assigned a “5” to the stakeholder who was identified from the SWOT analysis to have influence over the greatest number of stakeholders, and assigned the next highest score to the next most influential stakeholder. Likewise with determining rankings based on priority, we assigned a “5” to the stakeholder whose interests were determined to be the most urgent from the SWOT analysis (based on opportunities and threats identified), and assigned the next highest score to the next most prioritized stakeholder group until we either ran out of stakeholders or ranking positions. From our analysis, we did not identify more than 5 stakeholder groups; however, had there been more than 5 stakeholders, ties would have been allowed.

Table 7: Cochabamba stakeholders importance and influence rating

Stakeholder	Priority	Influence
Central government	2	4
Municipal government	5	2
International stakeholders	3	5
NGOs	1	1
Local stakeholders	4	3

Transferring the above scores to a priority/influence matrix, we are able to determine which stakeholders should be identified as key stakeholders (who are able to significantly influence the development project), identified as stakeholders that fall into boxes B, C and D (Figure 6).

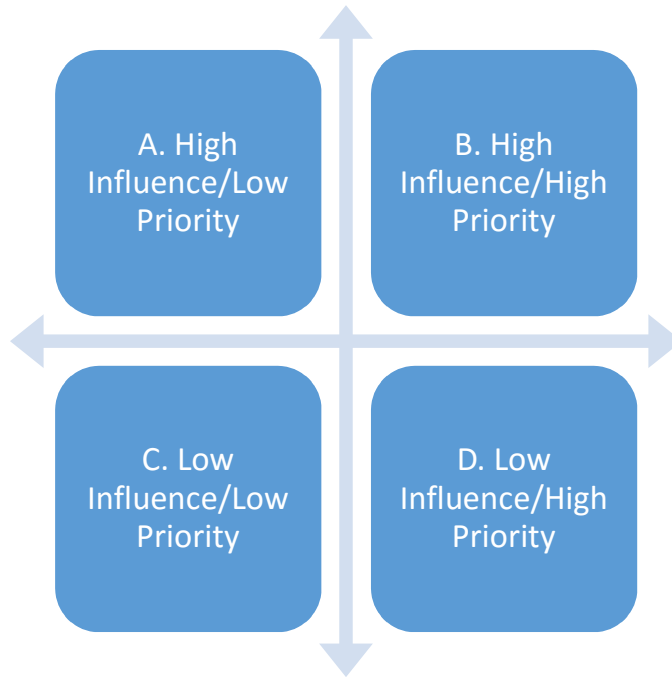


Figure 6: Graphical explanation of stakeholder categories based on level of influence and interest

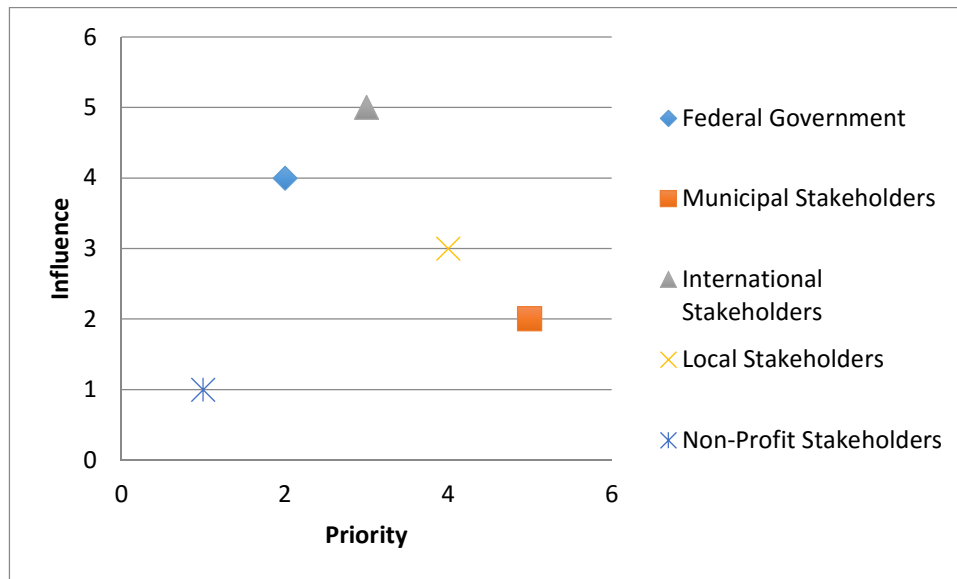


Figure 7: Cochabamba stakeholders priority and influence matrix

To understand how stakeholders should be classified, we divided our priority and influence matrix (Figure 6) into four equally sized quadrants and overlaid the stakeholder categories (Figure 7) on top of

the matrix. Stakeholders were then identified by the box or boxes (“A”, “B”, “C” or “D”) that they fell into.

Stakeholders falling into Box D possess low influence but are of high priority to the infrastructure development project. In Cochabamba, municipal stakeholders (and at times local stakeholders) fall into this category and require special initiatives to ensure that their interests are protected.

Stakeholders falling into Box B can greatly influence a project’s success and need to be prioritized first in project planning stages. In Cochabamba, these parties are international and local stakeholders. Project managers will need to establish excellent relationships with each of these stakeholders to guarantee united support for the development project.

Box C stakeholders are considered low-priority but may need minimal monitoring. In Cochabamba, this group consists of nonprofits and is not the focus of infrastructure development projects.

Box A stakeholders wield high influence but low priority (because their interests are not the target of the development projects). In this case, the central government falls into this category and has the ability to block projects, potentially acting as a “killer risk” (Department for International Development, 2003).

4.4.2.2 La Paz

La Paz’s water privatization efforts follow a similar path to Cochabamba’s (and were perhaps even inspired by the events in Cochabamba) and are known as Bolivia’s “second major water war” (Morales, 2010). In the twin cities of La Paz and El Alto, the water supply infrastructure was first publicly managed and fraught with corruption (Hardy 2009). To address issues of mismanagement, the World Bank mandated privatization (the same mandate that affected Cochabamba) and in 1997, Aguas del Illimani Consortium (a subsidiary of French Suez Group) won rights to the public water system in La Paz (Betrisey, 2015).

Public unrest began growing around private ownership in 2004 due to increasing water rates and intermittent service, resulting in a highly public protest in 2005 that involved a three-day strike and road blockades (Environmental Justice Atlas, 2015). In 2007, Evo Morales’ administration ended the Aguas del Illimani Consortium’s concession, paying around \$18.5 million USD in reparations (Hardy, 2009). Morales created the public enterprise Empresa Publica Social del Agua y Saneamiento (EPSAS), which managed to increase water connections by 40% (Stockholm Environment Institute, 2013). However, it is still greatly dependent on international aid for monetary support and is highly mismanaged, leading to additional protests in La Paz-El Alto in 2008 (Betrisey, 2015). Analyzing the influence of the stakeholders

involved in La Paz's transition away from and back to public ownership (Appendix 9) sheds light upon how stakeholder groups should be prioritized during infrastructure project planning and implementation.

Central government stakeholders

Pressured by the World Bank, which threatened to stop providing Bolivia with international development grants unless the water supply of La Paz and El Alto was privatized, the central government sold the city's publicly managed water system to Aguas del Illimani Consortium. After eight years of mismanaged operations and 5 short-lived Bolivian presidencies, Aguas del Illimani faced protests staged by La Paz residents in 2005. Having learned its lesson with Cochabamba in 2000, the central government publically announced its decision to end the contract with Aguas del Illimani. However, the central government faced the possibility of international litigation, so it struggled to structure a public-private partnership with Aguas del Illimani (Morales, 2010). The central government administration experienced backlash from the public and was forced to enact Supreme Decree 27973, which guaranteed the termination of Aguas del Illimani's contract by a set date (Environmental Justice Atlas, 2015). Ultimately, Evo Morales' regime returned power back into the hands of the public under EPSAS.

As illustrated by its actions in La Paz, the central government experienced a series of unstable presidencies and exercised minimal power in decision-making with regards to infrastructure development—it essentially bent to the will of international donors while also attempting to placate its dissatisfied citizens. Evo Morales has currently been in office for 10 years, providing much needed leadership consistency to the central government. Yet Morales' decentralization approach to governance indicates that the central government is not a primary stakeholder to engage during initial infrastructure planning.

Municipal stakeholders

As seen in the Cochabamba case, La Paz's publicly managed water infrastructure faced corruption and failed to meet the water needs of the poorer neighborhoods in La Paz. Although the transfer of power of public water infrastructure from municipalities to private corporations was an attempt to improve upon current infrastructure systems, it ultimately failed due to the private sector's unaccountability towards the local stakeholders. The transfer of power back to the municipality highlights the public's preference for a system that is held more accountable to its customers, even if operations are not as efficient. La Paz's preference for a municipal system, in addition to Morales' emphasis on the decision making power

of the municipal government through his decentralism policies, indicate that municipal stakeholders should be considered a primary stakeholder to involve in the beginning infrastructure design and implementation stages.

International stakeholders

In 1997, the World Bank, in partnership with the International Monetary Fund, mandated that the Bolivian government privatize its water infrastructure in La Paz in exchange for monetary aid (Sadiq, 2002). The Bolivian central government complied, and Aguas del Illimani Consortium (AISA) won concessions to La Paz's water and sanitation services. AISA raised the cost of residential water and sewage connections by 35%, increasing costs to about 60% of the average La Paz citizen's salary while also discriminating against poor neighborhoods (Environmental Justice Atlas, 2015). While AISA maintained control over the water infrastructure for much longer than Aguas del Tunari did in Cochabamba, it also ultimately lost control due to public dissatisfaction and unrest.

The mismatch of water service provision and customer satisfaction can be pinpointed to counterproductive incentives in AISA's concession contract, which charged households a below-cost rate for the first 30 cubic meters of water. Unfortunately, AISA had not conducted extensive due diligence and did not realize that a household in La Paz-El Alto consumes on average less than 10 cubic meters per month, resulting in net costs to AISA for each new household connection (Cowen et al., 1998). Failing to understand La Paz citizens' consumer behavior, AISA attempted to advertise and conduct hygiene education to urge customers to increase their water usage (Crespo, 2004). While many factors contributed to the failure of privatization efforts, the extent of the failure likely would have been mitigated had international agencies engaged local stakeholders in the planning process.

As mentioned in the case study on Cochabamba, Bolivia is still highly dependent upon foreign financial aid, and there are quite a few multilateral organizations that provide Bolivia with monetary support, including Germany's GTZ and KfW, the Inter-American Development Bank and the Development Bank of Latin America (CAF, 2015; Fritz, 2006). Consequently, international stakeholders yield a high level of influence in La Paz and should be one of the first primary stakeholders to engage in the infrastructure planning process.

Local stakeholders

Similar to the protestors in Cochabamba, the local stakeholders in La Paz utilized pressure tactics consisting of massive demonstrations, hunger strikes, and roadblocks. Organized as the Federation of

Neighborhood Councils of El Alto (FEJUVE), citizens of La Paz-El Alto were able to force the central government's actions on multiple occasions. In early 2005, FEJUVE blockaded El Alto with protests against AISA's management of the water supply systems. Two days after the blockade began, the central government passed a presidential decree cancelling AISA's contract (Fritz, 2006). This decree was met with much criticism from the international aid communities, and as a result, the central government attempted to devise a public-private enterprise as an alternative to privatization. Upset by the central government's concession to foreign institutions, FEJUVE managed to mobilize about 80,000 families—around 10% of the population—to shut down the city, ultimately pressuring the central government to return power of the water supply systems back into public hands (Morales, 2010).

The ability of citizens in La Paz to organize and protest against corporate management of water systems demonstrates the power and political clout that local stakeholders can wield. Taking this into consideration, future infrastructure development projects in La Paz will increase their political feasibility by engaging local stakeholders at the beginning of the planning process.

Non-profit stakeholders

As is the case in Cochabamba, non-profit organizations play more of a supportive role in Bolivia's political landscape, and their strength lies in their ability to connect relevant stakeholders. While non-profits are not documented as being heavily involved in La Paz as they are in Cochabamba concerning water infrastructure issues, they can be powerful stakeholders to involve early in the infrastructure planning stages (despite their general lack of political power) to ensure that the political agendas of all relevant stakeholders are aligned.

Analysis of La Paz stakeholders

In order to understand who the primary stakeholders are in order of priority and influence, it is necessary to understand the strengths, weaknesses, opportunities and threats of each stakeholder group. Performing a SWOT analysis of La Paz's stakeholders enables us to understand which stakeholders to engage during the planning and implementation process and in what order to maximize an infrastructure project's political feasibility (Appendix 13).

Looking at the stakeholders' actions and their resulting impacts during the second water war, we can determine their degree of influence and assign each stakeholder group a priority number. "Influence" is defined to be a stakeholder group's ability to advance or impede an activity, whereas "priority" is the order of importance given to satisfying the group's needs (Department for International Development,

2003). Ranking the stakeholder groups by their level of influence inferred from our case study (1 = least influential, 5 = most influential) and priority ranking (1 = lowest priority, 5 = highest priority) helps us understand which group of stakeholders to engage at which point in the project implementation process.

Table 8: La Paz stakeholders priority and influence rating

Stakeholder	Priority	Influence
Central government	2	2
Municipal government	5	3
International stakeholders	3	5
Local stakeholders	4	4
Non-profit stakeholders	1	1

Here we can see the difference in power across different stakeholder groups. The government maintained even less influence in La Paz than it did in Cochabamba due to the lack of continuity in leadership as well as the government's former conflicts with local residents in Cochabamba. Transferring the above scores to a priority/influence matrix, we are able to determine which stakeholders should be identified as key stakeholders (who are able to significantly influence the development project), identified as stakeholders that fall into boxes B, C and D (Figure 8).

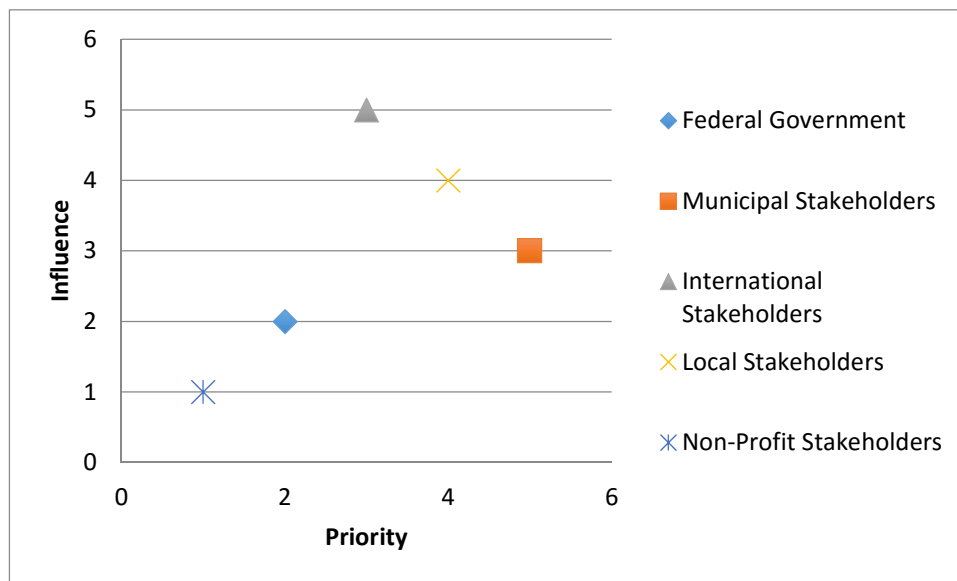


Figure 8: La Paz stakeholders priority and influence matrix

Stakeholders falling into Box D possess low influence but are of high priority to the infrastructure development project. In La Paz, municipal stakeholders have the potential to fall into this category and may require special initiatives to ensure that their interests are protected.

Stakeholders falling into Box B can greatly influence a project's success and need to be prioritized first in project planning stages. In La Paz, these parties are international, local stakeholders and municipal stakeholders. Project managers will need to establish excellent relationships with each of these stakeholders to guarantee united support for the development project.

Box C stakeholders are considered low-priority but may need minimal monitoring. In La Paz, this group consists of nonprofits and the central government and is not the focus of infrastructure development projects.

Box A stakeholders yield high influence but low priority (because their interests are not the target of the development projects). In La Paz, none of the stakeholder groups studied fall into this category.

4.4.2.3 Santa Cruz

Santa Cruz provides us with a successful case study of infrastructure development in Bolivia. At the time when La Paz and Cochabamba were experiencing national neoliberalism policies and struggling with the transition from public to privately operated water utilities, Santa Cruz's successful water cooperative had already been in place for over 30 years.

Unfortunately, the success seen in Santa Cruz appears to be unique and specific to its region—as demonstrated by the fact that water cooperatives have not been implemented in either La Paz or Cochabamba. Although the World Bank financed the cooperative in Santa Cruz, which is often cited as one of the most successful water cooperatives in the world (World Bank Operations Evaluation Department, 2002), it did little to encourage the same structure in La Paz and Cochabamba, but rather put pressure on President Bánzer's administration to go forward with privatization efforts (Nickson, n.d.). This push for privatization can be attributed to the U.S. government's movement to redesign the international economy according to neoliberal theories, and the U.S. government's demands for developing countries to follow the same conformations to neoliberal policies (Kotz, 2003).

Preceded by cooperatives in small-scale banking and telecommunications, Santa Cruz's water cooperative, *Cooperativa de Servicios Públicos Santa Cruz Ltda. (SAGUAPAC)*, was formed in an environment that was ripe with support for another cooperative structure. A stakeholder analysis of the central government, international stakeholders, local stakeholders and cooperative structure provides

insight into SAGUAPAC's success (Appendix 11) and records which stakeholders held positive or negative opinions on the development of a water cooperative system. The following sections study the more notable participants and highlights key Santa Cruz stakeholders that should be engaged during the planning and implementation process for future infrastructure development projects.

Central government

Unlike the privatization efforts during Banzer's 1997-2001 presidential term, cooperative efforts thrived in Santa Cruz during President Hernan Siles Zuazo's first presidential term (1956-1960), partially due to the national cooperative law "Ley de Cooperativas" that he decreed in 1958. When Zuazo assumed the presidency, he effectively overthrew the military junta that was in power and created a national cooperative law to emphasize the country's shift away from feudal traditions (LexiVox, 2016). While the central government promulgated a law supporting cooperatives, it did little to ensure the law's success; the city of Santa Cruz experienced neglect from the central government and had an extremely weak local government (Nickson, n.d.).

Facing a population that tripled between 1950 and 1960, Santa Cruz was under pressure to meet the needs of its growing population and needed to do so without strong central government or municipal support. Santa Cruz has historically had a heavy emphasis on the autonomy of its society, and this example of water infrastructure development demonstrates that while it is important to engage the federal government on future infrastructure building projects, the central government is not the primary stakeholder to mobilize during initial infrastructure planning.

International stakeholders

In Santa Cruz, foreign aid initially played a principal role in water privatization policy development, as it did in La Paz and Cochabamba. Since 1942, USAID launched a bilateral health and sanitation program aiming to develop water and sanitation systems for small communities throughout Bolivia, as well as for developing a National Water Supply Authority (USAID, n.d.). USAID sponsored two international consultants to assess feasible water infrastructure projects in Santa Cruz, who ultimately recommended a cooperative model (Nickson, n.d.). In 1979 the Instituto Nacional de Cooperativas (INACO), a national regulatory body for cooperatives, recognized the water cooperative SAGUAPAC, which continues to be the main water supplier for Santa Cruz to this day. With loans provided by the International Bank of Development and the World Bank, SAGUAPAC was able to build and improve its sewage and water treatment infrastructures and secure multiple rounds of funding due to its ability to pay by loans in their entirety on time (Betrisey, 2015).

Santa Cruz was not immune to the push for neoliberal policies—in the early 1990s, SAGUAPAC tried to contract its billing out to the private sector. This practice was quickly discontinued, however, because the private contractors would disconnect access to water for consumers who failed to pay their water bills—an act that contradicted the socially responsible nature of cooperatives (Ranicki, n.d.).

Withdrawing from privatization in the interest of consumers highlights the difference between Santa Cruz and La Paz or Cochabamba, where Bazer’s administration used military force to support private-sector stakeholders.

While infrastructure development in Santa Cruz likely would not have been possible without international monetary aid, the success of a cooperative over privatization demonstrates that funding in and of itself is not the answer to a project’s success. The Santa Cruz case illustrates that the key to successful funding lies in the international aid agency’s support of a project that fits well into the local political climate and culture. Aside from end consumers, there are a few other primary local stakeholders who need to be considered.

Local stakeholders

While there are local stakeholders in Santa Cruz who also appear in La Paz or Cochabamba (such as farmers, indigenous communities and private water vendors), the political climate in Santa Cruz is unlike that of La Paz or Cochabamba due to the presence of two strong local elite groups known as “logias” (*Toborocho logia* and the *Caballeros del Oriente logia*), which were created in the 1980’s. In order to have membership in a logia, a person must come from an established family, have a current logia member act as a sponsor, or be wealthy (Betrissey, 2015). Logias hold positions at the political executive level and take logia membership into strong consideration when approving public contracts for supplies, services, and construction (Betrissey, 2015). Within Santa Cruz, the Caballeros del Oriente logia maintained control of the COTAS cooperative, and the Toborocho logia controlled the CRE (electricity cooperative) and SAGUAPAC cooperatives (Ferreira, 1994). The logias are closely linked to the umbrella institution *Comite Pro Santa Cruz (CPSC)*, composed of at least 200 local associations, which comprises a moral government that defines its role as that of the “watchman” of the local culture and value system, looking out for the interests of the local population (Betrissey, 2015).

As a result of the vested interests of the local elite in supporting each other, some researchers have suggested that SAGUAPAC’s services exclude the poor outer rings of Santa Cruz, which are served by smaller cooperatives with lower levels of service (Muller et al., 2008). When looking to implement future infrastructure development projects in Santa Cruz, outside parties need to understand the influence of

the informal local elite network and secure the support of at least one of the logias as a primary stakeholder in order to get a project off the ground and to sustain it long term. Outside parties also need to be aware that their projects may not be meeting the needs of the entire community (particularly the poorer subgroups) if they are depending entirely on logias to maintain the projects.

Cooperative structure

SAGUAPAC is the world's biggest urban water cooperative, serving about 1.2 million people (Ranicki, n.d.). Its success has been credited to its cooperative structure, a two-tiered electoral system, and strong, stable management with a socially minded culture (Ruiz-Mier et al., 2006). While the cooperative does have ties to the local elite, keeping a system of checks and balances in place in addition to allowing each customer to have one vote during the management board elections has created transparent governance rules. Compared to the public utilities seen in La Paz or Cochabamba, SAGUAPAC has greater political independence (avoiding political interests and pressure groups) and higher accountability to its customers (Muller et al., 2008). By having a governance structure that was responsible to the people it served, SAGUAPAC was able to ensure its own success by taking into account the differing needs and political positions of its customers in a city that had a powerful and well-organized civic movement.

Analysis of Santa Cruz stakeholders

In order to understand who the primary stakeholders are in order of priority and influence, it is necessary to understand the strengths, weaknesses, opportunities and threats of each stakeholder group. Performing a SWOT analysis of Santa Cruz's stakeholders enables us to understand which stakeholders to engage in which order during the planning and implementation process to maximize an infrastructure project's political feasibility (Appendix 16).

Looking at the stakeholders' actions and their resulting impacts during the implementation of Santa Cruz's water cooperative structure, we can determine their degree of influence and assign each stakeholder group a priority number. "Influence" is defined to be a stakeholder group's ability to advance or impede an activity, whereas "priority" is the order of importance given to satisfying the group's needs (Department for International Development, 2003). Ranking the stakeholder groups by their level of influence inferred from our case study (1 = least influential, 5 = most influential) and priority ranking (1 = lowest priority, 5 = highest priority) helps us understand which group of stakeholders to engage at which point in the project implementation process.

Table 9: Santa Cruz stakeholders priority and influence rating

Stakeholder	Priority	Influence
Central government	1	1
International stakeholders	3	3
Cooperative stakeholders	4	5
Local stakeholders	5	4

Transferring the above scores to a priority/influence matrix, we are able to determine which stakeholders should be identified as key stakeholders (those who are able to significantly influence the development project), identified as stakeholders that fall into boxes B, C and D (from Figure 6, above).

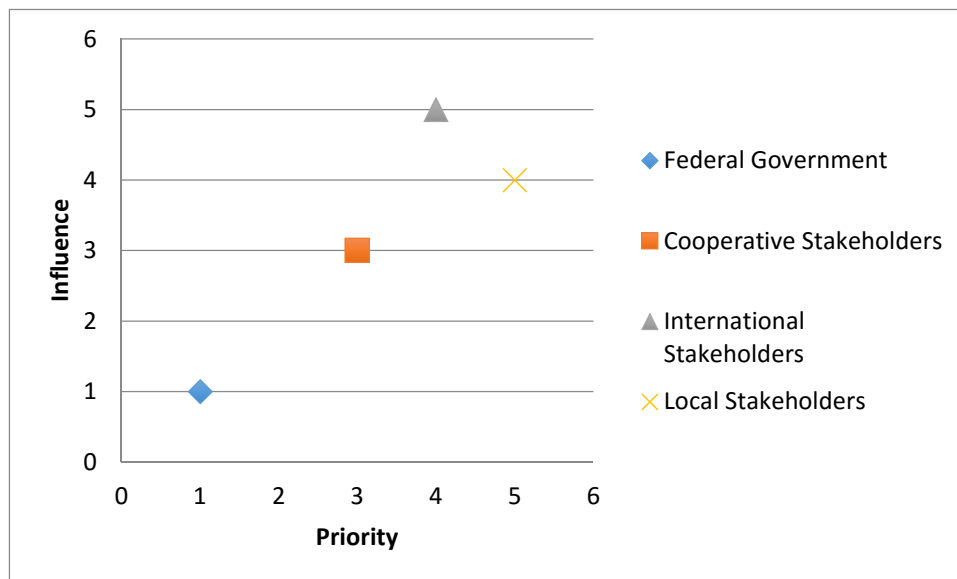


Figure 9: Santa Cruz stakeholders priority and influence matrix

Again, we divided our priority and influence matrix (Figure 6) into four equally sized quadrants and overlaid the stakeholder categories (Figure 9) on top of the matrix. Stakeholders were then identified by the box or boxes (“A”, “B”, “C” or “D”) that they fell into.

Stakeholders falling into Box D possess low influence but are of high priority to the infrastructure development project. In Santa Cruz, the stakeholders studied do not fall into this category.

Stakeholders falling into Box B can greatly influence a project’s success and need to be prioritized first in project planning stages. In Santa Cruz, these parties are international, local, and cooperative stakeholders. Project managers will need to establish excellent relationships with each of these stakeholders to guarantee united support for the development project.

Box C stakeholders are considered low-priority but may need minimal monitoring. In Santa Cruz, this group consists of nonprofits and is not the focus of infrastructure development projects.

Box A stakeholders yield high influence but low priority (because their interests are not the target of the development projects). In this case, none of the studied stakeholder groups falls into this category.

The La Paz, Santa Cruz and Cochabamba case studies illustrate that policies need to be locally relevant in order to be politically feasible. The water wars provide us with an example of central government policies that ultimately were unsuccessful due to their incongruity with local lifestyles, inflexibility during enforcement and vulnerability to municipal corruption. In light of the Morales administration's focus on decision-making within municipalities, the number one factor for political feasibility is a policy's ability to be locally adaptable. Each of the cities examined have unique political climates and stakeholders that have different, and sometimes region-specific, interests that need to be addressed in order for a policy to become adopted. Whereas informal "elite" networks may be predominant in Cochabamba and are key stakeholders to appeal to, these groups are not present in La Paz or Santa Cruz and will not be relevant for policy adoption in those contexts. In order to maximize a building code's chances of adoption, its policies must have the ability to address the issues unique to each city and specific to the interests of the key stakeholders identified.

4.5 Political and implementation feasibility of new building codes

Before discussing the political and implementation feasibility of the IBC and the IgCC, we first discuss the feasibility of maintaining and/or improving the existing codes in Bolivia.

4.5.1 Status quo political feasibility

When asked how aspects of the current building codes could be changed or improved, an architect from La Paz suggested "requir[ing] the certificate of occupancy to developers or builders to provide security to citizens" (BL-4-C). This is evidence of non-compliance, due to the fact that both the national guide and the Regional Laws of La Paz include provisions that each project requires a certificate of occupancy (Municipal Government of La Paz, 2012 and Bolivian Ministry of Public Works, Services and Housing, 2014). However, in reality, many projects are proceeding without the proper documentation due to a corrupt political and governmental system, implying that stakeholders in positions of high political influence are able to largely influence whether or not a policy is adopted.

There is a relationship between non-compliance of building codes and political corruption. Political figures and agencies may overlook procedures and protocols and relax guidelines to make building

projects easier, but at the expense of building safety—putting public citizens at higher risk because politicians may be “[giving] some [builders] the option for illegal buildings to appear legal within a customized plan” (BL-2-C). These loopholes in the municipal buildings codes give builders the opportunity to do cost-efficient work due to the high demand for building structures in the face of population growth. An engineer and agronomist manager from Cochabamba believes that to mitigate corruption, “there should be no political interference in technical decisions but this is unfortunately also Bolivia” (BL-12-C).

According to our stakeholder surveys, it appears that the status quo will continue to be politically feasible due to the rampant levels of corruption and the level of power that corrupt stakeholders yield in maintaining the status quo. Until there is international pressure (and monetary support) to incentivize otherwise, we expect the status quo to remain politically viable.

4.5.2 Status quo implementation feasibility

Even though future iterations of the status quo may be politically viable, they could be challenging to implement. To analyze the feasibility of implementation of locally-developed building code improvements, we used a matrix coding query to assess comments that included benefits and challenges of the current code development process. Many more examples of challenges from the current codes were mentioned than benefits (Figure 10).

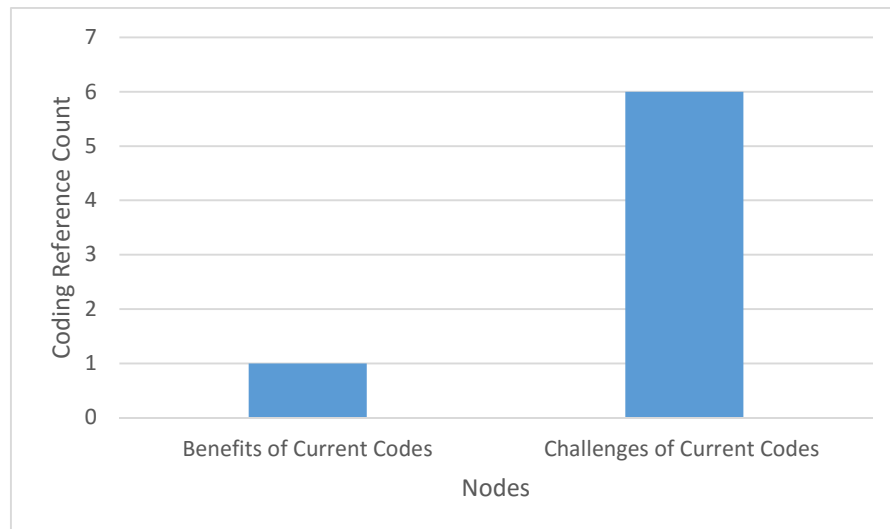


Figure 10: Perceptions of challenges and benefits of current Bolivian building codes (Bolivian stakeholders, n=23)

Overall, we see that the building code status quo is not feasible to implement due to the low levels of enforcement and the lack of repercussions for violating building codes (even though, as mentioned earlier, it has been feasible to adopt due to high levels of corruption by stakeholders in power).

4.5.3 IBC and IgCC political and implementation feasibility

IBC and IgCC political feasibility

Both the IBC and IgCC are designed to be model codes, thus differing from a national mandate by providing local municipalities with the option to adjust the codes to local environments and allowing publicly elected legislative bodies to have a final voice in code adoption. The flexibility of both codes to be customized to local conditions increases their political feasibility in the three Bolivian cities. In order to gauge the political feasibility of both the IBC and the IgCC, we asked Bolivian and American stakeholders about their perceptions regarding the adoption of green building codes.

Bolivian stakeholders viewed leapfrogging directly to a green building code as not only possible, but necessary. One survey respondent, an engineer, said that Cochabamba “should move to a green code, it is urgent. The professionals involved are unaware of the construction and design for application in geographical and climatic contexts such as Cochabamba and other Bolivian cities techniques” (BL-4-C). Bolivian stakeholders may be under the impression that a green building code will automatically provide solutions to problems that have been issues for decades. Worried by issues such as disproportionate migration from urban to rural areas, another citizen of Cochabamba explained that “Cochabamba is in urgent need to move to a green code as overcrowding construction is causing more frequent heat islands and air pollution with dangerous levels impacting public health” (BL-8-C).

However, survey responses pertaining to the feasibility of green building code adoption in Bolivian municipalities differed markedly between stakeholders from Bolivia and the United States. In a matrix-coding query, Bolivian stakeholders gave only two mentions of opposition to the feasibility of a green building code adoption (Figure 11). Stakeholders from the USA, on the other hand, made 20 references to potential challenges of adopting a green building code in Bolivian municipalities (Figure 12). Note that in this type of query, one respondent may be counted multiple times.

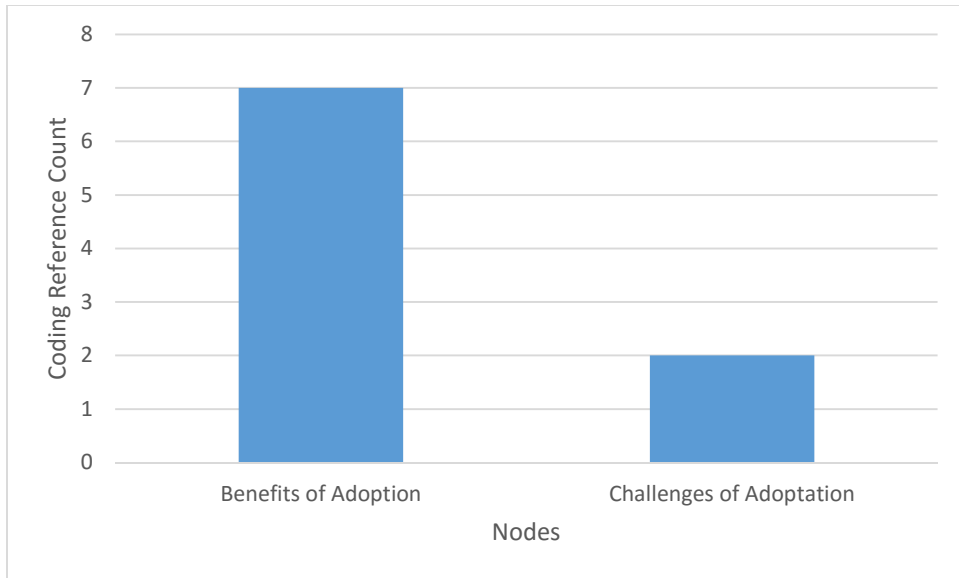


Figure 11: Perceptions of challenges and benefits of adopting a green building code in Bolivia (Bolivian stakeholders, n=23)

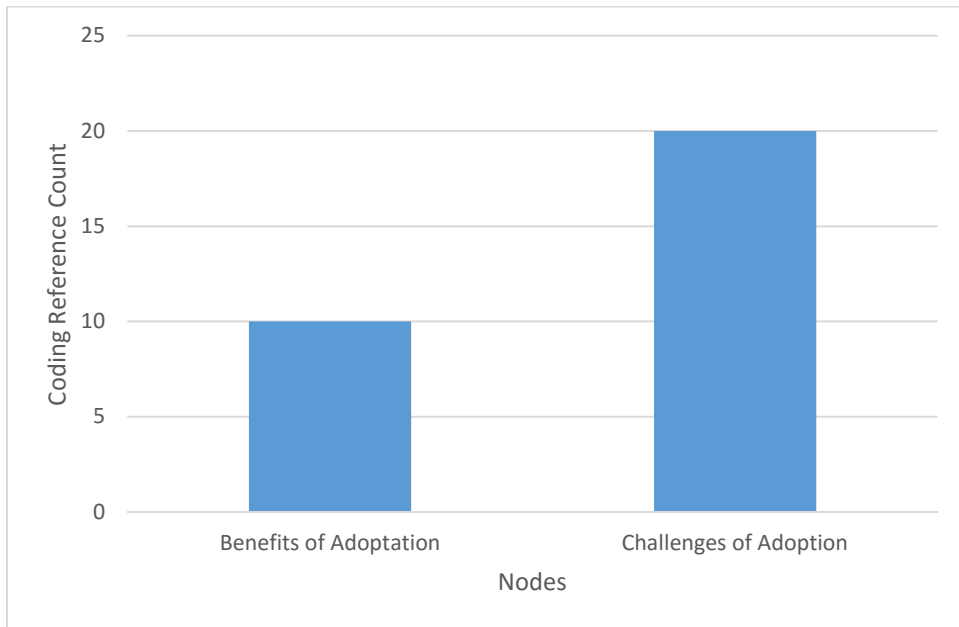


Figure 12: Perceptions of challenges and benefits of adopting a green building code in Bolivia (USA stakeholders, n=23)

Overall, based upon the IBC and IgCC’s ability to be customized to municipalities (an essential feature to engage key stakeholders such as local citizens and municipal governments) and based upon our Bolivian survey respondents’ positive view of green building, both policies appear to be politically feasible.

However, maintaining the status quo is currently the most politically feasible, due to the fact that it is already in place and the political sphere is not yet ready to transition to a green building code.

IBC and IgCC feasibility of implementation

While the IBC and IgCC appear to be politically feasible, US and Bolivian survey responses suggested that they may not be feasible to implement. Even if it were passed, implementing the IBC or IgCC in a developing nation would be a complex undertaking. In Bolivian municipalities, the potential barriers to implementation would include high recurring costs, political corruption and uninformed stakeholders. This section evaluates the feasibility of implementing the IBC or IgCC within Bolivian municipalities. Where possible, we describe the relative ease of implementation in each of the three principal cities separately.

All three cities face issues that must be addressed prior to implementing the IBC or IgCC. To implement the IBC or IgCC in Bolivia, municipal governments must first be economically and politically stable. If the municipal government cannot pay the up-front consulting fee for an ICC assessment, it is less likely to consider these policies. Municipal governments must also take into consideration additional costs associated with implementation, including policy enforcement. Due to corruption issues at the municipal level, implementing a code that will decrease the revenue of existing building and energy constituents would not be a favorable decision for politicians (Wickberg, 2012).

In Cochabamba, while the municipal government is interested in implementing policies that will help conserve the available natural resources, it is also very capital-constrained. Out of the three cities, Cochabamba's government has the least amount of available capital to implement the IBC or IgCC. There is also a high lack of understanding of the current building procedures among municipal government staff.

La Paz has the most available economic and political resources to achieve implementing the IBC or IgCC. Currently, La Paz is the only city in Bolivia with a green commercial building. La Paz also has international resources at its disposal such as the United Nations and the U.S. Embassy. The municipal government is also intrigued yet uninformed about the IBC and IgCC; however, it has more resources available than other cities to implement the codes. Compared to Cochabamba and Santa Cruz, La Paz is the most capable city to implement the IBC or IgCC.

Out of all three cities, Santa Cruz has experienced the largest growth in population and the economy in recent years. For this reason, the number of building projects has also grown exponentially. With a

strong relationship with the national government, Santa Cruz has utilized the federal public housing funds to produce low-quality, cheap residential buildings. Building professional stakeholders who are profiting from these cheap, low-quality building practices will oppose implementation of the IBC or IgCC. While they may have more resources to enact this code compared to Cochabamba, they lack the political will to introduce the IBC or IgCC. For this reason, along with local political corruption, Santa Cruz is currently the least likely city to implement the IBC or IgCC. Santa Cruz is the only city where a municipal office would not speak with our group while in country.

To better understand how building professionals from the United States perceived the feasibility of implementing the IBC or IgCC in Bolivia, we asked professionals with building policy expertise in the United States and in Bolivia their opinions. Stakeholders from the United States had mixed opinions about the current feasibility of implementing green building codes in Bolivia. Political instability and lack of legislative compliance are among the main concerns that USA stakeholders mentioned. These differences in perceptions could be attributed to the possibility that American stakeholders may be underestimating the poor living conditions in Bolivia caused by current building codes, whereas Bolivian stakeholders may be overestimating the ease of implementing a green building code due to their limited experience with building code policies. A senior ICC consultant with many years of experience implementing I-codes in developing countries said:

“It would be complex and very difficult to implement a green code, or green features when there is no code, or the current code is not enforced. There must be a holistic approach to implementation. All benefits and costs must be considered with codes, while maintaining simplicity. A green code is a code that has been developed specifically for that region or city, it is not a pop-up code. A complete regulatory system must be built, bringing a standard of a code from America into a developing country is not enough. However, having a hybrid to consider probably would be more feasible. Develop a code that is a building code but have some green features embedded in the initial code. And this too will be difficult, but will have a better chance at succeeding rather than just making that transition” (USA-16-LA).

In an interview with another stakeholder from the United States, a project manager at the U.S. Green Building Council suggests making “bite-size” attempts at formatting codes for a developing nation. He explains that the most important aspect about creating a code is ensuring that it is feasible. If a code is introduced to a city, region or country that is not prepared for the transition, it could cause more harm than good. If an ineffective code is followed by an even more stringent code without the proper

introduction, it could set progress back even further (US-17-DC). He also talked about the importance of including robust public engagement and capacity-building to educate, train and develop the workforce to enforce the code. The building industry must also be educated to understand the enforcement procedures and how these codes can actually benefit their overall productivity and use of building materials. Once properly educated, the local building industry will have the proper tools to see the benefits in a green building code and economically invest in meeting compliance (US-17-DC).

The IgCC contains newer and more challenging requirements than the IBC and therefore will require more enforcement. This complexity may make it more politically feasible than the IBC because it appeals to Bolivian citizens' high regard for sustainability and is closely aligned with the central government's Law of Mother Earth.⁴ However, it would also make the IgCC more challenging to implement. While Bolivian survey respondents view the feasibility of implementing a green building code positively, respondents from the USA are not as optimistic in the plan to leapfrog into a green building code in Bolivia, where there is political and governmental instability.

5. DISCUSSION

5.1 Summary of results

Existing building codes in Bolivia's three principal cities are narrow in scope and have historically not been enforced. Building industries have benefitted from these ineffective codes, while the general public has been subject to safety and environmental health risks. However, enforcement has improved in recent years, and the national government has issued guidelines that can help cities looking to develop their codes further. The evolution of locally developed codes is a positive development, albeit slow. Looking to international bodies for best practices in commercial construction could achieve gains in building safety and environmental health much more quickly.

The International Building Code has resulted in substantial improvements in building safety and durability in the United States and dozens of other countries. The International Code Council has a track record of successful code implementation in Latin American and Caribbean countries, so with the ICC's help, there is reason to believe Bolivia is capable of using the IBC to improve commercial building safety in its major cities.

⁴ This law decrees that Mother Earth should not be "affected by mega-infrastructure and development projects that affect the balance of ecosystems and the local inhabitant communities" (Vidal, 2011).

The IBC has also been extremely cost-effective to the implement in the United States. We are not able to determine whether Bolivia could achieve comparable economic savings given its weaker public institutions. However, the potential savings are so great that even if Bolivia achieved just one-third of the benefits seen in the U.S., the endeavor would still be economically advantageous for municipal governments.

Unfortunately, the International Green Construction Code's ability to improve human health and combat environmental degradation is somewhat uncertain. Environmental problems stem from many more causes than just commercial buildings, so even substantial improvements to the building stock can have only limited effects on global issues like pollution and climate change. Also, green building codes are quite new, so there has been little opportunity to evaluate their contribution to environmental impact reductions at a macro level.

Nevertheless, individual IgCC-compliant buildings perform well on reducing environmental impacts that are important in Bolivia like air pollution, global warming and freshwater depletion. The IgCC has generated significant economic benefits where it has been implemented in the United States, many of which are applicable to Bolivia. These include savings in resource costs and operations and maintenance expenses, plus new support for jobs and economic activity as a result of the new construction requirements.

However, proper enforcement is critical to the success of any building code. If code officials lack adequate training, municipalities risk eroding their return on investment. Worse yet, if code officials become corrupt, a building code would not only lack effectiveness but could actually reinforce rather than mitigate existing socioeconomic disparities. In other words, building codes are intended to combat information asymmetry between building owners and tenants, but if builders with political connections are able to capture the regulatory process, they could actually create a more uneven playing field rather than a flatter one.

For further research, a broader range of stakeholders must be included in the study. While the majority of our stakeholders were very knowledgeable of the issues associated with the current building codes, many of these individuals were architects, engineers and professors that support the transition to a green building code. For a more comprehensive and objective analysis of the impacts of the current building codes, it would be beneficial to gain insight from private industry and governmental officials who can speak about the current issues from their perspectives.

Case studies of the political feasibility of water infrastructure development in Cochabamba, La Paz and Santa Cruz highlight the key roles that stakeholders play during project planning and implementation. In each of the three cities, generally the same three stakeholder groups were highly prioritized and identified as key to a project's success: local, international and municipal stakeholders. In some cases the central government can act as a "project killer" and should be engaged when appropriate to mitigate this risk.

5.2 Additional considerations

Our case studies revolve around water infrastructure development in Bolivia. While intended to be proxies for understanding the political feasibility of green building codes in Bolivia, water is a unique natural resource in that people are acutely aware of the role it plays in their lives and survival. While our case studies identify local citizens as a primary stakeholder group to include early in the planning stages, it is possible that these groups will not be as strongly interested in building codes, which affect their health and safety in a less tangible way. Should this be the case, local stakeholders may not play as prominent a role as we expect them to.

Research from La Paz, Cochabamba and Santa Cruz brings approximately five main stakeholder groups to attention: international, central government, municipal, local and non-profit. There may be additional stakeholders to consider that have not been identified in the stakeholder analysis, particularly those stakeholders who currently fall in the low influence categories, such as local activists or individuals who are influential but who have not been formally classified as being highly influential because they are consolidated into the local stakeholder group, which is currently classified as having low influence. Early identification of and engagement with such stakeholders could either create another powerful stakeholder in favor of building codes or identify potential individuals who can hinder the building code development process.

Utilizing the Bolivian survey responses to understand the stakeholders identified for involvement in new commercial building code development, we see that the following groups should be engaged early in the policy development stage to maximize the code's political feasibility:

International Stakeholders

- International Code Council

Municipal Stakeholders

- Ministry of Housing and Urban Development (BL-2-C)
- Mayors of Municipalities (BL-5-C, BL-8-C)

Local Stakeholders

- Chambers of Architects (BL-4-C)
- Society of Engineers (BL-2-C)
- Electric utilities (BL-10-L)
- Mining corporation of Bolivia (BL-10-L)
- Leaders of territorial organizations
- Social organizations (BL-3-C)
- Awareness campaigns for young people (BL-4-C)
- Colleges and universities (BL-9-L)
- Environmental Institutions (BL-8-C)
- Agronomists Association (BL-12-C)

The stakeholders outlined above should be engaged in stakeholder meetings at the start of building code formation. Failure to include all of these stakeholders increases the risk of political failure; these groups have been identified to be of high priority and influence for building code development, and if stakeholders are not engaged to support building codes, they can utilize their influence to hinder the adoption of the building codes. It is important to identify other international stakeholders who may be involved, given the largely donor-dependent nature of infrastructure development in Bolivia. Particular attention should be paid to local stakeholders and their natural building use habits to ensure that building code policies adopted are not incongruous with the way that local stakeholders utilize buildings.

The role of local citizens as primary stakeholders should not be overlooked. It is usually the role of the municipal government to be accountable to the populace, but given the rampant corruption at the municipal level, organizations interested in implementing building codes need to put in the extra due diligence by including local community members in preliminary stakeholder analysis to hedge against investing in development projects that are ultimately politically unfeasible. Other stakeholders such as nonprofit organizations should also be engaged for their deep local knowledge and ability to connect relevant stakeholders to create synergies and partnerships among stakeholder groups.

Recognizing the decentralized nature of Bolivia's current government, organizations looking to implement building codes need to stress the importance of utilizing a model code which can be adjusted

to local conditions and allow for publicly elected bodies to have the final vote in the code's adoption process. Both the IBC and the IgCC utilize a model structure, increasing their political feasibility by placing emphasis on the decision making power of the municipalities. The IgCC's attention to water efficiency may appeal more to Bolivian stakeholders due to Bolivian indigenous groups' emphasis on the natural environment as decreed in Bolivia's Law of Mother Earth.

6. RECOMMENDATIONS

6.1 Policy design

Taking into account our analysis of the IBC and the IgCC, as well as our correspondence with U.S. and Bolivian stakeholders, we recommend that Partners of the Americas consider the following priorities in the policy design process:

- Start small
 - Start with the International Building Code, and leave the International Green Construction Code for a second phase. One important exception to this approach could be to incorporate basic water efficiency features.
 - Jumping to a green building code too soon could cause:
 - Further mistrust among municipal governments, the building industry and the general public
 - Municipal government hesitation in attempting future code improvements
 - Economic burdens for builders and building occupants
- Focus on enforcement
 - Building codes without enforcement are not only ineffective; they may be counterproductive. If resources are scarce, it would be better to invest in enforcement for existing codes than to spend money adopting new ones.
 - Create a regulatory agency or office within in each municipal government that is in charge of all enforcement procedures, and ensure that this agency has well-documented roles and responsibilities to hedge against corruption risk.
- Call on local expertise
 - Our visit to Bolivia in March 2016 revealed many efforts at the individual, non-profit, and private level to support the development of green building codes. However, these efforts remain largely disjointed and there is no municipal or national collective to foster information sharing or collaboration between these stakeholders. Developing a

roundtable or forum with regular meetings will strengthen these local efforts and unite stakeholders with a strong knowledge of nationally available technology and resources.

- Call in international expertise
 - The International Code Council has significant experience developing customized regulatory regimes for other developing countries, including in Latin America. They are familiar with this report and are ready and willing to help. An ICC official has offered to volunteer his time for one to three days of initial, in-country stakeholder meetings. From there, he would be able to provide more detailed estimates of consulting fees and related costs to develop a comprehensive building code framework specific to Bolivia. We can connect the client to this contact when they are ready.

6.2 Political strategy

Taking into account our case studies of water development infrastructure in La Paz, Cochabamba and Santa Cruz, we recommend the following political strategy:

- Engage all stakeholders
 - Failure to effectively engage stakeholders can kill even the most well-designed and well-resourced policy initiatives. This is especially true for international actors operating within Bolivia's socialist political structure, as was seen during Cochabamba's water wars. Particular attention should be paid to international, municipal and local stakeholders.
 - The most important stakeholders are the municipal governments, private industry and local citizens. We learn from Santa Cruz, Cochabamba and La Paz that local constituents (and the local elite) are key stakeholders that should not be overlooked. Our meetings with the municipal government, universities, and international institutions in Bolivia in March 2016 confirmed the effectiveness of a grassroots-based approach. Additionally, both public and private sectors must understand the challenges faced by previous infrastructure development projects to ensure that future plans are adaptable and respected by all parties. Finally, community leaders and academics must be included, to ensure that future broader audiences continue to be included in the decision making process.

- Conduct frequent stakeholder meetings to map out the various interests of identified stakeholders. Ensure that all stakeholder groups are represented, and make the exchange of knowledge as transparent as possible to avoid misunderstanding the needs of the local Bolivian stakeholders.
- Conduct extensive due diligence
 - As demonstrated by our case study on Santa Cruz’s water cooperative development, stability in government is key to enacting any type of successful infrastructure project. Therefore, it is important to verify with local government agencies that they feel prepared to enact and enforce a policy, and to collaborate with them to build that capacity and usher the policy through the political process with their support.
- Use a rights-based messaging strategy
 - During the water wars, a rights-based approach won the day, and this sentiment is still strong in Bolivia today. In order to engage the local population, stakeholder discussions should emphasize the people’s right to safety in commercial buildings, as well as the rights of Mother Earth to remain unspoiled so it can continue to provide for human beings. An approach that acknowledges the importance of local beliefs regarding basic human rights will increase community buy-in.

6.3 Timeline

In order to ensure the successful and sustainable adoption and implementation of new commercial building codes, we recommend the following next steps:

- Learning and education: 2016-2017
 - Education should be reciprocal—Bolivian stakeholders should learn from the ICC about building codes and their implications, the ICC should learn about local consumption patterns (e.g. of water, electricity, and building materials) and how locals interact with the built environment.
 - The approach we recommend is a slow social media awareness campaign that educates and includes all mentioned stakeholders while keeping the general public informed.
- Policy design: 2018-2019
 - Work with the ICC and other stakeholders to develop a comprehensive regulatory framework for each city and to craft a basic commercial building safety code using the IBC as a model. Based upon priorities identified in stakeholder meetings, determine

whether certain water efficiency standards from the IgCC should be incorporated as well.

- This may take years, and while we encourage starting as soon as possible, we recommend against rushing into the policy design phase and beyond.
- Policy adoption: ~2020
 - If and only if a critical mass of key stakeholder support is achieved during the previous two phases, municipal governments and other stakeholders should work to usher a policy through the appropriate legislative or regulatory processes in each city.
 - Where not already present, regulatory agencies must be established within each municipal government at this stage.
- Policy implementation: ~2021-2024
 - Ideally, a new policy would be enforced all at once. If this proves infeasible, however, a phased approach to policy implementation may start with builders certifying their projects on a voluntary basis and progress toward mandatory enforcement over a period of one to three years.
- Policy refresh: dates unknown
 - Reassess the basic building code to understand how it is received and whether it is properly enforced. If and when the code is well received and enforced, begin to integrate more green components to the code, prioritizing elements identified by primary stakeholders.

6.4 Conclusion and future directions

Clearly, new commercial building code adoption is a long-term undertaking that will require the collaboration of a complex and dynamic set of actors. No single formula can fully guide such a large-scale process. However, we hope this report serves as a framework upon which Partners of the Americas and other stakeholders can iterate over time. Additionally, we hope the process serves to foster improved rapport and increased dialogue among the North Carolina and Bolivian Partners chapters. We encourage Partners to develop ongoing relationships with Duke University, the International Code Council, the U.S. Green Building Council and other stakeholders for continued technical assistance and analysis. In short, relationships, more so than any specific knowledge or skill set, will make the transition to safe and sustainable building codes in Bolivia possible.

Limitations of this study include a small sample size, inherent bias in sampling design, and insufficient data on the costs and benefits of building code adoption specific to Bolivia. For future studies, a larger survey sampling would produce more robust conclusions about the Bolivian population's perceptions of existing and new building code options. Future efforts should also include more input from energy companies, politicians and large construction and architectural firms. Additionally, if economic data specific to Bolivia could be obtained, it would help produce recommendations more immediately applicable to our client, as would case studies of building code adoption in neighboring countries.

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APPENDICES

Appendix 1: Online survey for USA Stakeholders and codebook for transcription

Research Questions and Hypotheses:

RQ1: Please describe your occupation & the city you reside in.

H1: We expect respondents to be either former architects, building policy makers or building inspectors

H2: We expect most of our stakeholders to reside in Washington D.C., Maryland or California because this is where two of our initial interviewees were from and we asked that they share our survey to their colleagues.

RQ2: Please describe your experience with building codes.

H3: We expect this to vary amongst the occupation that the stakeholder holds. It may range from very little experience to extensive experience of over 20 years.

RQ3: What steps are required to implement a new type of building code within a city or state such as a green building code?

H4: We expect to hear varied results by the city and by the experiences that the respondents have had previously in their careers.

RQ4: What factors make adopting a green building code easier or more likely?

H5: We expect stakeholders to respond by saying a cooperative industry, cooperative municipal government and an informed general public.

RQ5: What factors make adopting a green building code more challenging or unlikely?

H8: We expect most stakeholders to respond by saying the lack of transparency and the current building culture within a city.

H9: We also expect stakeholders to mention the associated costs as being an issue or challenge.

RQ6: What has been the general response to green building codes from local building industry stakeholders?

H10: We expect this response to vary amongst the experiences of the stakeholder

H11: We expect responses to include a general sense of positivity

RQ7: Have any incentives been used to get local governments to enact a green building code?

H12: Since building codes are mandatory, we expect for governments to provide very few incentives.

RQ8: On a scale from 1 to 5, how positively has the public reacted to green building codes that have been implemented in your jurisdiction or in other jurisdictions in the United States? (1= very negative; 3= neutral; 5= very positive)

H14: We expect stakeholders to respond generally positively, with respects to choosing a 4 or 5.

RQ9: In your opinion, what are the largest benefits of implementing a green building code?

H16: We expect most stakeholders to view resource savings and public health as the largest benefits of implementing a green building code.

RQ10: In your opinion, what are the biggest costs to implementing a green building code?

H17: We expect stakeholders to respond by saying that the largest costs will be the funding to implement and enforce the code.

RQ11: Who bears these costs?

H18: We expect most stakeholders to see the municipal government bearing these costs.

RQ12: If you could start from scratch in a city with very little in the way of formal building codes, would you start with a basic policy like the International Building Code? Or would you try to incorporate “green” features from the beginning?

H19: We expect some to say it is possible to jump straight into a building code

H20: We expect some building experts to say that such a jump would be risky and to gradually transition into a formal building code with international experience, then introduce a green code.

RQ13: What is the largest obstacle to effectively enforcing a building code once the code is approved?

H22: We expect stakeholders to see the largest obstacles to effectively enforcing a building code to be: decreasing the amount of corruption and paying inspectors to properly enforce the codes

H23: We expect stakeholders to see compliance from industry to be the hardest obstacle pertaining to enforcement.

RQ14: Are there any unintended consequences you have seen when implementing a green building code?

H25: We expect this question to vary amongst the stakeholders, however public backlash could come from all industries alike, and make implementation even harder in the future.

RQ15: Would you be willing to put us in contact with any other potential building code or green building professionals in order to gather information from them as well?

H26: Most stakeholders, excited by the possibilities of implementing a green code in Bolivia will hopefully be willing to put us in contact with other building professionals.

Coding Instructions:

- Coders should read through the full transcript prior to beginning coding
- Coders should review codebook before coding
- When coding, coders should:
 - Code entire sentences, including any necessary contextual information around that sentence (when appropriate or necessary)
 - If coding for a single word using a 'find' search, read the entire question response by the subject in order to capture any context surrounding the word in question
 - Code for a single category of code at a time (i.e. code an entire document for all codes under super-code 'INFOSOUR' and then return to the beginning of the transcript to code for all codes under super-code 'ORGSIND')
 - Code segments of text into multiple codes, if appropriate (i.e. codes are not mutually exclusive)
 - Treat the super-code (e.g. INFOSOUR) as a bin to put text that should be under the broad category but may not fit within one of the sub-codes
 - After coding, return to this super-code to determine if additional sub-codes should be created (i.e. emergent categories of data per Corbin and Strauss)

Codebook:

- Economic Impacts: Mentions of economic impact of building codes
 - Builders: Mentions of economic impact on builders
 - Government: Mentions of economic impact on government
 - Poor: Mentions of economic impact on government
 - Public - Residential Citizens: Mentions of economic impact on general public
- Effectiveness of Current Codes : Mentions of the effectiveness or non-effectiveness of current building codes in Bolivia
 - Commercial: Mentions of commercial building codes
 - Compliance: Mentions of compliance to current building codes
 - Departmental Codes: Mentions of departmental or state wide building codes
 - Enforcement: Mentions of building code enforcement by local government
 - Implementation: Mentions of code implementation
 - Incentives from Government: Incentives provided by local governments to get public to support building code
 - Municipal Codes: Mentions of municipal codes
 - National Codes: Mentions of national codes (If existing)
 - Permitting: Mentions of permitting requirements
 - Residential: Mentions of residential codes in Bolivia
 - Safety: Mentions of safety of current building codes in Bolivia

- Evaluation of Current Building Code:
 - Perception: General attitude associated with statements
 - Positive: Mention has a good outlook or perception
 - Negative: Mention has a negative connotation
 - Neutral: No emotional attachment to statement is noticed
- Feasibility of Implementing a Green Building Code
 - Allies: Mentions of allies to help make implementation of a green code possible
 - Benefits: Mentions of benefits associated with introducing a green building code
 - Bodies of Opposition: Mentions of opposing bodies to green building codes
 - Challenges: Mentions of issues that will arise with attempting to implement green building code
- Public Reaction to Green Building Codes
 - 1 – very negative
 - 2 – negative
 - 3 – neutral
 - 4 – positive
 - 5 – very positive
- Themes
 - Built Environment: Mentions of the urban built areas within the city
 - Corruption: Mentions of political corruption associated with building or building policy
 - Economy/Cost: Mentions of cost or the economy being a factor in building codes
 - Education: Mentions of the lack of education of building codes
 - Energy Efficiency: Mentions of energy conservation through building codes
 - Legal: Mentions of legal process to approving policy or building projects
 - Natural Environment: Mentions of areas not disturbed by urbanization within the city
 - Politics: Mentions of political landscape of the municipal or national government
 - Population Growth: Mentions of population growth within the municipalities
 - Public Health: Mentions of health of entire cities
 - Public Outreach: Mentions of advocacy work pertaining to building codes
 - Raw building materials: Mentions of materials needed to complete building projects
 - Safety: Mentions of safety associated with building codes
 - Social well-being: Mentions of social implications of enforcing current code or implementing a green building code
 - Stakeholder Investment: Mentions of investments from venture capitalists
 - Technology: Mentions of building technology currently in Bolivia, or needed in Bolivia
 - Traditional Building: Mentions of Traditional building styles/culture in Bolivia

Research Questions and Hypotheses:

RQ1: ¿Cuál es su nombre? - What is your name?

Hypothesis N/A

RQ2: ¿Cuál es su título? y ¿En qué ciudad vive? - What is your title? In what city you live?

H1: We expect to see professionals in the following occupations (1) architecture (2) engineering (3) academia/professors (4) policy makers (5) lawyers and (6) community leaders

H2: We expect to see participants from the following three cities: (1) Cochabamba (2) La Paz and (3) Santa Cruz

RQ3: ¿Cuál es su experiencia con los códigos de construcción? - What is your experience with building codes?

H3: Experience with building codes will vary across communities based on extent of building laws within each city, profession and personal interests/expertise

H4: In communities with more active civil societies, we expect to see greater levels of building code knowledge/experience

RQ4: ¿Qué sabe usted de los actuales códigos de construcción para nuevos edificios comerciales en su ciudad? Por favor, describa la política, como usted lo entiende. - What do you know of current building codes for new commercial buildings in your city? Please describe the policy, as you understand it.

H5: Stakeholders with more building code experience will have more information to provide about the current building code within their respective city.

H6: Level of information available will vary by city and occupation.

RQ5: ¿Cuándo se promulgó esta política? - When this policy was enacted?

H8: We expect most stakeholders to be unaware of the initial enactment of the current building code, as enforce of these codes are not widely respected.

H9: It will also vary by city: Cochabamba – No official building code, La Paz - 2014 Santa Cruz – 2015

RQ6: ¿Quién diseñó el código de construcción en su ciudad? - Who designed the building code in your city?

H10: Majority of the stakeholders will not know.

H11: The building code designers will also vary by city

RQ7: ¿El gobierno utilice un código de construcción de otra ciudad o país como referencia? - Does the government use a building code from another city or country as a reference?

H12: We expect that the Bolivian cities have referenced building codes from neighboring countries such as Brazil, Argentina and more distant Latin American countries such as Mexico.

H13: We do not expect to governments to reference their building codes with other cities within Bolivia, especially since the three cities observed have very different altitudes and climatic zones.

RQ8: ¿Por qué crees que este código de construcción tuvo éxito en el proceso político? – Why do you think this building code was successful in the passage?

H14: We expect stakeholders to say policy passage was due to existing political leaders or general cooperative politics.

H15: We expect stakeholders to talk about the relationship between construction industries and municipal governments.

RQ9: ¿Cree usted que estos códigos se han implementado de manera efectiva? Utilice una escala del 1 al 5 (1 = no es eficaz; 5 = muy eficaz) - Do you think that these codes are implemented effectively? Use a scale from 1 to 5 (1 = not effective, 5 = very effective)

H16: We expect most stakeholders to view implementation of the current codes as a 1- not effective, 2-not very effective or a 3 – neutral effect (Not positively effective or harmful, more so just existing without standing)

RQ10: ¿Cree usted que la industria de la construcción local está de acuerdo con estos códigos? Utilice una escala del 1 al 5 (1 = no cooperativa; 5 = muy cooperativa) - Do you think the local construction industry agrees with these codes? Use a scale from 1 to 5 (1 = not cooperative; 5 = very cooperative)

H17: We think that implementation and enforcement are both challenges that Bolivian municipal governments face and we expect majority of our stakeholders to view industry compliance negatively. For this reason, we expect most participants to provide a 1- no cooperation

RQ11: ¿Cree usted que esta política tiene un efecto positivo o negativo en su ciudad? (1 = muy negativo; 5 = muy positivo) - Do you think this policy has a positive or negative effect on your city? (1 = very negative, 5 = very positive)

H18: We expect most stakeholders to answer with a 1 or 2 of very negative or negative.

RQ12: Describa las formas específicas en que los códigos de construcción han impactado su ciudad. - Describe the specific ways that building codes have impacted their city.

H19: Very lax codes have opened the opportunity for rapid building in these three cities

H20: Low income communities are being pushed out of their homes/neighborhoods for building projects

H21: Some respondents may say the codes have not impacted the city much, but has been more of a hindrance against sustainability and public health

RQ13: En su opinión, ¿cómo puede el gobierno hacer cumplir el código de construcción actual con mayor eficacia? - In your opinion, how can the government enforce the current construction code more effectively?

H22: Decrease the amount of corruption and under the table dealings.

H23: Include more of the community in the building process

H24: Conduct trainings for the local builders to ensure they are complying with the current building code

RQ14: ¿Qué aspectos del código de construcción cree usted que debe cambiarse o mejorarse en el futuro? - What aspects of the building code you think should be changed or improved in the future?

H25: We expect this question to vary amongst the city. Most associates of Partners of the Americas however will recommend to include more green public space.

RQ15: Los códigos de construcción "verdes" son las políticas que exigen no sólo las características mínimas de seguridad para edificios comerciales, sino también las normas mínimas para reducir el impacto de los edificios en el medio ambiente. ¿Cree usted que la ciudad podría pasar a un código verde para edificios comerciales? ¿Por qué sí o por qué no? - Codes of "green" construction are policies that require not only minimal security features for commercial buildings, but also the minimum standards to reduce the impact of buildings on the environment. Do you think the city could move to a green code for commercial buildings think? Why or why not?

H26: Most stakeholders, excited by the possibilities of a green code will say that they believe their city can move to a green code for commercial buildings. The conservation of natural resources will more than likely be the reasoning for their optimism.

RQ16: ¿Quién podría ser aliados para un código de construcción verde? - Who could be allies for a green building code?

H27: We expect stakeholders to respond by saying, International environmental groups, engineering & architectural societies, local university and university professors.

RQ17: ¿Podría ponernos en contacto con cualquiera de estos potenciales aliados para que podamos hablar con ellos también? - Could you contact any of these potential allies so that we can talk to them too?

H28: This will vary amongst the stakeholder and their willingness to offer further connections, along with their potential network.

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 - Code for a single category of code at a time (i.e. code an entire document for all codes under super-code 'INFOSOUR' and then return to the beginning of the transcript to code for all codes under super-code 'ORGSIND')
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 - After coding, return to this super-code to determine if additional sub-codes should be created (i.e. emergent categories of data per Corbin and Strauss)

Codebook:

- Attitude: Mentions of personal attitude of a policy/code or theme
 - Positive- Mentions with a positive perception/outlook
 - Negative- Mentions with a negative connotation/outlook
 - Neutral- No emotional attachment to a statement
- Benefits-Allies: Mentions of benefits associated with allied organizations
- Benefits of Current Code: Mentions of benefits of current building codes in Bolivia
- Challenges-Opposition: Mentions of challenges or opposing organizations
- Challenges of Current Code: Mentions of issues with current building code
- City: Mentions of certain cities evaluated in Bolivia
 - Cochabamba
 - La Paz
 - Santa Cruz
- Economic Impacts of Building Codes: Mentions of cost associated with building codes
 - Builders: Mention of costs on builders
 - Government: Mention of costs associated to the government (local, state, federal)
 - Poor: Mentions of costs/impact on poor
 - Public - Residential Citizens: Mentions of costs effecting general public or entire city
- Effectiveness of Current Codes in Bolivia: Mentions of current code effectiveness
 - Commercial: Mentions of current codes effects on commercial buildings
 - Compliance: Mentions of compliance with current codes in municipalities
 - Departmental Codes: Mentions of building codes at the state level (If existing)
 - Enforcement: Mentions of enforcement of the current building codes
 - Incentives from Government: Mentions of incentives provided by the government to promote building code compliance
 - Municipal Codes: Mention of municipal building codes

- National Codes: Mention of national building codes (If existing)
 - Permitting: Mentions of needed permits to build in Bolivia
 - Residential: Mentions of residential building codes in Bolivia
- Feasibility of Implementing a Green Building Code: Mentions of the possibility to implement a green building code in Bolivia
- Perception of Current Building Codes In Bolivia: Mentions of what stakeholders think that a building code will do for the city.
- Public Reaction to Green Building
 - 1- not effective at all
 - 2- not very effective
 - 3- neutral (not a positive or negative effect)
 - 4- very little effectiveness
 - 5- very effective
- Themes
 - Built Environment: Mentions of the urban or built area in the city
 - Corruption: Mentions of Political corruption
 - Economy/Cost: Mentions of economy or cost
 - Education: Mentions of education pertaining to building codes
 - Energy Efficiency: Mentions of energy savings
 - Legal: Mentions of the legal process within building
 - Natural Environment: Mentions of nature or areas within cities that have not been altered by building
 - Politics: Mentions of politics which effects the building process
 - Population Growth: Mentions of rapid population growth in the following cities
 - Public Health: Mentions of health to general citizens in the cities
 - Public Outreach: Mentions of advocacy for building groups
 - Raw building materials: Mentions of construction material needed
 - Safety: Mentions of the impact a stronger building code may have on safety of public
 - Social well-being: Mention of positive social impacts with introduction of a green code
 - Stakeholder Investment: Mentions Investments from venture capitalist in Bolivia
 - Technology: Mentions of current building technology in Bolivia
 - Traditional Building: Mentions of current building culture/style in Bolivia

Appendix 3: Informed consent forms (English and Spanish versions)

English:

Leapfrogging to a Green Building Code in Bolivia

PARTICIPANT INFORMED CONSENT FORM

Principal Investigators: Darren Legge, Darius Stanton, Theodora Tran

Key Advisor: Elizabeth Albright, PhD

Thank you for your participation!

This research will help us improve our understanding of how building experts and key stakeholders in perceive the feasibility of leapfrogging to a green building code in the Bolivian cities of La Paz, Cochabamba and Santa Cruz.

It is entirely your choice whether or not to participate in this study.

There are no direct benefits from participation in this study.

As part of the interview, you will be asked information pertaining to your professional activities and your relationship to building policy, the building/construction industry or academia. You do not have to disclose this information if you so choose.

You have the right to skip questions in the survey if you choose.

You can stop the survey at any time for any reason.

If you should have questions or concerns before, during, or after your participation, please contact Darren Legge, Darius Stanton or Theodora Tran, the graduate student team from Duke University's Nicholas School of the Environment, or Elizabeth A. Albright, Ph.D., a faculty member at Duke University's Nicholas School of the Environment in Durham, NC. Darren Legge can be reached at (919)564-6180 or Darren.legge@duke.edu. Darius Stanton can be reached at (301)821-3208 or Darius.stanton@duke.edu. Theodora Tran can be reached at (408)515-4962 or Theodora.Tran@duke.edu. Elizabeth Albright can be reached at (919)613-8153 or elizabeth.albright@duke.edu.

If you have questions regarding your rights as a participant, any concerns regarding this project or any dissatisfaction with any aspect of this study, you may report them—confidentially, if you wish—to the Duke Institutional Review Board at 919-684-3030 or ors-info@duke.edu.

By answering the survey questions, you indicate that you consent to participate in this study, based upon the information provided above.

Spanish:

El Desarrollo de un Código de Construcción Verde

FORMULARIO DE CONSENTIMIENTO INFORMADO PARA PARTICIPANTES

Investigadores Principales: Darren Legge, Darius Stanton, Theodora Tran

Asesor: Elizabeth Albright, PhD

¡Gracias por su participación!

Esta investigación nos ayudará a mejorar nuestra comprensión de cómo los expertos de construcción y los principales grupos de interés en La Paz, Cochabamba y Santa Cruz perciben la posibilidad de desarrollar un código de construcción verde. Los resultados de este estudio serán usados solamente con el fin de ayudar a los grupos de interés, y serán de acceso público.

Tenga en cuenta que es su decisión si desea o no participar en este estudio.

Debe tener en cuenta que:

- No hay beneficios monetarios de la participación en este estudio
- Como parte de la entrevista, se le pedirá la información relativa a sus actividades profesionales y su relación con la política, la industria de la construcción, o de la universidad. Usted no tiene que revelar esta información si así lo desea
- Usted puede saltarse las preguntas en la encuesta si lo desea
- Puede detener la encuesta en cualquier momento y por cualquier razón

Si tiene cualquier pregunta o preocupación antes, durante o después de su participación, por favor póngase en contacto con Darren Legge, Darius Stanton, o Teodora Tran, el equipo de estudiantes de posgrado de la <<Nicholas School of the Environment>> de la Universidad de Duke, o Elizabeth Albright, Ph.D., un miembro de la facultad a la <<Nicholas School of the Environment>> de la Universidad Duke en Durham, NC 27708. Darren Legge puede ser contactado en +1(919)564-6180 o Darren.Legge@duke.edu. Darius Stanton puede ser contactado en +1(301)821-3208 o Darius.Stanton@duke.edu. Theodora Tran se puede contactar al +1(408)515-4962 o Theodora.Tran@duke.edu. Elizabeth Albright se puede contactar al +1(919)613- 8153 o Elizabeth.Albright@duke.edu.

Si usted tiene preguntas sobre sus derechos como participante, las preocupaciones con respecto a este proyecto o cualquier insatisfacción con cualquier aspecto de este estudio, se le pueden informar, de forma confidencial si lo desea, a la Junta de Revisión Institucional de Duke al +1(919)684- 3030 o en el e-mail ors-info@duke.edu.

En base a la información proporcionada anteriormente, al continuar, usted indica que usted da su consentimiento para participar en este estudio.

Por favor responda las siguientes preguntas. Si usted es capaz de responder en inglés, por favor hágalo. Si no es así, por favor responda en español.

Appendix 4: Classification sheet for survey participants (USA and Bolivia)

Bolivian Stakeholders

Academic - Professor

Agronomist

Architect

Community Leader

Engineer

Lawyer

Policy Maker

Politician

USA Stakeholders

Architect

Building Code Administrator

Chief In Green Building Engineering Division

Community Leader

Consultant

Director of Sustainability

Engineer

Green Building Plan Reviewer

Language Translator

Lawyer

LEED Specialist

Licensed Home Inspector

Politician - Public Official

Professor-Academic

Project Manager

USGBC Employee

Appendix 5: Node structure for NVivo analysis

Bolivian Surveys

- Attitude
 - Positive
 - Negative
 - Neutral
- Benefits-Allies
- Benefits of Current Code
- Challenges-Opposition
- Challenges of Current Code
- City
 - Cochabamba
 - La Paz
 - Santa Cruz
- Economic Impacts of Building Codes
 - Builders
 - Government
 - Poor
 - Public - Residential Citizens
- Effectiveness of Current Codes in Bolivia
 - Commercial
 - Compliance
 - Departmental Codes
 - Enforcement
 - Incentives from Government
 - Municipal Codes
 - National Codes
 - Permitting
 - Residential
- Feasibility of Implementing a Green Building Code
- Perception of Current Building Codes In Bolivia
- Public Reaction to Green Building
 - 1
 - 2
 - 3
 - 4
 - 5
- Themes
 - Built Environment
 - Corruption
 - Economy/Cost
 - Education
 - Energy Efficiency
 - Legal
 - Natural Environment
 - Politics

- Population Growth
- Public Health
- Public Outreach
- Raw building materials
- Safety
- Social well being
- Stakeholder Investment
- Technology
- Traditional Building

USA Surveys

- Economic Impacts
 - Builders
 - Government
 - Poor
 - Public - Residential Citizens
- Effectiveness of Current Codes
 - Commercial
 - Compliance
 - Departmental Codes
 - Enforcement
 - Implementation
 - Incentives from Government
 - Municipal Codes
 - National Codes
 - Permitting
 - Residential
 - Safety
- Evaluation of Current Building Code
 - Perception
 - Positive
 - Negative
 - Neutral
- Feasibility of Implementing a Green Building Code
 - Allies
 - Benefits
 - Bodies of Opposition
 - Challenges
- Public Reaction to Green Building Codes
 - 1
 - 2
 - 3
 - 4
 - 5
- Themes
 - Built Environment
 - Corruption
 - Economy/Cost

- Education
- Energy Efficiency
- Legal
- Natural Environment
- Politics
- Population Growth
- Public Health
- Public Outreach
- Raw building materials
- Safety
- Social well being
- Stakeholder Investment
- Technology
- Traditional Building

Appendix 6: Potential annual GDP supported by IgCC implementation in Bolivia's 3 principal cities

Item	Amount	Source
Predicted GDP attributable to green construction in the U.S., 2015-2018 (US\$billions)	303.4	Booz Allen Hamilton, 2015
Predicted GDP attributable to LEED construction in the U.S., 2015-2018 (US\$billions)	108.4	Booz Allen Hamilton, 2015
Predicted GDP attributable to IgCC construction in the U.S., 2015-2018 (US\$billions)	195.0	
Predicted average annual GDP attributable to IgCC construction in the U.S., 2015-2018 (US\$billions)	49	
U.S. GDP, 2012 (current US\$billions)	16,163	World Bank, 2015
Bolivia GDP, 2012 (current US\$billions)	27.085	World Bank, 2015
Ratio of Bolivia GDP to US GDP, 2012	0.17%	
Predicted average annual GDP attributable to IgCC construction in Bolivia, first four years of full implementation (US\$millions)	81.7	
Exchange rate as of January 23, 2016 (Bolivianos/USD)	6.85	Reuters
Predicted average annual GDP attributable to IgCC construction in Bolivia, first four years of full implementation (million Bolivianos)	560	
Population of Bolivia, 2012 (millions)	10.24	World Bank, 2015
Population of La Paz, Cochabamba & Santa Cruz, 2012 (millions)	2.8	City Population, 2012
Ratio of principal cities' population to total	27.6%	
Predicted average annual GDP attributable to IgCC construction, first four years of full implementation (US\$millions)	22.5	
Predicted average annual GDP attributable to IgCC construction, first four years of full implementation (million Bolivianos)	154.4	

Appendix 7: Potential annual jobs supported by IgCC implementation in Bolivia's 3 principal cities

Item	Amount	Source
Predicted jobs attributable to green construction in the U.S., 2015-2018 (millions)	3.9	Booz Allen Hamilton, 2015
Predicted jobs attributable to LEED construction in the U.S., 2015-2018 (millions)	1.4	Booz Allen Hamilton, 2015
Predicted jobs attributable to IgCC construction in the U.S., 2015-2018 (millions)	2.5	
Predicted average annual jobs attributable to IgCC construction in the U.S., 2015-2018 (thousands)	625	
U.S. GDP, 2012 (current US\$billions)	16,163	World Bank, 2015
Bolivia GDP, 2012 (current US\$billions)	27.085	World Bank, 2015
Ratio of Bolivia GDP to US GDP 2012	0.17%	
Predicted average annual jobs attributable to IgCC construction in Bolivia, first four years of full implementation (thousands)	1.05	
Population of Bolivia, 2012 (millions)	10.24	World Bank, 2015
Population of La Paz, Cochabamba & Santa Cruz, 2012 (millions)	2.8	City Population, 2012
Ratio of principal cities' population to total	27.6%	
Predicted average annual jobs attributable to IgCC construction, first four years of full implementation	289	

Appendix 8: Potential annual resource cost savings generated by IgCC implementation in Bolivia's 3 principal cities

Item	Amount	Source
Predicted resource cost savings attributable to green construction in the U.S., 2015-2018 (current US\$billions)	4.8	Booz Allen Hamilton, 2015
Predicted resource cost savings attributable to LEED construction in the U.S., 2015-2018 (current US\$billions)	2.2	Booz Allen Hamilton, 2015
Predicted resource cost savings attributable to IgCC construction in the U.S., 2015-2018 (current US\$billions)	2.6	
Predicted average annual resource cost savings attributable to IgCC construction in the U.S., 2015-2018 (US\$millions)	650	
U.S. GDP, 2012 (current US\$billions)	16,163	World Bank, 2015
Bolivia GDP, 2012 (current US\$billions)	27.085	World Bank, 2015
Ratio of Bolivia GDP to US GDP, 2012	0.17%	
Predicted average annual resource cost savings attributable to IgCC construction in Bolivia, first four years of full implementation (US\$billions)	1.09	
Exchange rate as of January 23, 2016 (Bolivianos/USD)	6.85	Reuters
Predicted average annual GDP attributable to IgCC construction in Bolivia, first four years of full implementation (billion Bolivianos)	7.46	
Population of Bolivia, 2012 (millions)	10.24	World Bank, 2015
Population of La Paz, Cochabamba & Santa Cruz, 2012 (millions)	2.8	City Population, 2012
Ratio of principal cities' population to total	27.6%	
Predicted average annual resource cost savings attributable to IgCC construction, first four years of full implementation (US\$thousands)	300	
Predicted average annual resource cost savings attributable to IgCC construction, first four years of full implementation (million Bs)	2.06	

Appendix 9: La Paz stakeholder analysis

Category	Stakeholder		Interest in Project	+ve/-ve
Central Government	1	Hugo Banzer (1997-2001)	<ul style="list-style-type: none"> Neoliberalist policies Privatization of public sector 	+
	2	Evo Morales (2006-Present)	<ul style="list-style-type: none"> Socialist/decentralization policies Delegate responsibilities to municipal governments 	-
	3	Water Ministry	<ul style="list-style-type: none"> Created by Morales and led by main water privatization opposition leader Goal of public management of water with mandate to end water privatization 	-
Municipal Government	4	Public Utility Empresa Publica Social de Agua Y Saneamiento (EPSAS)	<ul style="list-style-type: none"> Aggregate markets and merge suppliers to serve water to La Paz 	+
	5	Municipality of El Alto	<ul style="list-style-type: none"> Address critical shortcomings in city's infrastructure Be responsive to local needs 	+/-
	6	Servicio Autonomo Municipal de Agua Potable y Alcantarilldo (SAMAPA)	<ul style="list-style-type: none"> Manage efficiently and transparently available resources 	+/-
International Stakeholders	7	Private Utility Aguas de Illimani	<ul style="list-style-type: none"> Run local water utility efficiently 	+
	8	GTZ (Germany)	<ul style="list-style-type: none"> Carry out work contracted to it by the German government within the framework of Technical Cooperation 	+
	9	KfW Development Bank (Germany)	<ul style="list-style-type: none"> Promote economy and reduce poverty 	+
	10	Inter-American Development Bank (IADB)	<ul style="list-style-type: none"> Accompany Latin American Countries in their efforts to institutionalize transparency and facilitate accountability for preventing and controlling corruption Offer technical and financial assistance 	+
	11	World Bank	<ul style="list-style-type: none"> Improving water services to urban poor through privatization 	+
	12	International Monetary Fund (IMF)	<ul style="list-style-type: none"> \$138 Million USD loan to Bolivia requiring privatization of public water utilities 	+
	13	Corporacion Andina de Fomento/Development Bank of Latin America (CAF) (Venezuela)	<ul style="list-style-type: none"> Provide sustainable development Provide multiple financial services 	-

Local Stakeholders	14	Water Utility Employees	<ul style="list-style-type: none"> • Job retention 	-
	15	La Paz Neighborhood Council	<ul style="list-style-type: none"> • Access to affordable water and sanitation for city • Protection for citizen's rights 	+/-
	16	Central Regional Workers of El Alto	<ul style="list-style-type: none"> • Stop privatization of water • Create/keep local jobs 	-
	17	Trabajadores Central Obrera Regional de El Alto	<ul style="list-style-type: none"> • Central peasant union federation of cocalero movement • Utilize pressure tactics to stop privatization 	-
	18	La Paz Citizens (farmers, local ejos, trade unions, local scientists)	<ul style="list-style-type: none"> • Get rid of increase to water bills • Mobilize through blockades, official complaint letters, petitions, protests, strikes, and occupation of buildings 	-
	19	Private Water Vendors "Aguateros"	<ul style="list-style-type: none"> • Sell water to population of city with unmet water access needs 	-
	20	Indigenous and rural communities	<ul style="list-style-type: none"> • Foster self-governance using to the traditional system of "usos y costumbres" 	-
	21	Farmer associations and unions	<ul style="list-style-type: none"> • Foster self-governance using to the traditional system of "usos y costumbres" 	-
	22	Federacion de Juntas Vecinales (FEJUVE)	<ul style="list-style-type: none"> • Association of neighbor councils seeking to protect its members 	-
Non-Government Organizations (NGOs)	23	Water for People	<ul style="list-style-type: none"> • Develop initiatives with local governments to improve rural clean water access 	+/-
	24	FEDECOR	<ul style="list-style-type: none"> • Integral management of water resources through uses and customs 	-

Sources: Fritz, 2006; Ruiz-Mier, 2002; Achtenberg, 2013; Greyl, et al., 2015; Strother, 2013; Sadiq, 2002; CAF, 2013; The World Bank, 2016; Abdollahi, 2014; Federal Ministry for Economic Cooperation and Development, 2016; and KfW Development Bank, 2015

Appendix 10: Cochabamba stakeholder analysis

Category	Stakeholder	Interest in Project	+ve/-ve	
Central Government	1	Hugo Banzer (1997-2001)	<ul style="list-style-type: none"> • Neoliberalist policies • Privatization of public sector 	+
	2	Evo Morales (2006-Present)	<ul style="list-style-type: none"> • Socialist/decentralization policies • Delegate responsibilities to municipal governments 	-
	3	Water Ministry	<ul style="list-style-type: none"> • Created by Morales and led by main water privatization opposition leader • Goal of public management of water with mandate to end water privatization 	-
	4	Bolivian Army	<ul style="list-style-type: none"> • Maintain public order 	+/-
	5	Senasba (National Service for Sustainable Water and Sanitation Services)	<ul style="list-style-type: none"> • Support the development of sustainable water provision across Bolivia 	-
	6	SENARI (National Irrigation Service)	<ul style="list-style-type: none"> • Improve irrigation in Bolivia along with farmers, taking into account their customs and rights (funded by German development bank) 	-
Municipal Government	7	Public Utility Empresa Publica Social de Agua Y Saneamiento (EPSAS)	<ul style="list-style-type: none"> • Aggregate markets and merge suppliers to serve water to La Paz 	+
	8	Cochabamba Mayor	<ul style="list-style-type: none"> • Maintain office • Please financial backers • Oversee spending and projects at the municipal level 	+/-
	9	Servicio Autonomo Municipal de Agua Potable y Alcantarilldo (SAMAPA)	<ul style="list-style-type: none"> • Manage efficiently and transparently available resources 	+/-
	10	Organizaciones Territoriales de Base (OTB) / Grassroots Territorial Organizations	<ul style="list-style-type: none"> • Control and mobilize community through participatory labor 	-
International Stakeholders	11	Private Utility Aguas del Tunari	<ul style="list-style-type: none"> • Run local water utility efficiently 	+

	12	GTZ (Germany)	<ul style="list-style-type: none"> Carry out work contracted to it by the German government within the framework of Technical Cooperation 	+
	13	KfW Development Bank (Germany)	<ul style="list-style-type: none"> Promote economy and reduce poverty 	+
	14	Inter-American Development Bank (IADB)	<ul style="list-style-type: none"> Accompany Latin American Countries in their efforts to institutionalize transparency and facilitate accountability for preventing and controlling corruption Offer technical and financial assistance 	+
	15	World Bank	<ul style="list-style-type: none"> Improving water services to urban poor through privatization 	+
	16	International Monetary Fund (IMF)	<ul style="list-style-type: none"> \$138 Million USD loan to Bolivia requiring privatization of public water utilities 	+
	17	Swedish International Development Agency (SIDA)	<ul style="list-style-type: none"> Promote a healthy environment for Bolivian citizens, along with democratic participation and human rights 	-
	18	International Centre for Settlement of Investment Disputes (ICSID, created by World Bank)	<ul style="list-style-type: none"> Arbitrate/mediate disputes 	+/-
Local Stakeholders	19	Water Utility Employees	<ul style="list-style-type: none"> Job retention 	-
	20	The Democracy Center/Pacific News Service	<ul style="list-style-type: none"> Expose and protest Betchel Company's Actions 	-
	21	Antiglobalization Activists	<ul style="list-style-type: none"> Protest IMF and World Bank Activities 	-
	22	Jim Shultz (Pacific News Service Reporter)	<ul style="list-style-type: none"> Reason with Bechtel to forgo lawsuit against Bolivia through ICSID Globally expose impact of water privatization on local consumers 	-
	23	San Francisco Chronicle & New York Times	<ul style="list-style-type: none"> Report news Expose negative impacts of water privatization efforts 	-
	24	Cochabamba Citizens	<ul style="list-style-type: none"> Maintain affordable access to water 	-
	25	Water Committees	<ul style="list-style-type: none"> Implement small-scaled infrastructure 	-
	26	ASICASUDD-EPAS (umbrella organization)	<ul style="list-style-type: none"> Facilitate coordination with the directory board of SEMAPA Foster dialogue around water rights and 	-

			<p>water management</p> <ul style="list-style-type: none"> • Bolster negotiating position with local authorities and organizations involved in water management 	
	27	Private Water Vendors “Aguateros”	<ul style="list-style-type: none"> • Sell water to population with unmet needs 	-
	28	Indigenous and Rural Communities	<ul style="list-style-type: none"> • Promote self-governance using a traditional system of “usos y costumbres” 	-
	29	Farmer Associations and Unions	<ul style="list-style-type: none"> • Foster self-governance using to the traditional system of “usos y costumbres” 	-
	30	Peri-urban Community Organizations	<ul style="list-style-type: none"> • Providing drinking water (in the face of SEMAPA, NGO, and church initiative failures) 	-
	31	Coalition for the Defense of Water and Life (La Coordinadora) – a civil society organization	<ul style="list-style-type: none"> • Led by Oscar Olivera • Coordinate peaceful protests against privatization 	-
Non-Government Organizations (NGOs)	32	Water for People	<ul style="list-style-type: none"> • Develop local initiatives with area governments to increase access to clean water in rural parts 	+/-
	33	Aguatuya (in Public Private Partnership with SEMAPA, two microfinance organizations, and water organizations)	<ul style="list-style-type: none"> • Increase drinking water and sanitation access outside municipal utility service areas 	-

Appendix 11: Santa Cruz stakeholder analysis

Category	Stakeholder		Interest in Project	+ve/-ve
Central Government	1	President Hernan Siles Zuazo (1956-60)	<ul style="list-style-type: none"> Nationalist policies (overthrew the military junta) Established national co-operative law "Ley de Cooperativa" in 1959 	+
	2	Autoridad de Fiscalizacion y Control Social de Agua Potable y Saneamiento Basico, AAPS	<ul style="list-style-type: none"> National authority to audit water cooperatives 	+/-
	3	Instituto Nacional de Cooperatives (INACO)	<ul style="list-style-type: none"> National regulatory body for cooperatives 	+/-
International Stakeholders	4	World Bank	<ul style="list-style-type: none"> Provide \$13.3M in loans to extend water distribution and production Provide good practice guidelines for tendering outsourced major construction activities 	+
	5	USAID	<ul style="list-style-type: none"> Provide consultants to analyze water distribution options and alternatives 	+/-
	6	PricewaterhouseCoopers	<ul style="list-style-type: none"> Audit water cooperative SAGUAPAC 	+/-
Cooperative Stakeholders	7	SAGUAPAC (Cooperativa de Servicios Publicos Santa Cruz Ltda)	<ul style="list-style-type: none"> Private non-profit organization Provide potable water and sewage drains in Santa Cruz Utilize World Bank financing to implement and operate water cooperative 	+
	8	General Delegate Assembly	<ul style="list-style-type: none"> Appoint senior management to SAGUAPAC 	+
	9	Supervisory Board	<ul style="list-style-type: none"> Maintains veto rights over SAGUAPAC Management Board and appoint external auditors 	+
	10	Administration Board	<ul style="list-style-type: none"> Elected by general assembly Approve budget and tariff increases Elect general manager and leadership 	+
	11	Co-operative Members/Customers	<ul style="list-style-type: none"> Pay water bills Vote for delegates Wants affordable potable water 	+
Local Stakeholders	12	Small Barrio Cooperatives	<ul style="list-style-type: none"> Provision of water to poor informal neighborhoods 	-
	13	Socios (water users)	<ul style="list-style-type: none"> Want access to affordable water 	+/-
	14	Local Elite #1: Taborochi Logia	<ul style="list-style-type: none"> Conciliate requests of modern life with structures of feudal habitus 	+/-

			<ul style="list-style-type: none"> • Membership drawn exclusively from professional males from traditional families 	
15	Local Elite #2: Caballeros del Oriente Logia		<ul style="list-style-type: none"> • Conciliate requests of modern life with structures of feudal habitus • Membership drawn exclusively from professional males from traditional families 	+/-
16	Comite Pro Santa Cruz (CPSC)		<ul style="list-style-type: none"> • Umbrella institution that federates 200 local associations • "Watchman" of local culture and value system 	+/-
17	Private Water Vendors "Aguateros"		<ul style="list-style-type: none"> • Sell water to population of city with unmet water access needs 	-
18	Indigenous and rural communities		<ul style="list-style-type: none"> • Foster self-governance using to the traditional system of "usos y costumbres" 	+/-
19	Farmer associations and unions		<ul style="list-style-type: none"> • Foster self-governance using to the traditional system of "usos y costumbres" 	+/-
20	El Deber Newspaper		<ul style="list-style-type: none"> • Antagonistic view of La Paz and central governments 	-

Appendix 12: National stakeholder SWOT analysis

Stakeholder	Strengths	Weaknesses	Opportunities	Threats
Central Government	<ul style="list-style-type: none"> • Ability to pass central government laws affecting municipalities • Ability to use military force • Power to enlist technical experts 	<ul style="list-style-type: none"> • High staff turnover • Technical employee hiring not designed to select the most qualified candidates • Low coordination between prefecture and municipal government • Lack of monitoring and evaluation of work plans • Weak prefecture representation at the department level 	<ul style="list-style-type: none"> • Can organize investments and programs more actively at both the departmental and municipal levels 	<ul style="list-style-type: none"> • If support of the people is lost, the government can lose its legitimacy and control over project outcomes
Municipal Government	<ul style="list-style-type: none"> • Democratically elected • “Popular participation law” strengthens the authority of municipal governments and reinforces decentralization policy • Basic unit for planning, administration, and management • Equitable distribution as well as good stewardship of public resources • Ownership of 	<ul style="list-style-type: none"> • High staff turnover • Technical employee hiring not designed to select the most qualified candidates • Low coordination between prefecture and municipal government • Lack of monitoring and evaluation of work plans • Weak prefecture representation at the department level 	<ul style="list-style-type: none"> • Grouping together in partnership with other municipalities • Significant resources (85%) dedicated to project implementation • Ability to carry out local development • Share experiences and lessons learned with other municipalities 	<ul style="list-style-type: none"> • Municipal governments prioritize health and education spending over other infrastructure • Scattered and disjointed from other municipalities • Legal recognitions of groupings of municipalities is still weak

	infrastructure			
External Stakeholders	<ul style="list-style-type: none"> Financial criteria for decision making Generally nationwide coverage Provision of grants gives external stakeholders large amount of power and influence over government institutions Access to large amounts of funding Development projects in Bolivia are largely donor driven Ability to utilize international firms with experience and expertise for implementation 	<ul style="list-style-type: none"> Urban bias (tend to exclude the poor) Little interest in rural areas Utilization of metrics for desired outcomes often have very narrow scope Very rigid structure, usually not much room for flexibility 	<ul style="list-style-type: none"> Can work with local population and include them in stakeholder analysis Opportunity to utilize funding to train and build capacity of local human capital to implement development projects Opportunity to work with other aid organizations Access to top management in target country 	<ul style="list-style-type: none"> Local population can greatly hinder development/progress if the majority do not agree with policies Morales' decentralized approach could prevent international firms from working on development projects
NGOs	<ul style="list-style-type: none"> Some NGOs are considered efficient Strong presence in remote areas Nationwide presence Years of experience in country Familiarity with important customs and community 	<ul style="list-style-type: none"> Some considered inefficient Usually reduced volume of operations Dependence on outside resources Lack of dependable financing Financing for long-term projects difficult to secure Programs not necessarily in line 	<ul style="list-style-type: none"> Potential to coordinate with the many other NGOs in the country Opportunities to work with local population on grassroots efforts 	<ul style="list-style-type: none"> Potentially insufficient updating of development approaches and mechanisms Funders have a large amount of influence on projects Could be an excessive number of NGOs in Bolivia—decreasing the

	culture	with national strategic priorities, causing a lack of coordination <ul style="list-style-type: none"> • Skills and expertise offered sometimes inappropriate for problem at hand 		impact that a single NGO can have
Local Stakeholders	<ul style="list-style-type: none"> • Strength in numbers and ability to disrupt peace if in disagreement • Ability to apply pressure tactics in large numbers • Ability to get the global community aligned with their concerns (through media) 	<ul style="list-style-type: none"> • Not much financial power • Inability to utilize pressure tactics unless they can mobilize a majority of the population • Power can still be skewed towards the elite/local political institutions • Generally not education about entire picture/scope of projects • Generally not given a seat at the table during project planning stages 	<ul style="list-style-type: none"> • Work more closely with municipalities to have their interests represented • They know what their needs are and will know for the most part whether or not a policy can be enforced 	<ul style="list-style-type: none"> • Not being able to form enough of a resistance to stop harmful policies

Sources: IFAD, 2007

Appendix 13: La Paz stakeholder SWOT analysis

Stakeholder	Strengths	Weaknesses	Opportunities	Threats
Central Government	<ul style="list-style-type: none"> Ability to pass national laws that can act as an impetus for a specific type of infrastructure development (in this case, neoliberalism/privatization) 	<ul style="list-style-type: none"> Can lose legitimacy and power in political uprisings Unable to effectively mediate between needs of local citizens Weakened state of power due to interrupted/short presidential regimes 	<ul style="list-style-type: none"> Can work more closely with municipalities and national non-profit organizations to ensure that policies are serving the needs of the citizens Conduct thorough stakeholder analysis in project planning stages to ensure maximum compliance during project implementation 	<ul style="list-style-type: none"> Dependency on foreign aid subjects government to conditions imposed by international agencies La Paz citizens have shown in the past that the central government cannot force municipalities or citizens to obey its laws; potential for future uprisings
Municipal Stakeholders	<ul style="list-style-type: none"> Under Morale's decentralization policy, municipal government has a large amount of power in determining how money is spent on infrastructure projects Theoretically should be more accountable to the local population 	<ul style="list-style-type: none"> Still subject to central government laws (which sometimes are out of touch with local needs), putting the municipal government at odds with either the commands of the central government administration 	<ul style="list-style-type: none"> Can work with local population and include all socioeconomic groups in stakeholder analysis (such as the poorer neighborhoods in La Paz) Work more closely with 	<ul style="list-style-type: none"> Municipal governments have tendency towards corruption, which can reduce their influence in local communities if they lose their legitimacy Large amount of power is dependent upon Morale's decentralization

		<p>or the needs of the local population</p> <ul style="list-style-type: none"> • Still subject to high levels of corruption 	<p>central government administration to convey needs of local populace and prevent future harmful central government policies from being enacted</p>	<p>policies. If central government moves away from decentralization, municipalities will lose the amount of power they have</p>
International Stakeholders	<ul style="list-style-type: none"> • Providing funding for projects gives international development agencies a large amount of influence in deciding what projects are implemented in La Paz • Ability to utilize international firms with experience and expertise for implementation can add to international stakeholder credibility and influence 	<ul style="list-style-type: none"> • Tendency to utilize top-down methods of creating conditions, without conducting necessary level of due-diligence by studying local population (leaving room for potential failure of projects) 	<ul style="list-style-type: none"> • Can work with local population and include all socioeconomic groups in stakeholder analysis (such as the poorer neighborhoods in La Paz) • Ensure that all stakeholders are fairly represented (from large multinational corporations to community members) 	<ul style="list-style-type: none"> • If multilateral organizations choose to ignore the demands of local stakeholders in the interest of achieving monetary metrics/goals, they risk engendering unrest
Local Stakeholders	<ul style="list-style-type: none"> • Sheer size of population can lead to powerful political clout 	<ul style="list-style-type: none"> • Interests of the poorest citizens in La 	<ul style="list-style-type: none"> • Voice opinions on developme 	<ul style="list-style-type: none"> • Bolivia was formerly under military regime,

	<p>through pressure tactics which have the ability to influence central government actions</p> <ul style="list-style-type: none"> • Can choose not to comply with policies that do not serve their interests 	<p>Paz often ignored</p> <ul style="list-style-type: none"> • Unless local stakeholders have solidarity, they have little political power 	<p>nt projects early in planning stages</p> <ul style="list-style-type: none"> • Work with non-profit organizations and municipal government to make sure interests are represented • Form coalitions to keep governing bodies accountable 	<p>and military force was used against dissenting populations—should democracy be overthrown, there is the threat of military interests prevailing again</p>
Non-Profit Stakeholders	<ul style="list-style-type: none"> • Intimate knowledge of local customs and cultures • Subject matter experts/deep knowledge about specific subject • Ability to connect various stakeholders 	<ul style="list-style-type: none"> • Little to no monetary influence • Rarely initiator of political movements, serves more of a supporting role 	<ul style="list-style-type: none"> • Can engage with local stakeholders during planning stages to help secure their support in infrastructure development 	<ul style="list-style-type: none"> • Usually have little negotiating power • Can only advance a cause if they have powerful partners on their side

Appendix 14: Cochabamba stakeholder SWOT analysis

Stakeholder	Strengths	Weaknesses	Opportunities	Threats
Central Government	<ul style="list-style-type: none"> • Ability to pass national laws that can act as an impetus for a specific type of infrastructure development (in this case, neoliberalism/privatization) • Ability to mobilize the military to enforce laws 	<ul style="list-style-type: none"> • Central government viewed antagonistically by local population • Can lose legitimacy and power in political uprisings 	<ul style="list-style-type: none"> • Can work more closely with municipalities and national non-profit organizations to ensure that policies are serving the needs of the citizens • Conduct thorough stakeholder analysis in project planning stages to ensure maximum compliance during project implementation 	<ul style="list-style-type: none"> • Strong decentralized and civic minded culture contributes to antagonistic view of central government • Cochabamba citizens have shown in the past that the central government cannot force municipalities or citizen to obey its laws; potential for future uprisings
Municipal Stakeholders	<ul style="list-style-type: none"> • Under Morale's decentralization policy, municipal government has a large amount of power in determining how money is spent on infrastructure projects • Theoretically should be more accountable to the local population 	<ul style="list-style-type: none"> • Still subject to central government laws (which sometimes are out of touch with local needs), putting the municipal government at odds with either the commands of the central government 	<ul style="list-style-type: none"> • Can work with local population and include all socioeconomic groups in stakeholder analysis (such as the poorer neighborhoods in Cochabamba) • Work more 	<ul style="list-style-type: none"> • Municipal governments have tendency towards corruption, which can reduce their influence in local communities if they lose their legitimacy • Large amount of power is dependent upon Morale's decentralization policies. If

		<p>administration or the needs of the local population</p> <ul style="list-style-type: none"> • Still subject to high levels of corruption 	<p>closely with central government administration to convey needs of local populace and prevent future harmful central government policies from being enacted</p>	<p>central government moves away from decentralization, municipalities will lose the amount of power they have</p>
International Stakeholders	<ul style="list-style-type: none"> • Providing funding for projects gives international development agencies a large amount of influence in deciding what projects are implemented in Cochabamba • Ability to utilize international firms with experience and expertise for implementation can add to international stakeholder credibility and influence 	<ul style="list-style-type: none"> • Inability to be flexible, or failure to take local stakeholder interests (like in the World Bank's strict stance on forbidding water subsidies) into account can delegitimize organization and reduce their power, and waste resources 	<ul style="list-style-type: none"> • Can work with local population and include all socioeconomic groups in stakeholder analysis (such as the poorer neighborhoods in Cochabamba) • Ensure that rights and quality of life of local citizens are not abused in order to avoid political uprisings 	<ul style="list-style-type: none"> • If multilateral organizations choose to ignore the peaceful protests of local stakeholders again in the future, they can damage their reputation and effectively damage their influence in Cochabamba
Local Stakeholders	<ul style="list-style-type: none"> • Sheer size of population can lead to powerful political clout 	<ul style="list-style-type: none"> • Interests of the poorest citizens in 	<ul style="list-style-type: none"> • Voice opinions on development 	<ul style="list-style-type: none"> • Bolivia was formerly under military regime,

	<p>through pressure tactics</p> <ul style="list-style-type: none"> • Can choose not to comply with policies that do not serve their interests 	<p>Cochabamba often ignored</p> <ul style="list-style-type: none"> • Unless local stakeholders have solidarity, they have little political power 	<p>nt projects early in planning stages</p> <ul style="list-style-type: none"> • Work with non-profit organizations and municipal government to make sure interests are represented • Form coalitions to keep governing bodies accountable 	<p>and military force was used against dissenting populations—should democracy be overthrown, there is the threat of military interests prevailing again</p>
Non-Profit Stakeholders	<ul style="list-style-type: none"> • Intimate knowledge of local customs and cultures • Subject matter experts/deep knowledge about specific subject • Ability to connect various stakeholders 	<ul style="list-style-type: none"> • Little to no monetary influence • Rarely initiator of political movements, serves more of a supporting role 	<ul style="list-style-type: none"> • Can engage with local stakeholders during planning stages to help secure their support in infrastructure development 	<ul style="list-style-type: none"> • Usually have little negotiating power • Can only advance a cause if they have powerful partners on their side

Appendix 15: Santa Cruz stakeholder SWOT analysis

Stakeholder	Strengths	Weaknesses	Opportunities	Threats
Central Government	<ul style="list-style-type: none"> Ability to pass national laws that can act as an impetus for a specific type of infrastructure development (in this case, cooperative structures) 	<ul style="list-style-type: none"> Laissez-faire approach to governing Removed and distant from local politics – did not exercise any actual political power in Santa Cruz Central government viewed antagonistically by local population 	<ul style="list-style-type: none"> Can develop national infrastructure development policies with funding incentives to engage citizens in La Paz Can secure access to international development funds for projects in Santa Cruz 	<ul style="list-style-type: none"> Strong decentralized and civic minded culture contributes to antagonistic view of central government Santa Cruz is geographically removed from the capital city, posing an additional challenge for making central government politics and policies relevant for Santa Cruz
International Stakeholders	<ul style="list-style-type: none"> Providing funding for projects gives international development agencies a large amount of influence in deciding what projects are implemented in Santa Cruz Ability to utilize international firms with experience and expertise for implementation can add to international stakeholder credibility and influence 	<ul style="list-style-type: none"> Sometimes prescribed projects are out of touch with needs of population they are trying to assist (like recommendations for privatization of billing in Santa Cruz), which reduces their influence 	<ul style="list-style-type: none"> Can work with local population and include all socioeconomic groups in stakeholder analysis (such as the poorer outer rings of Santa Cruz) Can recognize the importance of local logia influence and engage them as primary stakeholders to ensure success of infrastructure development 	<ul style="list-style-type: none"> If international agencies don't recognize Santa Cruz's unique political structure, they can fail to engage the correct stakeholders to get projects off the ground Prescribing projects that are not suited to local political climate can harm organization's political legitimacy for

			projects	future projects
Cooperative Stakeholders	<ul style="list-style-type: none"> • Democratically elected • Two-tiered electoral structure allows for governance transparency • Cooperative structure ensures that water infrastructure serves its customers • One vote per customer ensures that cooperative is not influenced by unions or local businesses on elected management board (allowing for greater political independence) 	<ul style="list-style-type: none"> • Need strong political leadership to transfer power from state to cooperative • Strong ties to political agendas of local elite, <i>logias</i>, is possibly why poor outer rings of Santa Cruz are not serviced by cooperative 	<ul style="list-style-type: none"> • Can expand services to include the outer poorer communities of Santa Cruz 	<ul style="list-style-type: none"> • In cooperative systems with less governance transparency, there is the potential for cooperative governance to be swayed by political interest groups
Local Stakeholders	<ul style="list-style-type: none"> • Their interests are represented through voting for cooperative managers • Because the SAGUAPAC is owned by its customers, local stakeholders exercise the most influence and power over decisions made regarding the water infrastructure 	<ul style="list-style-type: none"> • Interests of the poorest citizens in Santa Cruz are not captured in cooperative structure • Power can still be skewed towards the elite/local political institutions due to informal power structures created by local <i>logias</i> 	<ul style="list-style-type: none"> • Work with smaller cooperatives who serve the poorer outer rings of Santa Cruz to integrate their infrastructure into SAGUAPAC's system 	<ul style="list-style-type: none"> • If customers do not utilize their vote during cooperative elections (as is increasingly becoming the case), SAGUAPAC may be influenced by political interests

*Appendix 16: National stakeholder priority and influence rating
(1= Lowest priority/least influential, 5 = Highest priority/most influential)*

Stakeholder	Priority	Influence
Central government	3	3
Municipal government	4	4
International stakeholders	5	5
Local stakeholders	1	2
Non-profit stakeholders	2	1

Appendix 17: National stakeholder interest and influence assessment
(1= Lowest priority/least influential, 5 = Highest priority/most influential)

