ASSESSING THE EFFECTIVENESS OF RESULTS-BASED
REGULATIONS IN FOSTERING INNOVATION AND SOCIAL LEARNING:
A FOCUS ON THE SASKATCHEWAN MINISTRY OF ENVIRONMENT

A Thesis
Submitted to the Faculty of Graduate Studies and Research
In Partial Fulfillment of the Requirements

For the Degree of
Master of Public Policy
University of Regina

By
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Regina, Saskatchewan
December 2019
Jane Christopher Akpan, candidate for the degree of Master of Public Policy, has presented a thesis titled, *Assessing The Effectiveness of Results-Based Regulations in Fostering Innovation and Social Learning: A Focus On The Saskatchewan Ministry of Environment*, in an oral examination held on December 10, 2019. The following committee members have found the thesis acceptable in form and content, and that the candidate demonstrated satisfactory knowledge of the subject material.

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Abstract

Results-Based Regulation (RBR) is a hybrid regulation that incorporates some features of a prescriptive regulation, outcome-based regulation, and co-regulation. Traditionally, the environmental activities in Saskatchewan were administered through prescriptive regulation. In 2015, RBR was introduced to substitute the prescriptive regulation. When RBR was introduced, some notable changes were made, and some expected outcomes were stipulated. The core changes that shaped this thesis include the introduction of ‘alternative solutions’ when complying with the regulation, reliance on qualified persons (QP) to certify alternative solutions, and a focus on results. The emphasis on results and the provision of alternative solutions were expected to give room for in-depth research and development, which may induce firms’ innovation activities.

This thesis assessed if RBR had led to innovation, especially where a firm decides to follow an alternative solution in achieving the regulatory outcomes. To advance innovation, stakeholders’ interaction was deemed necessary. However, the level of interaction required for advancing innovation should be one that instigates a form of learning where assumptions are questioned, and alternative options considered, creating an avenue for social learning.

Thus, the thesis assessed if innovation and social learning have been fostered by RBR? To achieve this objective, it employed a mixed-method approach; primary data were sourced between July and November 2018 through an online survey and semi-structured interviews. Fifty respondents completed the survey. To analyze the survey results, the researcher computed descriptive statistics, conducted a Chi-square test of independence and Spearman’s ranked...
correlation. For the interview, twenty-two stakeholders participated, and a thematic network analysis was employed to interpret the transcripts.

After reviewing related literature and analyzing the survey and interview results, it was discovered that RBR had fostered some firms’ innovation activities. For social learning, some stakeholders’ interactions existed; however, the need to advance social learning through stakeholders’ collaboration was evident. Thus, the researcher recommended the formation of a collaborative risk management committee (CRMC) comprised of stakeholders within related environmental activities. The CRMC may deliberate on collaborative risk management processes (CRMP) with the objective of enhancing environmental protection, reducing non-compliance, advancing social learning and encouraging innovation.

The research findings and recommendations may inform future policy decisions for regulating environmental resources in Saskatchewan and other jurisdictions that are currently implementing or proposing to implement the RBR.

Keywords: Innovation, Social learning, Results-based Regulation, Stringency, Flexibility, Affordability, Uncertainty, Stakeholders’ interaction.
Acknowledgement

Reflecting on this research journey, I am thankful for the great minds that made this thesis a success. A heartfelt thank-you to my supervisor Dr. Margot Hurlbert who guided me with high professional standards; her constant motivation saw me through intricate technical details. Her steadfastness, resilience, patience and optimism reflect on the success of this thesis. Fortunately, she embedded some of her versed expertise in me. Also, she encouraged me to present a paper at an academic conference at the University of California, Berkeley, USA.

I thank my thesis committee, Dr. Kathleen McNutt, Dr. Jeremy Rayner and Thon Phommavong, for their invaluable advice. Dr. McNutt was excellent at ensuring consistent progress on the thesis, always ready to listen and give constructive advice. Dr. Rayner provided highly constructive criticisms that put me on my toes. Overall, I was glad he did because he fortified me with ideas to guide against possible errors. Thon, an expert on the results-based regulations, offered continuous support on practical details in the environmental legislation.

My sincere gratitude to the Saskatchewan Ministry of Environment, and the Saskatchewan Environmental Industry and Management Association for granting me access to environmental resource firms. Thank you to the stakeholders who completed the survey, and participated in the interviews; without your input, I may not have completed this thesis.

Furthermore, I am grateful for the Saskatchewan Innovation and Excellence Scholarship. Also, several Teaching and Research Assistantships from the Faculty of Graduate Studies and Research (FGSR) offered me opportunities to expand my professional experience. Finally, the Travel Awards from FGSR and the Canadian Association of Members of Public Utility Tribunals granted me opportunities to meet other professionals and to gain robust insights for this thesis and the Master of Public Policy (MPP) program.
Dedication

First, I thank the Lord Almighty for granting me divine favor all through my MPP program. I dedicate this thesis to my mom. A humble, steadfast and impeccable person who encouraged me in her calmness, action and fortitude to take on greater strides. Never tired of supporting where necessary. Your passing on to the world beyond during my research journey brings tears to my eyes each moment I reminiscence, but the virtues you embedded in me lives on. Also, my father taught me the need to be focused, patient and to persevere. These virtues played in my research journey and enhanced the successful completion of my study.

I thank my husband and best friend Chris, for his patience and support. Thank you for believing in me, especially those moments when I didn’t believe in myself. To my lovely sons, Awesome and Emma, you got your mommy back. To my siblings – thank you for your fervent prayers.

When the Saskatchewan Ministry of Environment identified the need to assess the effectiveness of its reformed regulation, the RBR team and Jennifer Redston, my executive internship mentor at the Ministry, believed that I could carry on this independent investigatory research. Jeff Paterson, Sarah Gammell (RBR team members) and Jennifer motivated me to take on pieces and build remarkable structures.

Also, while serving as the Graduate Chair at the Johnson Shoyama Graduate School of Public Policy, Dr. Bruno Dupeyron provided continuous advice for me to sail through.

Finally, I am grateful to all who supported this thesis and the completion of my MPP program, whom I have not mentioned earlier – Dr. Ken Rasmussen, Doug Moen, Jim Marshall, John Bird, Connie Heshka, Cara Bradley, Tiana Yaskow, Janice Yule, Abayomi Akintola, Augustina Osaseri, Benjamin Olayele, Mac Osazuwa-Peters, Kwaku Ayisi, and many others.
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Chapter One: Introduction

1.1 Purpose

High-risk environmental problems threaten the environment and human health and safety (Government of Saskatchewan (GOS, 2014a). The growing challenge to keep pace with high-risk environmental issues and opportunities for new solutions has necessitated dynamic ways of knowledge formation and responsive science. Also, it has prompted policymakers to involve relevant stakeholders in the policy decision processes that relate to environmental protection activities. One such policy process relates to how environmental resources are regulated. In general, government regulations refer to the rules implemented by public authorities (policymakers) to influence firms' activities and the behaviour of private actors in an economy (Organization for Economic Co-operation and Development (OECD), 1997). Regulations are designed as policy instruments to guide processes and improve the outcomes of defined activities in ways that reduce social harms, promote social welfare, enhance economic growth, protect health, improve safety and environmental protection activities (Coglianese, Nash & Olmstead 2004; Government of Canada (GOC), 2012; OECD, 1997; OECD, 2015).

Policymakers ensure that firms comply with the environmental regulations that relate to their business activities. This is pertinent because research has shown that if the protection of environmental resources resides in the fate of private firms, the resources will be prone to congestion due to their non-rivalry nature and will gradually deplete without firms being accountable for the marginal external costs (MEC) conferred to the environment (Weimer & Vining, 2017, chapters 5-6; Bhaskar, 2013). In this light, scholars in two schools of thought informed widespread perceptions over the role of the government and
private firms towards environmental protection. The first school of thought (the neoclassical economists) argued that compliance with environmental regulations reduces firms’ competitiveness because it diverts resources away from increasing their productivity, but increases firms’ total cost (Palmer, Oates & Portney 1995; Crafts, 2006). The emerging school of thought (a combination of contemporary economists and policy analysts amongst others) view regulatory impacts from the perspective of providing higher quality products and improved production process that emanate from complying with environmental regulations (Porter & van der Linde, 1995; Ambec et al., 2013; Ramanathan et al., 2017). For instance, Porter & van der Linde (1995), in their study, popularly known as the Porter Hypothesis, posit that environmental regulations can foster innovation and eventually increase firms’ competitiveness. However, the extent of these regulatory impacts depends on the type of regulatory framework in place.

Thus, policymakers are beginning to shift their regulatory focus towards possible frameworks that facilitate innovation (Paraskevopoulos, 2012; Hoberg, Malkinson & Kozak, 2016; Porter & van der Linde, 1995, p 97; Government of Saskatchewan (GOS) 2014a). This process involves a sustained interaction between independent stakeholders in a trusting environment (Cundill & Rodela, 2012). Several studies acknowledge the link between stakeholders’ interaction and innovation (Lundvall, 1992; Smits, Kuhlman and Shapira, 2010); however, there is little progress regarding the type of learning that occurs in such spaces, if any social learning has occurred, and when social learning may be necessary to solve complex environmental problems (Hurlbert and Gupta, 2015), which may, in turn, facilitate a regulatory-induced innovation.
This thesis attempts to fill a gap within the environmental resource management literature regarding the interaction between regulation, innovation and social learning. It reviewed the attributes of a specific regulatory framework and assessed if any firms’ innovation activity and social learning have been fostered while complying with the regulation.

This research is consistent with Ramanathan et al. (2017), who examined the relationships between environmental regulations, firms' innovation and private sustainability benefits using nine case studies of the UK and Chinese firms. Ramanathan et al. (2017) took its cue from the Porter Hypothesis (Porter and van der Linde, 1995). Porter and van der Linde (1995) reviewed the impact of environmental regulations on firms’ competitiveness. In their study, they formulated some hypothesis that a stringent and flexible environmental regulation can trigger innovation that may partially or more than fully offset the costs of complying with it. Their hypothesis was popularly termed the Porter Hypothesis (PH).

Ramanathan et al. (2017) did not test the PH but used them as guidelines to conduct case studies and for advancing the PH. From the PH, they made some broad preliminary assumptions that informed their research design. The difference between Ramanathan et al., (2017) and this study is in the research design and methodology. In their case study, they interviewed fourteen participants - six from UK firms and eight from Chinese firms (p. 82). The result of their study showed that firms who adopted a more dynamic approach in responding to environmental regulations innovatively, and who were proactive in managing their environmental performance, were generally better able to reap the private benefits of sustainability (p. 89). For future research, they recommended that their qualitative study
could be verified by using a quantitative oriented research method, such as collecting primary data from questionnaire surveys (p.89).

In a similar light, this thesis took its cue from Porter and van der Linde (see Appendix 1: Table1.1). However, it does not intend to test the PH; instead, the PH served as a guide for developing its research themes that aided in addressing the research questions. Improving on Ramanathan et al. (2017), this study used a mixed-method, it collected primary data from questionnaire surveys and conducted semi-structured interviews with firms legislated under two specific Acts in Saskatchewan, Canada. The Acts include *The Environmental Management and Protection Act, 2010* (EMPA) \(^1\) and *The Forest Resources and Management Act* (FRMA) \(^2\) (GOS, 2014b). By applying a mixed-method and incorporating social learning, the study advances the PH and fills a gap within the environmental resource management literature regarding the interaction of regulation, innovation, and social learning.

The remaining part of this chapter follows as thus: Section 1.2 discusses the different types of government regulatory framework (section 1.2), and section 1.3 describes the concept of social learning within the regulator bracket. Section 1.4 describes the case study – the Saskatchewan Ministry of Environment Results-Based Regulation (RBR). Section 1.5 presents the RBR expected outcomes, the research objectives and the research questions. Section 1.6 discusses the research epistemology and ontological premise that informed the research methodology and section 1.7 outlined how the thesis is structured.

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\(^2\) FRMA governs the Saskatchewan forest resources (http://www.qp.gov.sk.ca/documents/english/statutes/statutes/f19-1.pdf)
1.2 Types of Government Regulatory Framework (Designs)

Regulations have been categorized based on how they are designed/framed. The categories include prescriptive regulations, outcome-based regulations and co-regulation (OECD, 2002; British National Audit Office (BNAO), 2014). Each regulatory framework has specific impact on firms' business activities.

A Prescriptive regulation refers to a process-based regulation (Hoberg & Malkinson, 2013). It details the exact design and processes of how regulated entities should carry out defined activities (Hoberg, Malkinson & Kozak, 2016). Often, prescriptive regulations are appropriate for very high-risk environmental activities that may have a macro impact in the case of non-compliance (Natural Resource Canada (NRCan), 2016).

However, prescriptive regulations have some negative effects on both the regulator and the regulated. On the part of the regulator, applying prescriptive regulations on routine, low-risk environmental protection activities may amount to inefficient use of scarce resources and delay in administrative processes (BNAO, 2014, and Natural Resource Canada, NRCan 2016). From the perspectives of regulated organizations, prescriptive regulation was described as a regulation that produces complicated and inflexible rules, which impose constraints on firms' freedom to manage operations (Ramanathan et al., 2017). Given these features, prescriptive regulation is perceived to deter the creation of novel ideas, which may enhance compliance. For example, in the United States, a prescriptive regulation that governed water and air pollution before 1990 compelled polluting firms to either conform to pre-defined standards or face closure (Majumdar and Marcus, 2001). Further research illustrated that prescriptive regulations discouraged the creation of novel ideas in firms and the propensity to innovate while maintaining high
environmental standards (Ramanathan et al., 2017; Mohnen, & Van Leeuwen, 2017; Weiss & Anisimova, 2018). Due to the weakness of prescriptive regulation, policymakers started shifting their focus towards a more flexible (outcome-based) regulation that facilitates innovation activities within firms (GOS, 2014a; Porter and van der Linde, 1995).

An Outcome-based regulation (often referred to as performance-based) is a regulation that sets out the expected regulatory outcomes and allows the regulated community (firms) to develop processes required for achieving the required outcomes (BNOA, 2014; OECD, 2002). The regulation is designed on the assumption that when producers are given the right incentives, they will develop systematic approaches for controlling and minimizing environmental and production risks and devise lower-cost solutions than in a prescriptive regulatory system (BNOA, 2014). However, outcome-based regulations may make monitoring of compliance costlier and difficult due to the non-uniform way of achieving the regulatory requirements (NRCan 2016).

For co-regulation, the regulatory role is shared between government and industry (BNOA, 2014). Typically, the industry or large proportions of industry participants formulate a code of practice in consultation with the government (ibid). The industries complement the government in leading the regulation of its members by setting standards in the form of codes and encouraging greater responsibility for performance (ibid). If the code is breached, professional organizations may impose sanctions on the industry/firm (ibid). Co-regulation is perceived to enhance both the industry and professional association expertise on regulatory issues, but there is a challenge that the government may lose sight of the control processes (BNAO 2014; OECD 2012).
A brief description of the three main regulatory frameworks (including their strengths and limitations) explains how the design of regulation may influence firms' innovation activities. However, regulation is only one of the factors that may induce innovation because the literature on innovation theories have shown that innovation is highly connected to different elements in an entire innovation system and is linked with several fields of study (Blind, 2012; Smits, Kuhlman & Shapira, 2010; Godin, 2015). The dynamic nature of innovation and the varying characteristics of regulation bring some complexity to understanding their relationship (Ramanathan et al., 2017; Blind, 2012), such that creating an overarching novelty (innovation) requires a learning space beyond the confines of individuals in an organization (Reed et al. 2006; Cundill & Rodela, 2012). Such a space is situated within a wider social network that enhances interaction between independent stakeholders (Paraskevopoulou, 2012), wherein some social learning may occur.

1.3 Social Learning within Regulatory Brackets

Though the literature on how specific regulatory designs stimulate social learning is still nascent and challenging to access, inference from a few studies that examine the impact of regulation/policy programs on organizations reveal that social learning may occur in two different stages. First, during the consultation stage before the regulation is implemented (Paraskevopoulou, 2012), and second during the actual implementation of the policy program (Hurlbert, 2013).

Some studies have made a strong case for social learning that occurs at the introductory stage of a regulation (see Paraskevopoulou, 2012; Coglianese, Nash and Olmstead, 2004). In a study of how non-technological regulations impact firms,
Paraskevopoulou (2012) presented how stakeholders’ inputs were formally requested in Europe before the promulgation of regulations. She explained that upon the announcement of an intention to regulate in an industry, the authorities consult with the stakeholders requesting their inputs. To offer reliable information to the regulators, firms within the industry, participated in several information sessions, workshops, and seminars. Coglianese, Nash and Olmstead (2004) also illustrated how regulators seek to get facts from stakeholders’ experiences that could help shape the regulation in Washington, D.C (2004).

During the introductory stage of RBR (the case study of this research), the Saskatchewan Ministry of Environment engaged relevant stakeholders in a series of consultations (GOS, 2009b, 2014a, 2014b). Through this interaction, stakeholders shared knowledge and learned from each other in a social context.

The next stage of social learning is expected to occur during the implementation of the regulation. Insights can be drawn from Hurlbert (2013), where stakeholders interaction served as a causal factor for social learning to occur after the implementation of a government program (Canada-Saskatchewan Farm Stewardship Program (CSFSP)). In turn, social learning led to improved environmental practices for the farmers to develop a group plan for source water protection. The creation of the group plans improved learning and adaptive behaviours amongst the farmers because it increased the producers’ trust in the system, increased accessibility to government funding, and allowed a more robust program that encouraged collaborative learning between the network of producers and the government.

Another factor that may influence the occurrence of social learning after implementing a regulation is the design of the regulation. Prescriptive regulations may not
present an opportunity for social learning because it details the processes that firms are expected to follow, thereby leaving little or no room for stakeholders to develop any novel solution. On the other hand, flexible regulations may offer an incentive for social learning amongst stakeholders. Due to limited evidence to explain this phenomenon, this research seeks to provide some evidence as it investigates if innovation and social learning have been induced by a flexible (results-based) regulation that was implemented in Saskatchewan in 2015.

1.4 Case Study: Saskatchewan Ministry of Environment Regulatory Framework

1.4.1. A Prescriptive Regulatory Framework

Prior to 2015, the Saskatchewan Ministry of Environment (the Ministry) governed all environmental protection activities in Saskatchewan through prescriptive regulation. However, prescriptive regulation is akin to a command and control regulation that is process-centric, and as such, delayed the issuance of permits, and caused revenue losses (Clifton Associate Report, 2009). During the prescriptive regulation regime, firms complained of the long wait time for the approval of both low and high-risk environmental activities (Wittrup and Murphy 2012; GOS, 2011). This issue raised concerns about regulatory uncertainties, which resulted in a poor climate for investment in the province (Wittrup and Murphy 2012).

The delay in issuing permits was aggravated by inadequate information management systems (Wittrup and Murphy 2012). One of the quantifiable negative impacts was revealed by a 2005 internal provincial study that estimated an annual loss of $12 million to the provincial government from missed opportunities due to regulatory delays (see Wittrup and Murphy 2012; Clifton Associate Report, 2009).
Also, in a prescriptive regulation regime, firms may be left with no option than to stick to the stipulated processes to avoid non-compliance costs, thereby discouraging the propensity for firms to innovate (Wittrup & Murphy, 2012). This limitation may have a long-term adverse multiplier effect in the province. For instance, under the prescriptive regulatory process, if companies fall short of compliance due to the stringent requirements that may be difficult to achieve, and are repeatedly fined, the taxpayers and other final consumers may eventually pay for the non-compliance cost. This is possible because firms may incorporate the charges into their cost of production and increase the selling price of their product/services being that firms may not continue producing if they do not breakeven due to the increased cost of compliance (see Krugman et al., 2014, pp. 388-389). In severe cases, some companies' production processes may be distorted, some companies may relocate to more favorable business environments, and workers may lose their jobs (ibid). Ultimately, any negative impact of provincial policy instruments undercuts federal objectives of generating a sustainable, innovative, and prosperous economy (Taras & Phillips, 2016).

Having realized that the level of complexity required for the government to regulate, and for the industry to comply with environmental regulation in Saskatchewan is substantial, the Ministry thought it might not be sustainable to govern all the environmental protection activities through a prescriptive regulation (Wittrup and Murphy 2012, p.2). Thus, to avert the unintended consequences of the prescriptive regulations, the Ministry embarked on a review process to restructure its regulatory framework in 2008. It undertook a comprehensive review of the existing regulatory model and benchmarked it against models in other provinces, including Alberta, Ontario, BC, and Manitoba. Also, it engaged
After a comprehensive review process, a results-based regulatory (RBR) was implemented in 2015 (ibid). Table 1.1 briefly explains how some environmental activities were carried out during the prescriptive regulation and the changes made in the RBR. For instance, in the prescriptive regulation, there was no active QP participation in an environmental site assessment process, the procedure was informally handled through policies and guidelines (GOS, 2014c, p.8). In the RBR, QPs are required to sign-off site assessments. By appending their signature, they certify that the site assessment meets all the regulatory requirements, including the provision of a sampling plan, how representative samples were acquired, analyzed, interpreted and the record management techniques. It is expected that involving QPs will enhance sophisticated science and technology, which in turn leads to innovation.

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<th>Results-based Regulation</th>
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<td>EMPA 2010</td>
<td>Clearer directions</td>
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<td>Handled informally through policy and guideline</td>
<td>Legally formalized under EMPA and the Saskatchewan Environmental code chapter</td>
<td>Provides a clearer guide for compliance</td>
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<td>Active Participation of a QP</td>
<td>Site assessments handled by policy</td>
<td>Site assessment signed off by a qualified person.</td>
<td>Enhance sophisticated science and technology</td>
<td></td>
</tr>
<tr>
<td>Land renewal</td>
<td>Quantify land renewal to minimize the risk that unproductive forest land impacts future generations.</td>
<td>Quantify land renewal to minimize the risk that unproductive forest land impacts future generations.</td>
<td>No change</td>
<td></td>
</tr>
<tr>
<td>Alternative Solution</td>
<td>Not applicable</td>
<td>Proposed new regeneration assessment methods may be presented for review and approval as part of the operating plan.</td>
<td>May enhance innovative ways of complying with the regulation</td>
<td></td>
</tr>
<tr>
<td>Hydrostatic Testing</td>
<td>Legislation</td>
<td>EMPA 2002</td>
<td>EMPA 2010</td>
<td>Clearer directions</td>
</tr>
<tr>
<td>Alternative Solution</td>
<td>Provides precise details of the materials required for discharging water after hydrostatic testing</td>
<td>Do not require a detailed specification of discharge materials but allows firms to decide how they will prevent rust and foreign biodata during the discharge, after hydrostatic testing.</td>
<td>Firms’ innovation activities may be enhanced through alternative solutions</td>
<td></td>
</tr>
</tbody>
</table>

Source: GOS (2014c, 2014d); Wittrup & Murphy (2012)
1.4.2 The Results-Based Regulation (RBR) Framework

The RBR framework aims at enabling the Ministry to achieve its vision of providing public service excellence in protecting and promoting the sustainable use of natural resources (Government of Saskatchewan, GOS 2014b).

For consistency and cohesion in the RBR model, the Ministry developed a Saskatchewan Environmental Code (code). The code contains sixteen environmental code chapters comprising of the following activities: impacted sites, forest resource management, water mains, sewage mains, hydrostatic testing, and air quality, amongst others (Government of Saskatchewan, GOS, 2014a). The code guides the options that firms may adopt when carrying out environmental activities by providing a full picture of the RBR. Also, it outlines the prescriptive regulations (process-based) chapters that were maintained for high-risk activities and the results-based chapters (including changes from the prescriptive regulation). This thesis focuses on the results-based chapters. The results-based chapters are divided into three parts; Part 1 applies to all solutions available to the firms, Part 2 applies to alternative solutions, and Part 3 applies to acceptable solutions (see figure 1.1). In the RBR, a qualified person (QP)\(^3\) must certify a firm’s alternative solution if a firm decides to pursue an ‘alternative solution’ (Figure 1.1: Part 1 and Part 2). However, if the firm decides to apply acceptable solutions (Part 1 and Part 3), there may not be a need for a QP’s certification.

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\(^3\) A Qualified Person (QP): a person who possesses the required skills and competencies needed to certify some environmental activities. QPs are required for activities such as preparing and certifying environmental site assessments, certificates of completion, liability transfer approvals, corrective action plans and risk assessment reports (GOS, 2016). Firms are required to engage the expertise of a qualified person, defined in the applicable environmental code chapter, to certify that the activities proposed in the alternative solutions meet the regulatory requirements. Since organizations can propose alternative plans, the Ministry and the public need to be assured that the proposal will meet the regulatory requirements (environmental outcome).
From Figure 1.1, ‘Part 1 and Part 3’ is similar to the processed-based chapters (prescriptive regulation) because it details the processes that each organization should adopt in the regulatory scheme (Hoberg, Malkinson & Kozak, 2016, p. 3). For example, a prescriptive regulation regarding hydrostatic testing may detail the length, breadth and thickness of the material that should be affixed at the tip of a pipeline being tested to prevent any rust or foreign biota from entering freshwater when the water used for pressuring the pipeline is being discharged into a freshwater source (see Hydrostatic Testing Chapter in GOS 2014b). Meanwhile, an outcome-based regulation (RBR), allows firms to decide how they will prevent rust and foreign biota from entering freshwaters (ibid), and not the bit by bit details.

**Figure 1.1 The Saskatchewan Environmental Code (the code)**

![Diagram of the Saskatchewan Environmental Code](http://www.environment.gov.sk.ca/Default.aspx?DN=63177088-1060-4fd5-bae3-9f44b61af656)

From the description of the code, it was deduced that some features of prescriptive regulation are embedded in its acceptable solutions, while the features of outcome-based
regulations and co-regulation are in its alternative solutions where a qualified person certifies a solution. Having prescriptive, outcome-based, and co-regulation elements position the Saskatchewan RBR as a hybrid of the three regulatory approaches developed by the OECD (2002) and BNAO (2014) (see section 1.2 for the types of regulatory design). However, a unique feature of the “Alternative Solution” in RBR is that the Ministry enforces the regulation and not the professional association as regards co-regulation. Again, RBR requires the Minister of Environment to approve the plan certified by the QP.

Also, when RBR was introduced, the Ministry made some significant changes from the previous regulation and outlined some expected outcomes (see Table 1.2).

**Table 1.2. Changes to Prescriptive Regulation and RBR Expected Outcomes**

<table>
<thead>
<tr>
<th>Changes to the Prescriptive Regulation:</th>
<th>RBR Expected Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allow alternative solutions</td>
<td>increase options on how compliance is achieved and encourage innovation</td>
</tr>
<tr>
<td>Increase reliance on qualified professionals</td>
<td>Leverages the use of sophisticated environmental and resource management science and technology</td>
</tr>
<tr>
<td>A focus on outcomes and to provide clear direction</td>
<td>Enhanced environmental stewardship and resource management as a result of emphasizing results instead of processes</td>
</tr>
<tr>
<td>Expand access to online environmental data</td>
<td>Increases pressure to comply through transparency and accountability</td>
</tr>
<tr>
<td>Strengthen accountability tools</td>
<td>Increases confidence in environmental and resource management</td>
</tr>
<tr>
<td>Strengthen penalties and increase fines</td>
<td>Strengthens deterrents for non-compliance</td>
</tr>
<tr>
<td>Increase the Ministry's authority to order repairs to the environment</td>
<td>Enhances environmental stewardship</td>
</tr>
<tr>
<td>Increase ministerial power to gain access to and inspect contaminated sites and to reject corrective action plans that are not sustainable</td>
<td>Sustainably Increases power to encourage compliance</td>
</tr>
</tbody>
</table>

Source: Government of Saskatchewan (GOS, 2014a, p. 5).

The first three changes in Table 1.1 serve as springboards to other changes. First, firms could propose alternative solutions that are different from the ‘acceptable solutions’ stipulated by the government with an expectation that the alternative solutions may enhance innovation. Second, each alternative solution must be certified by a QP. It is expected that
active QP participation may encourage continuous professional input and modernized science in environmental protection. Third, RBR focuses on outcomes and provides clear direction through the code, with an expectation to see enhanced environmental stewardship and improved resource management by emphasizing results instead of processes.

Focusing on expected outcomes may grant firms greater flexibility to comply with the regulation, foster innovation and enhance firms’ competitiveness (GOS 2014b; Hoberg & Malkinson, 2013). RBR may also encourage social learning through the interaction among firms in formal networks aimed at improving environmental protection.

1.5 The Research Objectives and Research Questions

Given the above changes and expected outcomes, this research aimed to assess if RBR has led to innovation, especially where a company decides to follow an alternative solution in achieving the regulatory outcome. In addition to fostering innovation, the study also assessed if social learning has occurred amongst firms after RBR was implemented. Also, the study may serve as a baseline for measuring future assessment of the code performance, contribute to the continuous improvement of the code and inform the development of additional code chapters. To achieve the above objectives, a primary research question was formulated.

In what ways has RBR fostered innovation activities and social learning in Saskatchewan since its implementation in 2015?4

As an investigative research project, additional specific questions were developed to aid in answering the primary research question:

A. What are the critical success factors (attributes of the RBR) that may contribute to shaping the innovation activities of firms?

---

4 This research focuses on assessing if RBR has fostered firms’ innovation activities. It does not focus separately on an individual-level innovation; thus, if a qualified person (QP) files a process that was innovative, it will be taken as the firm’s innovation.
B. Regulatory induced innovation comes from complying with the regulation; what are some incentives the Ministry could explore to encourage compliance within the RBR framework?

C. What are the factors that may enhance social learning within the regulatory framework?

D. What are the possible ways of improving the RBR to build more capacity for social learning?

1.6 The Research Epistemology and Ontological Premise

An understanding of how a researcher views an object of enquiry reveals the researcher's ontological premise (Mason, 2002, p. 14). Ontology describes what exists and the nature of reality concerning the object of inquiry (Frauley and Pearce, 2007). It shapes how the researcher’s thought, analysis, and mode of generating and evaluating empirical evidence are presented (ibid). A researcher who perceives reality as external and objective maintains an objectivist ontological position (Creswell, 1994, p. 4). Alternatively, a researcher who views reality as being subjective, individually constructed and continuously in motion maintains a constructivist ontological position (Bryman, 1988, p. 103; Bryman & Teevan 2005).

Generally, a researcher’s ontology informs their epistemology. Epistemology refers to what constitutes valid knowledge – how the knowledge of reality can be gained and the process of knowing what exists (Mason, 2002, p. 16; Blaikie, 1993; Saunders et al., 2009a). It is directly linked to a researcher’s ontology, such that a researcher with an objectivist ontological position is said to be a positivist and believes in the use of scientific methods to gain knowledge of reality (Bryman, 1988, p. 104; Bryman & Teevan 2005). The positivist epistemology posits that the same method of research should be employed by social and natural science, acclaiming that through quantitative techniques in comparing relationships and correlations between variables, sociologists can unveil the laws that govern societies in
a similar way as scientists discover different laws governing the physical world (Saunders et al., 2009a). The objectivist ontology and positivistic epistemology employ a deductive approach when conducting research. An objectivist embraces empirical methods with extensive use of quantitative methods such as structured questionnaires, surveys and official statistics, tests hypotheses to generalize, and remains detached from those being studied (Creswell, 1994, p. 6).

Meanwhile, a researcher with a constructivist ontological position is said to be an interpretivist, who believes that knowledge should be gained by studying individuals' perceptions of reality because human actions become clearer when the world is viewed from the lens of the actors doing the actions (Paul, 2005; Bryman, 1998, p. 104). An interpretivist believes individuals are not objects designed to react to external social forces as positivists posit (Paul, 2005). Hence, they assert that the intricate and complete nature of humans makes individuals view the same objective reality from different perspectives (ibid). It also argues that the statistics that positivists use in their analysis are socially constructed, and thus, the interpretivist allows for evolution and patterns to emerge when investigating a phenomenon (Creswell, 1994).

Leveraging a constructivist paradigm, the literature review in this thesis evolved from the negative perception of regulation amongst firms due to the framing of the phenomena by the neoclassical economists (Francis, 1993; Palmer, Oates & Portney, 1995). The next phase reviewed how the negative perceptions were framed to positive thoughts (Porter 1991; Porter and van der Linde, 1995). Thereafter, the concept of social learning was reviewed. Social learning was initially perceived by neoclassical economists to be exclusive to
scientists and natural resource managers (Lee 1993; Walters 1986), over time, it evolved to include independent stakeholders’ interaction (Hurlbert, 2013)

1.6.1. Deciding on a Research Methodology for this Thesis

Research methodology becomes more apparent when the ontological and epistemological premise is identified (Saunders et al., 2009a; Creswell, 1994). For this research, the primary researcher’s ontological and epistemological perspectives were mixed, and the research philosophy was based on critical realism that was promulgated by Roy Bhaskar (1975). Critical realism is known to steer between positivism and interpretivism. It preserves the positivist concern of unity of methods in the sciences and emphasis on objectivity; while, incorporating the interpretivist belief on the crucial role of human agency in the maintenance and transformation of social structures (Carter, 2000: 64). Critical realism thus brings in a mixed perspective wherein both qualitative and quantitative research are conducted, and mixed data are tabulated and validated.

Critical realism has a stratified ontology with significant epistemological implications; the strata are ‘the real,’ ‘the actual’ and ‘the empirical’ domain (Bhaskar, 1978). In critical realism, the real domain is described as entities that have powers to act; these entities may have internal structures, such as departments and individuals with assigned responsibilities (Easton, 2010). Regarding this thesis, the decision-making bodies within the regulating authority and the regulated industries are the real domain. Events occur as a result of mechanisms that operate in the real domain but may not imply full access to it or be wholly observed (ibid). Thus, partially obscured or unobservable entities may be inferred to exist from what can be seen or measured physically or socially, yet these unobserved entities may cause change (ibid). For this thesis, the mechanism the operates in the real domain is the
regulation. ‘The actual’ refers to the changes that occur when those mechanisms in the real domain are activated (Zachariadis, Scott and Barrett, 2010). When aligned with this study, the actual and empirical domain refers to the new/improved product and process innovation, and social learning that occurs when a mechanism (such as RBR) in the real domain is activated.

Drawing from the critical realism perpective, this thesis commenced its literature review with an evaluation of the neoclassical economists' negative perceptions regarding the effect of regulations on the innovation activities of firms. In recent years, Porter and van der Linde (1995) reframed it to a more positive perception. In the review of the literature that leveraged on Porter and van der Linde (1995) to determine a relationship between regulation and innovation, it was observed that most of the studies utilized secondary data (Ambec et al., 2011). Some results from the studies were significant, and some were non-significant (ibid). Critical realism identifies these limitations as being inherent, where a scientific approach is solely adopted to solve a social phenomenon. Thus, this research took a different approach to explore the phenomena by applying a mixed-method (see the structure of the thesis, section 1.7).

Though the epistemology and ontological premise of a researcher may inform the research methodologies, Bryman (1988) suggests that a research methodology could be selected based on technical issues (policy problem), as is the case of this thesis. The construct of the thesis is a combination of the critical realism philosophy of the research and the policy issue presented by the Government of Saskatchewan (see section 1.4).
1.7 The Structure of this Thesis

Chapter one introduces the object of inquiry. It details the case study, specifies the research objectives, the research questions, and explains how a critical realist perspective aids in investigating the phenomena.

Chapter two provides a systematic review of related literature that aids in integrating the research phenomena (regulation, innovation, and social learning). It commences with a definition of innovation and then reviews how the impact of regulation was framed negatively by the neoclassical economists. It then reviews the positive framing regulation by some contemporary scholars, notably Michael Porter and van der Linde (1995). Also, the concept of social learning was reviewed. From the literature review, some prior themes were deduced to aid in addressing the research questions.

Chapter three describes the research design and research methods. An online survey and semi-structured interviews were employed for data collection. Also, the chapter described the techniques adopted in reporting the results found in chapters four and five.

Chapter four provides the results of the survey. It describes how the Likert items and the dichotomous questions (in the survey) were separated from the open-ended explanations and analyzed through a Statistical Package for Social Sciences (IBM SPSS Statistics for Windows). The open-ended explanations were analyzed in NVivo, which aid in describing the reasons behind the results computed in SPSS.

In chapter five, a thematic network is applied to illustrate how the semi-structured interviews were coded and analyzed in NVivo, to see if specific patterns were replicated and if these patterns were sufficient for a conclusion to be drawn on the mechanisms behind the
research phenomena. Some themes that were not in a priori themes emerged and are included as a new theme and sub-themes in the existing framework.

Chapter six converged the findings from the online survey and semi-structured interviews. In summary, the survey results, interview results, and inferences drawn from existing literature aided in addressing the primary and secondary research questions. Also, the chapter provides some policy recommendations, proffered some contribution to the policy field, identified the research limitations, and suggested areas of future research.
Chapter Two: Literature Reviews

2.1 Introduction

Chapter two provides a systematic review of related studies that aid in integrating the research phenomena (regulation, innovation, and social learning). It defines innovation (section 2.2) and evaluates the negative framing of the impact of regulation on firms by neoclassical economists (section 2.3). Over time, from the 1980s, research towards a change in perception began (Ashford 1993). By the 1990s, Porter (1991); Porter and van der Linde (1995) published outstanding literature that popularized the positive impacts of regulations on firms’ innovation activities.

In the literature review, the author observed that the Saskatchewan RBR has the properties of a strict and flexible regulation that as described by Porter and van der Linde (1995). Hence, this thesis took its cue from their study. However, Porter and van der Linde (1995) and other related innovation literature did not elaborate on a significant part of the research question. Thus, the author reviewed social learning concepts from other contemporary studies to determine the factors necessary for social learning to occur (Armitage et al., 2017; Hurlbert & Gupta, 2015; Hurlbert 2013:2016; Cundill & Rodella, 2012; Reed et al., 2010).

The above literature and other related studies were sourced from several environmental resource journals such as The Journal of Cleaner Production, The Journal of Economic Perspectives, Ecological Economics, Environmental Policy, and Energy Policy, amongst others. Through a deductive approach, the author identified some a priori themes, hereafter referred to as Critical Success Factors (CSFs). The CSFs include stringency, flexibility, uncertainty, affordability, and interaction amongst stakeholders. They informed
how RBR might shape firms’ innovative activities. Having identified the CSFs, the researcher used NVivo software to create nodes\(^5\) for each CSF, describing how they may influence innovation and social learning (see section 2.6). This chapter started addressing the secondary research questions A and C by identifying the CSFs that may enable a regulation such as RBR to induce firms’ innovation activities and social learning.

### 2.2. Defining Innovation and its relationship with Environmental Regulation

Many scholars attribute the contemporary history of innovation to economics and Joseph Schumpeter\(^6\). While other scholars relate innovation to politics (Godin, 2015; Gallouj 1999). For instance, Godin (2015), in his study of the history of innovation, provided several facets of how innovation was perceived in early modern society and aligned innovation to politics, as seen in the history of novelty in Ancient Greece by Angour (2011). In recent times, other fields such as psychological, sociology, anthropologists, education, management, and engineering started contextualizing innovation (Godin, 2015).

Several scholars have conceptualized innovation based on their research phenomena (see Gault 2016; Bloch and Bugge 2013; Crossan and Apaydin, 2010; Gallouj 1999, OECD 2005; Porter and van der Linde 1995). These scholars highlighted two main terms ‘product innovation’ and ‘process innovation.’ Product innovation involves combining inputs to produce outputs. In more specific terms, Gault (2016) described product innovation as a product that is made available to potential users with new or significantly improved characteristics or intended

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\(^5\) Node is a term used in NVIVO term for themes and child nodes are sub-themes. It can also be referred to as a storage area for references to coded texts (Bazeley 2007).

uses. Bloch and Bugge (2013) described process innovation as the implementation of new or improved methods for the production and delivery of goods or services compared to an existing process in an organization. Examples of processes innovation include improvement in the use of equipment, and improvement in support functions such as accounting and human resources (OECD 2005; Bloch & Bugge, 2013).

In a similar light, Porter and van der Linde (1995) viewed innovation broadly. They asserted that product innovation occurs when compliance with regulation enhances the production of higher quality, safer, or less expensive products. On the other hand, process innovation may occur when compliance with regulations improve firms’ operations. They gave some examples of process innovation, such as cost savings through recycling of production input, efficient use of energy during production and safer workplace conditions.

Process and product innovation interlink such that achieving one may lead to the realization of the other, as some firms may develop new products due to improved processes that are induced by environmental regulation. For instance, a change in process to reduce emissions may result in increased product yields (see Porter and van der Linde (1995, p 102). In another example, new and more energy efficient boilers were developed in the Netherlands, due to compliance with a reformed flexible regulation introduced in 1996 (Beerepoot & Beerepoot, 2007; Pries & Dorée, 2005).

Thus, as firms comply with the regulatory requirements, novel ideas may be created through innovation activities to develop new/improve products, processes or services. Given the objective of this study, the researcher leveraged on OECD (2005); Porter and van der Linde (1995) to define innovation as the implementation of a new or improved product, process or service advanced by the interaction of actors in a non-linear networked
interactive process. The definition is contextualized to highlight the relevance of stakeholders’ interaction in advancing innovation. Thus, innovation activities are the processes (including stakeholders’ interaction) that allows innovation to occur.

The research aims at assessing if compliance to regulation (RBR) has fostered firms’ innovation activities in producing new products or improved quality of existing products, and developing new and improved operations or service delivery.

Having contextualized innovation, the next section reviews the relationship between firms’ innovation activities and environmental regulations. It reviewed two popular branch of literature that have reviewed the relationship between environmental regulation and firms’ innovation activities - the Neoclassical Economics and the Contemporary Economics Perception.

2.3. Environmental Regulation and Firms Innovation Activities: A Review of the Neoclassical Approach – Negative Perception

The evolution of the neoclassical theory of innovation is traceable to the mid-nineteenth century during the second industrial revolution when companies were characterized as a single plant firm, specialized in a narrow range of activities (Tigre, 1998; 2006, cited in Baron Mussi et al., 2018). As industrial activities grew, pollution to the external environment increased, firms incurred external costs due to these pollutions (Weimer & Vining, 2017. The external costs levied on firms due to pollution were perceived as an additional economic burden that the government imposes on firms; thereby, framing regulations as restrictive rules that constrain private actions that do not promote the public interest (Nordgren & Hauknes, 1999; Ashford & Heaton, 1983; Francis, 1993). This perception of regulation was made popular by demonstrating the corrective functions of regulation against undesirable impacts on market
activities such as the environmental externalities and monopolistic phenomena (Francis, 1993; Posner, 1974; Weimer & Vining, 2017; Varian 2010). For instance, the concept of environmental externality posits that firms view environmental regulations as additional costs that divert funds away from productive investments (Weimer & Vining, 2017; Varian 2010). Thus, environment regulation was seen as a way of compelling firms to devote some inputs to pollution prevention as opposed to profit-making activities (Jaffe et al., 1995; Crafts, 2006; Koźluk & Zipperer, 2015).

However, the above perception depicts a partial representation of the impact of environmental regulations on a firm’s innovation activities. It emphasizes the costs borne by firms and not the benefits that accrue from compliance, such as improved product quality and improved business processes.

Another particularity of the neoclassical view regarding the burden of regulation on firms is the Panglossian belief that firms always make optimal choices and should not be compelled to comply with regulations if it is certain that complying with environmental regulations can be profitable (Porter and van der Linde, 1995). This perception is not entirely valid because the concept of optimality is only possible in an ideal world where neoclassical economists use a static model to illustrate a state of equilibrium (Chaminade and Edquist, 2010, p102). Applying a static model when representing firms’ activities that occur in a dynamic innovation system makes it practically impossible to compare the activities of firms in a real-world (system) with firms in an ideal world or optimal system (Chaminade and Edquist, 2010, p.102; Porter and van der Linde, 1995, p. 97; Mussi et al. 2018, p. 18).

In the neoclassical static model, technology and land (capital assets of the firm) are assumed to be fixed, and firms can make optimal cost-minimization choices amidst fixed
Introducing environmental regulation in a static model is perceived to raise costs since it may not match the long-run benefits against the initial cost (ibid). This ideal perception of high compliance cost creates a significant problem between environmental regulation and the economy, and build the wrong perception in firms, such that business managers consider taxes and emission levies as a diversion from productive investment (Ambec et al., 2011). Also, it pulls firms towards concentrating on paper works for resolving environmental litigation issues with the public authorities. For instance, in a Rand Institute study, it was discovered that 88 percent of funds claimed by U.S. companies from insurers between 1986 and 1989 were for legal and administrative expenses, and only 12 percent were used for actual site cleanups (Acton and Dixon, 1992).

Placing greater emphasis on compliance costs build negative perceptions and ignores the benefits of environmental regulation. Thus, if we solely depend on the neoclassical economic construct regarding the burden regulations impose on firms, we may ignore the fate of the planet by allowing environmental resources to deplete over time, with no one being accountable (Bhaskar, 2013; Weimer & Vining, 2017). Thus, the neoclassical approach to innovation created a huge challenge in balancing the society’s need for environmental protection and the benefits accrued to firms.

2.4. Environmental Regulation and Firms’ Innovation: A Review of the Contemporary Economist Approach - Positive Perceptions

In the early 1980s, some researchers started examining if environmental regulations could enhance technology innovation and still enhance firms’ competitiveness (Ashford, 1993). In the 1990s, a dramatic shift from the negative perception of regulation took effect when
Michael Porter, an economist and strategy professor, framed stakeholders’ view towards the positive impacts of environmental regulations on firms (Porter, 1991; Porter & van der Linde, 1995). In their study, Porter and van der Linde (1995) illustrated that pollution amounts to a waste of resources and that reducing pollution could improve a firm’s productivity in their Hypothesis (Porter Hypothesis (PH)). Due to the popularity of the PH, several studies explored the relationship between regulation and innovation to correct the negative framing depicted by the neoclassical economists (Paraskevopoulou, 2012; Blind, 2012; Ambec et al., 2011:2013; Ramanathan et al., 2017; Mohnen & Van Leeuwen, 2017; Weiss & Anisimova, 2018).

After a critical review of the above literature, it was observed that the PH best aligns with how RBR may foster innovation activities; thus, some critical success factors (CSF) that may aid in addressing the research questions were drawn from it (section 2.4.2.1).

2.4.1. Understanding the Critical Success Factors (CSF)

The term critical success factor (CSF) is commonly used in the business management literature to mean the key elements allied with the success of a business deal, and the absence of such factors could mean a massive flaw in the deal.

Though the term CSF is not popularly used in environmental literature, recent contemporary studies are beginning to use the term when referring to the key factors required for enhancing the success of certain environmental programs. Badini, Hajjar, Kozak (2018) identified twelve emergent CSFs that act as a foundation for the development of a successful small and medium forest enterprises. De Medeiros, Ribeiro, Cortimiglia (2013) conducted a systematic literature review on environmental sustainability and

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7 CSF was first introduced by Daniel (1961) and elaborated in Rockart (1979). The UK Office of Government Commerce (2008) posits that CSF must be defined in every business case and must be SMART (Specific, Measurable, Achievable, Realistic and Time-bound). Though CSF differs in business owing to business types and nature (Fryer et al., 2007), it has a common goal of ensuring a successful business deal.
identified some CSFs that drive the success of an environmentally sustainable product to include regulation knowledge; inter-functional collaboration; innovation-oriented learning; market, law, and R&D investments (p 78).

In a similar light, this thesis utilizes the term CSF to mean those key factors that create an avenue for a flexible regulation to foster firms’ innovation activities and social learning, absence of which might reduce the effectiveness of the regulation. The CSFs include regulatory stringency, flexibility, affordability, reduction in regulatory uncertainty, and stakeholders’ interaction. These CSFs were identified in existing literates through a framework synthesis, and they served as a priori themes used for developing and analyzing the primary data collected (online survey and semi-structured interviews). Thus, the CSFs formed the conceptual framework of this thesis.

2.4.2. Developing a Conceptual Framework for this Thesis

Four CSFs adopted as a priori themes emerged from Porter and van der Linde (1995). They include regulatory flexibility, stringency, affordability, and reduction of regulatory uncertainties. These CSFs were reflected in their study as casual links and principles that explain why a flexible and stringent regulation may lead to firms’ innovation activities and improve firms’ competitiveness vis-à-vis protecting the environment. Given the role that the PH played in channelling the positive perception of regulations and given that the CSF identified in their study best aligns with the attributes of an RBR, this thesis took its cue from their article to build its a priori themes.
2.4.2.1. Positive Perception of Environmental Regulations – The Porter Hypothesis

In Michael Porter’s study of America’s Green Strategy in 1991, and in the Porter and van der Linde study of environment competitiveness in 1995, the authors relied primarily on case studies to challenge the neoclassical economic approach regarding the impact of environmental regulations on firms’ competitiveness. Their hypothesis (referred to as the PH) argued that a stringent and flexible environmental regulation could induce innovation that may partially or fully offset the costs of complying with it. Eventually, the innovation offset will lower the net cost of compliance and can increase firms’ competitiveness (ibid).

Having challenged conventional wisdom by contradicting a traditional belief that environmental protection is always detrimental to business and economic growth, the PH attracted a wide range of attention amongst politicians and scholars (see Ambec et al., (2011: 2013) for a detailed review).

In Porter and van der Linde (1995), the authors profiled some causal links that explains why a flexible and stringent regulation may lead to firms’ innovation activities and improve firms’ competitiveness vis-à-vis protecting the environment, as follows:

First, regulation signals companies about resource inefficiencies and potential technological improvements. Second, regulations may raise corporate awareness through expedited information gathering. Third, regulations enable companies to reduce the uncertainty attributed to environmental investments. Fourth, regulation creates pressure that motivates innovation and progress. Fifth, during the transition period to innovation-based solutions, regulations create a level playing field to ensure that companies do not indirectly avoid environmental investments. Sixth, regulation is needed in the case of incomplete offsets. (Porter & van der Linde1995, p. 100)

The above causal links posit that a flexible and stringent environmental regulation could lead to “innovation offsets” that may improve environmental performance and
eventually offset the additional cost of complying with the regulation.

**2.4.2.2 The PH vis-à-vis the RBR**

Linking the PH to this thesis, one might argue that the term ‘stringent regulation’ does not explicitly mean a results-based regulation. The phrase appears subjective and different scholars may fit it into any of the three types of regulation (prescriptive, outcome-based or co-regulation). To reduce the obscurity, the research reviewed Porter and van der Linde (1995) three principles that may fortify a regulation to foster innovation:

*First, the regulation must create the maximum opportunity for innovation, leaving the approach to innovation to the industry and not the standard-setting agency. Second, the regulation should foster continuous improvement, rather than locking in any technology. Third, the regulation reduces the uncertainty regarding investments on environmental protection (110)*.

The above description depicts similar features of RBR. RBR is designed to enhance creative reasoning and allows for knowledge formation, which may stimulate innovation by offering the options for firms to implement alternative solutions, this aligns with Porter and van der Linde’s first principle (see Appendix 1: Table1.2). The second principle features continuous improvement, and RBR is designed to encourage continuous improvement through regular updates to the environmental code. Third, reducing uncertainty is akin to increasing assurance: The Ministry mandates QPs to certify any proposed alternative solution offered by firms in Saskatchewan (see Appendix 1: Table1.1).

**2.4.2.3. Identifying the Social Learning Gap in the PH**

In Porter and van der Linde (1995) sixth causal link, they recognized that innovation may not always offset the cost of compliance completely, especially in the short term, but in the long run, learning can reduce the cost of innovation-based solutions (Porter & van der
Linde 1995, p. 100; Ambec et al., 2011:2013). Also, they asserted that learning effects can reduce compliance costs and that such learning can be induced by regulations. However, they did not specify if learning should remain within the organization (individual intra-organizational learning) or should involve interaction among independent stakeholders. Also, they did not indicate what type of environmental problem (structured8 or unstructured9) may require interacting with other firms. Instead, they recommended the US Environmental Protection Agency (EPA) to move beyond a single medium of monitoring towards a total impact approach of managing the environment by grouping affected industries in clusters to have a better understanding of a cluster of products, technologies, and composite environmental problems (Porter & van der Linde, 1995, p.111). They emphasized that the cluster-based approach to regulation will save the government money and eliminate the practice of sending multiple EPOs, who do not communicate with each other to inspect the same plant and often end up making conflicting demands, wasting time and resources (p.113).

Thus, Porter & van der Linde’s perception towards a social learning space was geared towards redesigning how government can control compliance through group and unified monitoring processes; however, the authors did not indicate how social learning may occur between independent stakeholders regarding compliance with the environmental regulation.

Porter & van der Linde’s perspective was similar to several contemporary literatures that explored the relationship between regulation and innovation (Weiss & Anisimova, 8 Structured environmental (policy) problems exist where there is a reasonable agreement on norms, principles, and goals regarding the policy problem, and agreement on how the problem can be solved (Hurlbert & Gupta, 2015, p. 101). An example of structured environmental problems is determining the costs and benefits of expanding an irrigation project (Batie, 2008: 1177).
9 Unstructured policy problems are characterized by dynamic economic, social, political and biophysical factors that are difficult to identify and model (Rittel & Webber, 1973), and are commonly referred to as wicked problems (Batie, 2008; Hurlbert and Gupta, 2015)
2018; Ramanathan et al., 2017; Blind, 2012; Paraskevopoulou, 2012), and placed learning at the center of their study. However, applying Porter & van der Linde’s context of learning to this thesis revealed they did not specify how, and what kind of learning should occur regarding the solution to environmental problems. This gap presents a need to conduct a detailed literature review that explores the concept of social learning within environmental management literature.

2.5. The Concept of Social Learning

This section identifies the conditions under which learning might occur. It started by defining what learning is, and the frameworks underpinning learning in environmental resource management. It aims at addressing a section of the research questions regarding social learning.

2.5.1. Individual Learning and Social Learning

There is a lack of consensus on the definition of learning due to the difficulty in defining such a broad concept that cuts across all disciplines (Houwer, Barnes-Holmes & Moors, 2013). Thus, there are several definitions of learning. Learning has been defined as a change in behaviour due to experience (Lachman, 1997), and as a range of ways that involve cognitive, normative and behaviourial changes at the individual level, as well as within groups and organizations (Baird, Plummer, Haug and Huitema 2014). Learning is both an individual cognitive and a social-relational process that is grounded in the lived realities of individuals and organizations (Armitage et al. 2017, 2). Learning that occurs through an interactive network of social groups, organizations and interdependent stakeholders is termed social learning (Siebenhuner, 2008; Cundill & Rodela, 2012).
The literature on social learning in environmental management has been evolving, though there is little consensus on its theoretical basis (Reed et al. 2006, p. 58), some prominent theoretical frameworks that explains social learning in environmental resources management has evolved from adaptive management (Lee 1993; Walters 1986; Bormann, Haynes, and Martin 2007); collaborative management (Daniels and Walker 1996; Dale 1989); adaptive co-management (Rodríguez and Vergara-Tenorio, 2007; Ostrom, 1990; Arimitage et al., 2008), and most recently the adaptive governance framework (Hurlbert 2013:2016; Hurlbert and Gupta, 2015).

Each of the social learning frameworks above influences how it is contextually defined and relates to how social learning processes and outcomes are achieved (Cundill & Rodela 2012). Some of the contextual definition of social learning concerning environmental resource management are presented in Table 2.1 below.

From the list of literature in Table 2.1, it was concluded that adaptive management was the dominant framework in the environmental management literature that relates to learning before the 1980s. Most literature within the adaptive management framework focused on scientific models and the experimental learning that is often conducted by selected actors such as scientists and natural resource managers (Lee 1993; Walters 1986; Bormann, Haynes, and Martin 2007; Borrini-Feyerabend et al., 2004). In the 1990s, literature within the collaborative management framework started becoming popular (Daniels and Walker 1996). These studies professed inclusive participation of all stakeholders, and their analysis focused on community projects and the management of common pooled resources (Rodríguez and Vergara-Tenorio, 2007; Ostrom, 1990).
Table 2. Definition of Social Learning in the Environmental Resources Management

<table>
<thead>
<tr>
<th>Sources</th>
<th>Definition</th>
<th>Frameworks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walters, 1986.</td>
<td>Learning is referred to as a process that leverages scientific models of structured experiments and involves setting objectives, planning, implementing, monitoring and reflecting on the outcomes achieved.</td>
<td>Adaptive Management</td>
</tr>
<tr>
<td>Pinkerton, 1994; Daniels &amp; Walker, 1996.</td>
<td>Social learning occurs when issues are framed, alternatives analyzed, and choices debated, in an inclusive, deliberative process, with shared tasks, revealed values and perceptions, that involves joint monitoring towards solving a problem.</td>
<td>Collaborative Management</td>
</tr>
<tr>
<td>Keen, Brown &amp; Dyball 2005, p. 4</td>
<td>Social learning is the “collective action and reflection that occurs amongst different individuals and groups as they work to improve the management of human and environmental interrelations.”</td>
<td>Adaptive Co-management</td>
</tr>
<tr>
<td>Tabara et al. 2010; Hurlbert 2016, p. 57.</td>
<td>Social learning is contextually described as a multi-step social process in which individuals and organizations learn how to manage different framings of issues while raising awareness of climate risks and opportunities, exploring policy options and institutionalizing new rights, responsibilities, feedback and learning processes for climate adaption in the long term.</td>
<td>Adaptive governance</td>
</tr>
</tbody>
</table>

Over time, contemporary literature in environmental management and governance merged the key elements of adaptive and collaborative management into what is commonly referred to as an adaptive co-management (Keen, Brown, and Dyball 2005; Armitage, Marschke & Plummer, 2008). A more recent framework designed in response to a growing complex environmental problem is the adaptive governance framework.\(^\text{10}\) It stresses on social learning, responsiveness, and accountability and is designed to operate in a system where the science is contextual; where knowledge of how to address a complex environmental problem is incomplete and involves multiple ways of knowing (Hurlbert and Gupta, 2015, p. 100).

Leveraging on the adaptive co-management and the adaptive governance framework, the researcher defined social learning as *a change in perception (an advancement in knowledge) that occurs through an interactive process when experiences and values are shared amongst stakeholders.*” In this definition, ‘perception’ was referred to as a set of

\(^{10}\) Drawing from the existing literatures, Hurlbert and Gupta (2015) described adaptive governance as a range of political, social, economic, and administrative systems that develop, manage and distribute a resource in a manner that promotes resilience through collaborative, flexible, and learning across different scales (pp. 103-104).
concrete beliefs based on knowledge, goals, values, norms and causal beliefs (van der Wal et al. 2014, p. 2). This change in perception that occurs through social learning may enable stakeholders to understand how to effectively manage different framing of issues, explore policy options and work together towards solving complex environmental problems (Hurlbert and Gupta, 2015) that might lead to positive innovation offsets.

Having defined social learning, it is pertinent to understand the conditions under which social learning can occur. Two issues are paramount to this research, the first is knowing what form of learning that may have occurred, and the second are the conditions necessary for social learning to occur.

Several studies explored the feedback loops between a sender and receiver of information to explain the form of learning that occurs when communication is established (Argyris & Schön, 1978; Hurlbert, 2016; Hurlbert & Gupta, 2015; Van der Wal et al., 2014; Amdam, 2014, p. 4; Armitage et. al., 2008). They contextualized this concept as learning loops.

2.5.2. The Learning Loop Concept

The concept of a learning loop illustrates the feedback from a receiver of information to the sender in a learning process. Learning loops range from zero loops to single, double and triple-loop learning.

Zero loop learning can be described as a regression of learning, wherein the stakeholders begin to forget the previous practices that built resilience (Hurlbert, 2016; Hurlbert and Gupta 2015). There is no social learning in this domain. The regulatory framework that may retard learning is a prescriptive regulation with little or no incentives to encourage the creation of novel ideas.
Single-loop learning is concerned with incremental changes, improvement in existing routines, and necessary change in strategy within an existing framework (Hurlbert and Gupta, 2015, p. 103). Single-loop learning often involves only one loop of error correction between actions and outcomes without questioning existing norms (Van der Wal et al., 2014, p.3). Such learning is required for improving routines and policy approaches to address structured environmental problems (Hurlbert and Gupta, 2015). For instance, in the Saskatchewan RBR, the discharge and discovery reporting chapter require firms to report a discharge of any substance that may cause or is causing an adverse effect or to report the discovery of such a substance (GOS, 2014b, page 1 of 5). The chapter further states that the discharge may not be reported if it does not exceed what is expressly authorized by the code, or an accepted environmental protection plan, among others (GOS, 2014b). In this instance, the instruction to correct an error (discharge of any substance) comes from the policymaker to the affected firms as one-way communication. In this example, single learning is said to occur where the receiver understands the instruction, and act on it to improve a firm’s discharge routine; however, the action does not constitute social learning.

Double-loop learning takes a step ahead of single-loop learning by adding a second feedback loop when the perceived range of options does not result in desired outcomes (Van der Wal et al., 2014, p.3). In double-loop learning, norms, assumptions and beliefs are questioned, and alternative options considered (Armitage et al., 2008; Hurlbert, 2016, p. 57; Amdam, 2014, p. 4). In the RBR framework, double-loop learning may occur within the alternative options, where firms may propose solutions towards a complex environmental problem. Double-loop learning is needed where there is scientific certainty but no consensus on the relevant norms and values, or where there is some scientific uncertainty, but no
consensus on the norms to addressing the problem (Hurlbert and Gupta, 2015, p. 103).

Triple-loop learning is more complex than double-loop learning. In triple-loop learning, values and norms that underpin assumptions are questioned and reflected upon (Pahl-Wostl 2009; Hurlbert 2016, p.57; Hurlbert and Gupta 2015, p. 103). More comprehensive knowledge is formed, power dynamics and values that influence the environment are well understood (ibid). Triple-loop learning goes beyond insight and patterns to a change in causal beliefs that may lead to some transformation (Hurlbert, 2016, p. 57). However, triple-loop learning may be time-consuming, but it is necessary to structure unstructured wicked environmental problems such as climate change Gupta (2014). Also, radical innovation offsets are more prevalent in the triple-loop learning domain (ibid).

2.5.3. Factors that enhance Social Learning Amongst Independent Stakeholders

Having explained the concept of learning loops and where they are likely to occur in the RBR framework. A list of literature that explored the possible conditions for social learning were reviewed (Pahl-Wostl et al., 2008; Rodríguez & Vergara-Tenorio, 2007; Axelsson et al., 2013; Hurlbert & Gupta, 2015; Hurlbert 2016; Armitage et al., 2017).

From related studies, there was a widespread consensus that networking (Hurlbert, 2013; Axelsson et al., 2013; Noorderhaven and Harzing, 2009; Rodríguez and Vergara-Tenorio, 2007), and trust (Cundill and Rodella, 2012; Hurlbert 2013; Hurlbert and Gupta 2015) are key factors that can enable social learning amongst stakeholders within a regulatory framework. For instance, Rodríguez and Vergara-Tenorio (2007) analyzed the social learning process that occurred in 24 communities who participated in different resource management projects in Mexico from 1992 to 2001. Social networks were
developed, and the stakeholders attended workshops and periodic evaluations. In these projects, the authors discovered that the participants were able to propose new solutions and rescue practices of resource management.

In another study, Hurlbert (2013) explored the perceptions of policymakers and rural agricultural producers regarding how policies are framed and how they adapt to climate change, social learning and the stakeholders’ input surrounding two successful agri-environmental programmes in Saskatchewan. The author observed that when stakeholders unanimously developed a group plan for source water protection, the stakeholders’ synergy increased their trust in the system, enhanced accessibility to government funding and allowed a more robust program. Formal networking was encouraged through workshops and training wherein individual and social learning was enhanced, and the farmers lead the innovation activities required for climate change adaptation.

In a similar light, to assess if social learning has occurred since RBR was implemented, this research inquired if there are established social/corporate networks where independent stakeholders meet to exchange ideas about environmental activities. This was reflected in the interview guide, where the researcher asked if participants have attended seminars that discuss several ways of managing environmental resources and if the seminars were related to the RBR. Also, from the interview responses, the researcher deduced if there were some level of trust between stakeholders.

2.6. Reviewing the Critical Success Factors (a priori themes)

After reviewing the social learning concept, stakeholders’ interaction emerged as an additional CSF that can enable RBR to facilitate firms’ innovation activities and social learning. Thus, the five CSFs are stringency, flexibility, uncertainty reduction, affordability,
and stakeholders’ interaction. These CSFs are utilized in this research as follows: first, the CSFs serve as the conceptual framework for exploring and synthesizing related literature through a framework synthesis technique\(^{11}\) (Houghton et al., 2016). Second, they serve as deductive themes that shaped the construction of the survey questionnaire and interview guide. Third, they aid in structuring the survey results in chapter four and are used for the thematic analysis in chapter five. Table 2.2 below presents a definition of each CSFs and their theoretical implications.

### Table 2. 2 A priori themes (CSFs) and their Theoretical Implications

<table>
<thead>
<tr>
<th>CSF</th>
<th>Definitions</th>
<th>Theoretical Implications</th>
</tr>
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| Stringency           | Regulatory stringency refers to the strict measures put forth by a regulator to maintain constant vigilance in order to encourage compliance with regulatory requirements. (Cogliano & Nash, 2017). | Advantage: (1) A more stringent regulation provides significant incentives for polluting firms to decipher possible means of avoiding any extra cost, the regulation will impose on them (Johnstone et al. 2010). (2) The more stringent the regulation, the higher the effect on innovations that have the effect of reducing emissions (Johnstone et al., 2010, p. 295).  
Disadvantage: regulatory stringency diverts investment fund and focuses it on compliance (Palmer, Oates, & Portney, 1995). |
| Affordability        | Affordability depicts how a regulatory framework enables the regulated community/firms to comply with the regulation in a least-cost approach while maintaining high environmental standard GOS (2009a). | Advantage: lower compliance cost increases the propensity to innovate (Blind, 2012).  
Disadvantage: Higher compliance cost reduces the propensity to innovate (Blind, 2012). |
| Stakeholders Interaction | Interaction refers to the ability of a policy (regulation) to create opportunities for stakeholders to interact in a manner that encourages social learning (Hurlbert, 2013, p. 4). | Advantage: (1) Social learning through stakeholders’ interaction increases the ability to cope with informational uncertainty (Lebel et al. 2010). (2) Learning effects can reduce compliance costs, and such learning could be induced by a regulation (Porter and van der Linde, 1995, p. 100).  
Disadvantage: There might be cases of free riders who use the information of other stakeholders to their advantage (Paraskevopoulou, 2012). |

\(^{11}\) (see section 2.4 and section 2.6). Framework synthesis could be built from existing knowledge of the research phenomena or a pre-existing framework in related literatures if a suitable framework exists that can be used to guide and structure the synthesis (Houghton et al., 2016). A framework synthesis was conducted in this thesis to give credibility to the a priori themes. It was used to identify the commonalities and differences in the qualitative data of existing literatures that explored related research phenomena. Also, it served as a means of validating the primary findings of this research.
Flexibility
Regulatory flexibility allows the regulated community to proffer different alternatives to achieving the regulatory requirements (Porter & van der Linde, 1995; Ramanathan et al. 2017).

Advantage: Regulatory flexibility allow firms to select the most effective or lowest-cost options and may place fewer obstacles in the way of innovation (Coglianese & Nash, 2017; Johnstone et al., 2010; Porter & van der Linde, 1995).
Disadvantage: (1) Regulatory flexibility can increase uncertainty on how to achieve the expected regulatory outcomes (Coglianese, 2017; Coglianese & Nash, 2017). (2) Flexibility offers no guarantee against the emergence of conflict and litigation in the regulatory processes, thus designing and implementing regulations require considerable care and vigilance (Coglianese, 2017; Coglianese & Nash, 2017).

Uncertainty reduction
Uncertainty reduction refers to the ability of a regulation to reduce the risks of financial losses from investments in environmental protection assets (Porter and van der Linde, 1995, p. 113).

Advantage: Reduction in regulatory delays reduces uncertainty and increases innovation (Prieger, 2007). Disadvantage: Uncertainty and delays in the implementation of regulations are disincentives for investments in innovation (Blind, 2012).

Taking its cue from Porter and van der Linde (1995) and Hurlbert (2013), Table 2.3, depicts that a ‘stringent’ and ‘flexible’ environmental regulation may trigger innovation, though innovation may not always offset the ‘cost of compliance’ in the short run, but in the long run, ‘learning (social learning)’ can ‘reduces regulatory uncertainties’ and the cost of innovation, which may eventually offset the costs of compliance. The attributes of the flexible regulation posited by Porter and van der Linde (1995) is comparable to the RBR, and significant insights about stakeholders’ interaction emerged from Hurlbert (2013).

2.6.1. Synthesizing the CSFs (A Prior Research Themes)

Following Houghton’s (2016a) framework synthesis, the five CSF were synthesized. A Framework Synthesis enabled the researcher to integrate different research findings of the research phenomena from various jurisdictions to provide a meaningful explanation of similar findings in the current study. Thus, the researcher sourced evidence from related
studies that explored stakeholders’ perceptions regarding the impact of regulations on firms’ innovation activities and social learning. Appendix 2 provides a detailed description of the steps followed in developing a framework synthesis.

Having applied the required steps for synthesizing the CSF systematically, this section provided a summary of the synthesis from the related articles and illustrated how they informed the findings of this thesis. Where applicable, the author indicated the positive and negative findings and explained how they might inform policy decisions regarding RBR. It is vital to note that each CSF isolated on its own has little effect; thus, they were reviewed in loops as illustrated below.

2.6.1.1. Evidence on Stakeholders’ interaction: Regulatory Uncertainty: Affordability - Negative Effects

Evidence from existing studies revealed that stakeholders’ interaction had been limited by ‘free-riding,’ a situation where non-innovating firms use the information of other firms to their advantage (Paraskevopoulou, 2012). In turn, it may reduce the competitive advantage of innovating firms (Paraskevopoulou, 2012; Axelsson et al., 2013). For instance, Axelsson et al. (2013) examined a sustainable development initiative that aimed to unite independent stakeholders’ efforts in developing multi-level collaboration and learning for sustainable landscapes in Bergslagen, Sweden. The authors discovered that private businesses were reluctant to participate in the joint initiative programs despite being regulated by similar societal policies on sustainable resources due to their owners’ economic ambitions (p.249). Likewise, in another study in Spain, Paraskevopoulou (2012) observed that stakeholders were willing to interact and network in seminars, training and workshop during the introduction of a new regulation that deals with the Registration, Evaluation,
Authorization and Restriction of Chemical substances (REACH). However, after the regulation was implemented, the interactive scenery was altered when stakeholders were required to provide the ‘Detergent Ingredients Database’ that contained the properties of surfactants. Some stakeholders viewed it as offering free-riding opportunities to non-innovators and refused to disclose information on the specifications of ingredients. Thus, free riding undermines the effort of innovators and impacts on their cost of complying with the regulation.

In Paraskevopoulou (2012), regulatory authorities managed the concern for confidentiality in two ways: by mediating the information exchange process in some cases, and by financing the creation of sophisticated software that controls information flow. Thus, regulation safeguarded level-playing and protected the pacesetters by providing incentives to intensify their efforts; also, the room for imitation was eliminated by improving the standards” (p.1065).

2.6.1.2. Evidence on Stakeholders’ interaction: Regulatory Uncertainty: Affordability - Positive Effects

On a positive note, the synthesis revealed that continuous stakeholders’ interaction increases social learning, reduces assumed uncertainties in regulatory requirements, fosters enhances cost-effective programs/projects and encourages firms’ innovation activities.

A study in Saskatchewan Canada by Hurlbert (2013) discovered that increased stakeholders’ interaction through formal and informal networks increased trust in the regulatory system (p.12). The increase in trust enabled the stakeholders to develop cost-effective programs (Canada-Saskatchewan Farm Stewardship Program (CSFSP), and the Farm and Ranch Water Infrastructure Program (FRWIP)) collaboratively with federal and
provincial agencies. The FRWIP was a long-term water-related infrastructure project initiated by producers, and was subsequently adopted and administered by the provincial government. When compared to the RBR system, the program initiated by the farmers was akin to an alternative solution, since it was not an acceptable standardized solution stipulated in the code. However, on acceptance by the government agency, the solution moved from being an ‘Alternative Solution’ to an ‘acceptable solution’ and was subsequently administered by the provincial government, similar to the administration of acceptable solutions.

Coming up with the FRWIP involved collaborative learning between government agencies and the producers’ network (p. 12), which reduced informational uncertainties, and increased stakeholders’ trust in the system. Also, the author reported that the program was a cost-effective program making it affordable by reducing the cost of compliance. Increased stakeholders’ interaction and affordability are two essential CSF that may aid regulations/policies in fostering firms’ innovation activities and social learning.

In a similar light, another study in China by Tan et al. (2017) revealed that meaningful performance measures could be agreed upon when regulators engage with firms. One of the participants in their study highlighted that “firms should be involved in the formulation of regulatory measures to ensure it is developed according to its intended use (p.51).” Another participant stated that “a collaborative relationship between policymakers and firms (based on mutual trust) is required for long-term progress (p.51).”

Stakeholder’s participation is more eminent in a flexible regulation than in a prescriptive regulation. Flexible regulations (including performance-based, outcome-based or hybrid regulations) allow firms to select the most effective or low-cost options that may
place fewer obstacles in the way of innovation (Porter & van der Linde, 1995; Ramanathan et al. 2017, Hoberg, Malkinson & Kozak, 2016). However, the focus on outcomes could lead to the Achilles’ heel of flexible regulations if not supported by sufficient stringency (May, 2003). Thus, it is vital to temper the enthusiasm for outcomes with constant vigilance (stringency) to monitor some private-sector tactics that run counter to the actual regulatory goals (Coglianese & Nash, 2017, p.33; Tan et al. 2017). The findings below present some evidence of the negative consequences caused by flexible regulations with inadequate stringency.

2.6.1.3 Regulatory Flexibility and Stringency

Evidence from Coglianese and Nash (2017) provide retrospectives of how Volkswagen (a renowned car manufacturing company) intentionally altered the setting of their diesel engines. The diesel engines meet the EPA standards when tested in the laboratory but emit up to 40 times more nitrogen oxide when driving on the road (ibid). This scandal was made public in 2014 by the West Virginia University's Center for Alternative Fuels, Engines and Emissions (CAFE). A major lapse from the EPA that aided Volkswagen’s non-compliance was that the agency only tested the vehicle engines in the laboratory, which may have been done with some level of trust in the firms but was turned against the EPA.

When estimates of the hazards to health and safety caused by Volkswagen was conducted by researchers at the Massachusetts Institute of Technology and Harvard University, they discovered that the excess emissions from Volkswagen 482,000 vehicles could contribute to premature fatalities of approximately sixty (60) to one hundred and

Another major incident of regulatory flexibility with inadequate stringency is the New Zealand leaky building saga (May, 2003). The government of New Zealand introduced an outcome-based building regulation in 1992. The benefits of the reformed regulation were the use of new materials and innovative processes in buildings. Ironically in the late 1990s, a significant number of newly constructed buildings were leaking. Approximately 22,000 to 89,000 homes were affected, with an estimated remediation cost of $11.3 billion New Zealand 2008 dollars (Meacham 2010). Both incidences from the two countries reveal the complexity of flexible environmental regulations, and the exigent need to instill stringency if the regulatory objectives are to be achieved.

Synthesizing the above findings from selected literature were aimed at demonstrating the reliability of the CSF adopted in this thesis. Having provided practical studies from at least twelve countries where the CSFs served as facilitators to achieving the success of a government regulation/program, it suffices that the CSF applied in this thesis is reliable and can be replicated in future studies.

2.7 Summary of the Literature Review

This chapter evaluated the prevailing views of related literature regarding the impact of regulation on firms’ innovation activities and social learning. It commenced with the negative perception of the impact of regulation on firms’ innovation activities that was instigated by the neoclassical economists. It then explained how Porter and van der Linde (1995) instigated a historic change of stakeholders’ perception towards the benefits that
environmental regulations can stimulate on firms, ranging from process and product innovation to enhancing firms’ competitiveness. The literature review identified some CSFs that may aid in enabling RBR foster firms’ innovation, such as stringent regulatory requirements, flexibility, affordability, uncertainty reduction, and stakeholder’ interaction.

However, there was a social learning gap in regulation and innovation literature. Most literature mentioned the importance of learning within the organization (Paraskevopoulou, 2012; Ramanathan et al., 2017; Porter and van der Linde, 1995), but little emphasis was made on inter-organizational or stakeholders’ interaction; hence, the need for a further review on the concept of social learning. A review of the social learning revealed the concept of loop learning and some factors that may enable social learning amongst stakeholders (firms and the policymakers), such as networking and trust. Also, stakeholders’ interaction emerged as another CSF that may aid in addressing the research question.

Thus, the CSFs were reviewed through a framework synthesis to identify some commonalities and differences in the findings of related literatures.
Chapter Three: Research Methodology

3.1. Introduction

A research methodology is an overall approach to a research process; it is a systematic approach of collecting and analyzing data to obtain information that are relevant for the research phenomena (Collins & Hussey, 2003; Jankowicz, 2000). A clearly defined research methodology provides a precise guide on how the research question is addressed.

Also, research methodology embodies the research ontology and epistemological position. A researcher’s ontology and epistemological position informs the research methodology and shapes the mode of generating and evaluating empirical evidence (Frauley and Pearce, 2007). Thus, a comprehensive review of this thesis ontology and epistemological premise revealed that the research leverages on critical realism (see section 1.6). Following a critical realist perspective, the author employed a mixed research method in analyzing the online survey and interview results that address the following research questions:

In what ways has RBR fostered innovation activities and social learning in Saskatchewan since its implementation in 2015?

Specific secondary questions were included to aid in answering the primary research question:

A. What are the CSFs that may contribute to shaping the innovation activities of firms?
B. Regulatory induce innovation comes from complying with the regulation; what are some incentives the Ministry could explore to encourage compliance within the RBR framework?
C. What are the factors that may enhance social learning within the regulatory framework?
D. What are the possible ways of improving the RBR to build more capacity for social learning?
This chapter describes the methods applied in answering the above research questions. Having established that the thesis is based on critical realism (section 1.6) and how it led to the choice of employing a mixed research method, the researcher discussed the rationale for applying a mixed-methods (MM) design (section 3.2). Section 3.3 describes how respondents were selected and how the online survey was constructed. Section 3.4 described the interview selection processes and protocols. Section 3.5 presents the techniques adopted in analyzing and integrating the results. Section 3.6 discusses the reliability of the survey instruments and ethics approval. Finally, section 3.7 reviewed the limitations of the research methodology.

3.2. The Rationale for a Mixed Research Method

A mixed-method (MM) research involves collecting at least one qualitative and one quantitative method, and rigorously analyzing and integrating the results (Johnson, Onwuegbuzie, & Turner, 2007; Pluye & Hong, 2014, p. 32; Creswell 2014; Campbell et al., 2011). Without integration, the knowledge acquired from an MM research design may be equivalent to that gained from a separate qualitative study and a quantitative study rather than a robust understanding of the phenomena (O’Cathain, Murphy and Nicholl, 2010).

There are several rationales for applying a mixed-methods (MM) design. A research study may need a quantitative method to generalize qualitative findings. Mixed methods may be required to understand a new phenomenon (through qualitative methods) better, and to measure cause and effect, magnitude and trends of such phenomenon (through quantitative methods) (Pluye and Hong, 2014, p. 30; Creswell, 2014). Often when a single method is applied in research, some important evidence may be overlooked; this limitation
may be neutralized by collecting and analyzing both quantitative and qualitative data (ibid). Thus, MM design combines the strengths and compensate for the limitations of both quantitative and qualitative methods (ibid).

The MM research design became popular in the 1980s, and several suggestions on how the mixed data could be analyzed and integrated were proffered (Creswell, 2014, chapter 10; Pluye and Hong, 2014). Amongst the suggested methods, three are popularly used; they include sequential exploratory MM design, sequential explanatory MM design, and convergent MM design (see Pluye & Hong (2014) and Creswell (2014, chapter 10) for a review of the MM research designs).

This thesis adopted the convergent MM research design (Campbell et al., 2011; Pluye et al., 2012; Pluye, Sridhar & Grad, 2013; Pluye & Hong, 2014; Creswell, 2014, chapter 10). In a convergent MM research design, quantitative and qualitative data are collected and analyzed separately; results from the analysis are then converged and juxtaposed (O’Cathain, Murphy & Nicholl, 2010). For this thesis, the quantitative and qualitative data collected were grouped under the CSF deduced from existing studies. Figure 3.1 represents a snapshot of the research method from the point of collecting data to the final integration of the qualitative and quantitative results, with the CSF serving as themes that aids in the integration and interpretation of results.
3.3. Survey Instrument and Data Collection

Survey methods have a concise structure and are time efficient (Creswell, 1994, p. 10). Surveys are useful means of communicating stakeholders’ views to the government (OECD, 2012). Also, it provides an avenue for evaluating the level of stakeholders’
awareness of recent regulatory updates, and for assessing the performance of a regulation (ibid). OECD countries often adopt perception surveys to identify areas of concern that can inform future regulatory reforms (ibid).

For this thesis, an online survey was sent to a list of stakeholders that were legislated under the EMPA (2010) and FRMA in Saskatchewan. To get this population (sample frame), a request for approval to undertake independent research on the progress of the RBR was sent to the Ministry. When the research was approved, the Ministry sent an email requesting stakeholders' voluntary participation in the research project. This procedure was necessary to maintain an information confidentiality agreement between the Ministry and the stakeholders. The email sent to the stakeholders comprise of the following information: (i) a brief description of the thesis, including its objectives; (ii) an assurance of confidentiality maintain in the study; (iii) the researcher’s contact information for further inquiries; (iv) the respondents’ liberty to opt-out of the survey without any attachments to their decision; (v) the expected survey completion date, and (vi) a link to the survey. Also, the survey link was posted on the Government Saskatchewan Website to encourage stakeholders’ participation (See Appendix 3.1). After three weeks, a reminder email was sent to the stakeholders. The first request for participation was sent on July 11, 2018 and the final survey responses were received on August 31, 2018.

The survey instrument adopted was an online surveygizmo\(^\text{12}\) approved by the communications branch of the Ministry. The Ministry used the Surveygizmo because of its

\(^{12}\) SurveyGizmo is an advanced (but easy to use) online survey software tool that creates surveys, quizzes, and questionnaires. It can be used to reach out to potential and existing customers, manage organizational and employee relationships, and conduct academic research. https://www.surveygizmo.eu/
user-friendly, standard and advanced reporting features, including customized charts and graphs.

The survey comprises fifty-one (51) questions, of which thirty-one (31) were Likert-items; six (6) were dichotomous questions, and fourteen (14) were open-ended questions (see Appendix 3.6). Also, the questionnaire was divided into three sections. Section one consisted of the Likert-items and were ranked from a scale of one to four, categorized as 1 = strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree (Sarwar et al., 2018; Joshi and Pal, 2015; Gliem and Gliem 2003). There was also an option for respondents whose environmental activities may not fall under an inquiry in each Likert item; a space for ‘not applicable’ was provided for respondents in such instances. In the online survey, the ‘not-applicable’ option was placed at the extreme right intentionally to avoid a profound limitation observed in Likert-items where respondents often pick the middle response (Boone and Boone, 2012). A value of zero (0) was assigned to the ‘not applicable’ option. The dichotomous questions were assigned a value of ‘3= yes and 2=no.’ This was done to align the dichotomous responses of ‘yes or no’ with the ‘agree or disagree’ Likert-item responses.

Section two of the survey questionnaire consists of open-ended questions that require detailed responses. Also, stakeholders were required to indicate the RBR legislations that relate to their firms. Section three was a combination of dichotomous (yes or no) questions and explanations targeted at the QPs only.

In summary, the Ministry sent an online survey to a target population of 639 stakeholders whose firms were currently implementing the RBR. From the 639 stakeholders, ten (10) emails returned as “out of office” until the survey ended. Thus, the
629 stakeholders who received the email were termed as the population frame\textsuperscript{13}. In return, 125 respondents commenced the survey. A respondent is any stakeholder that initiated the online survey, regardless of whether he completes the survey (Sakshaug, Vacari & Couper (2019, p.757). From 125 responses, only 50 were uploaded for analysis because some respondents started the survey but did not complete it. Analyzing all the 125 responses may produce a biased estimate, which may lead to wrong predictions.

3.3.1. Techniques Applied in Analyzing the Survey Data

After completing the survey, the Likert items and dichotomous questions were separated from the open-ended statements and analyzed through a Statistical Package for Social Sciences (SPSS) (Griffith, 2010). The open-ended explanations complemented the quantitative results. Figure 3.1 presents a brief snapshot of how the data was analyzed. The process includes transforming the Likert items and dichotomous variables to numeric values; determining the Cronbach alpha, conducting a Chi-square test, computing for range, mean, mode, median, standard deviations, correlation coefficient and cross tabulating results. Being a perception survey, the results were presented in chapter four as perceptions rather than facts. To complement the survey results, the researcher conducted semi-structured interviews.

3.4. Semi-Structured Interviews

Interviewing is a research method that sources primary data from participants who have knowledge of a research phenomenon in other to gain access to detailed experiences and information regarding how they view the research concepts (Kvale, 2003; Bryman and Teevan, 2005). There are different types of interviews method – structured, unstructured

\textsuperscript{13} “A population frame is that portion of the target population that can be enumerated” (Schonlau et al., 2002, p. 13).
and semi-structured (Bryman & Teevan, 2005). This thesis employed a semi-structured interview method\(^\text{14}\) in order to keep responses within the scope of the research while exploring the detailed experience of participants. Also, some of the firms’ business activities were legislated outside the RBR framework. It was necessary to adopt a semi-structured interview, and to maintain an interview guide, to avoid mingling experience of other legislations not related to RBR,

### 3.4.1. A Sampling of Interview Participants

The selection of the interview participants followed a similar sampling technique adopted for the survey to get a significant representation from the stakeholders while maintaining their confidentiality. Potential interview participants were sampled from the same list of stakeholders whose firms were legislated under the EMPA (2010) and FRMA in Saskatchewan. Due to the confidentiality agreement between the Ministry and the stakeholders, and the sensitive nature of the research object, a request for approval to meet with interested participants was sent to the Ministry. Upon approval, the Ministry sent an email requesting stakeholders’ voluntary participation in the interview sessions in August 2018. However, there were slight differences in the email to stakeholders because interested stakeholders were invited to contact the researcher directly to arrange for the interviews.

The email for participating in the interview sessions was first sent in August, 2018, with the following information (i) a brief description of the thesis, including its objectives, (ii) an assurance of confidentiality and anonymity maintain in the study, (iii) the researchers contact information for further inquiries, (iv) a request for interested stakeholders to contact

\(\text{14\ In a semi-structured interview, the interviewer only provides few prompts and the interviewee replies freely. The interviewer responds to points that require following up (Bryman and Teevan, 2005). The interview comes in a more narrative style, with greater flexibility than the semi-structured interview, allowing the interviewee to elaborate on various issues (ibid).}\)
the researcher directly and make arrangements for a convenient place and time for the interview, (v) each participant was provided with a formal consent form to confirm their willingness to participate in the discussion. If a participant refuses to indicate a formal consent, the interview session terminates, and the potential participant thanked for his time. This provision was necessary to protect both the participant and the researcher legally. However, the researcher did not experience any refusal to a formal consent in this thesis.

At first, 629 potential participants received a request to participate in the interview and only nine (9) independent stakeholders contacted the researcher. To increase stakeholders’ representation, the researcher contacted several environmental associations in Saskatchewan. Thus, another email (second call) was sent to the stakeholders through the Saskatchewan Environmental Industry and Managers Association (SEIMA) requesting participation. Also, SEIMA uploaded the request on its website (see Appendix 3.2). All members of the SEIMA are in the Ministry’s database. The interview participants attested that SEIMA serves as a communication branch of the Ministry in many instances, while upholding the interest of its members. Thus, the interview was sent out to a targeted population that is legislated under EMPA (2010) and FRMA to maintain the validity of the data source.

After the second call for participation, a total of twenty-four (24) stakeholders participated in the interview. The environmental activities of twenty-two (22) participants were legislated under the FRMA, and EMPA (2010) Acts, but two participants were not legislated under FRMA and EMPA (2010). Thus, the two out-of-scope participants were
3.4.2. The Interview Guide (Protocols)

The researcher prepared an interview guide that comprises of 18 open-ended questions (Appendix 3.4). During the interviews, participants were guided through each question and prompted to give examples where necessary. At the end of each interview, the researcher requested if there were additional information that participants were willing to share. At the early stage of the interviews, the researcher asked the guided questions on the spot; however, after nine participants, it was deduced that more tangible information could be sourced if the questions were sent ahead of time. Thus, the researcher informed her supervisor of the observation, and the interview questions were then sent through email before the interview for each participant to become familiar with the interview guide before the actual interview date. All the interviews were recorded with the permission of each participant. On completion of the interview, the responses were transcribed, and where necessary, the transcripts were sent back to the interviewees to reconfirm the content.

3.5. Techniques Applied in Analyzing the Interview Transcripts

The interview results were analyzed through thematic network analysis, complemented with theme frequency tables. The researcher recognized the relevance of using themes in reporting the findings because themes unite ideas that have a common point of reference regarding the object of inquiry and each theme may have subthemes that aid in obtaining a comprehensive view and uncover patterns that emerges in a dataset (Guest, MacQueen & Namey, 2014). Specifically, thematic network analysis was preferred due to
its accuracy and popularity in analyzing qualitative data (Braun & Clark, 2006; Attride-Sterling, 2001).

Attride-Sterling (2001) introduced the use of thematic networks for organizing and presenting qualitative data. A thematic network is a web-like map that aid in summarizing themes within a piece of research. It is found to be a robust and highly sensitive tool that aids a systematic presentation of qualitative findings (Aliyu et al., 2012). A thematic network is useful in uncovering salient themes in research (ibid). It facilitates how themes are identified, reviewed and structured; also, it reveals consistent patterns and interconnection of themes that emerge in research data (Attride-Sterling, 2001; Aliyu et al., 2012). Appendix presents a guideline for this thesis thematic network analysis (TNA). The next section describes how the themes used for the TNA were generated.

3.5.1. Identifying Deductive and Inductive themes

A combination of factors that may enable RBR to foster innovation and social learning were deduced from existing literatures and positioned as a priori themes. Also, these themes were referred to as the CSFs (see section 2.6). The CSFs aided in constructing the interview guide and were used to label corresponding responses in the interview transcripts.

While transcribing the data, the researcher identified new themes. These new themes were organized as subthemes under each CSF (see Appendix 3, Table 3.1). Remarkably, one of the new themes – environmental stewardship reflected throughout the interview transcript and was thus positioned as a global theme.
3.5.2. A Global Theme Emerges - Environmental Stewardship

Environment stewardship emerged as a common theme in the interview because stakeholders increasingly assumed ownership and accountability for their actions. They appreciated the role of a QP as one that is necessary for advancing environmental science and technology. Fermades and Guiomar (2016) defined environmental stewardship as “the responsible use and conservation of natural resources in ways that take a balanced account of the interests of the society, as well as of private needs, (including the future generation’s needs) and accepts significant answerability to the society” (p. 509). In a similar light, Welchman (2012) defined environmental stewardship as the responsible management of human activity affecting the natural environment to ensure the conservation and preservation of natural resources and values for the sake of future generations of human and other life on the planet and being accountable to society (p. 303). Given its prevalence and consistency in the transcript and its high significance to advancing innovation and accountability, environmental stewardship emerged as an overarching theme.

Thus, the researcher identified ten subthemes, five main themes, and one global theme. For precision, the themes were defined and explicitly focused on the research object (Attride-Sterling, 2001, p. 391); see Appendix 3, Table 3.1 for the description of the subthemes and the global theme. It also depicts the deductive and inductive themes.

Having presented the steps employed in the thematic network analysis (Appendix 3) and defined the subthemes and global theme (Appendix 3, Table 3.1), the next section describes the rationale behind the use of theme frequency tables and charts. It also described the assessment criteria adopted in chapter five and its relevance.
3.5.3. The Use of Theme Frequency Tables and Charts

In the analysis stage, tables of theme frequencies were created to complement the thematic network analysis. A table of theme frequency shows the frequency of key ideas assigned to each theme in the transcript (Guest, MacQueen and Namey, 2014). Altheide (1996) recognizes significant meanings associated with the frequent occurrence of ideas in a body of research. Altheide asserts that “the frequency of occurrence of certain symbols within a body of research presumably take up space; hence, the greater that space, the greater the significance of the symbol” (ibid, p.5). Thus, key findings were reported by illustrating their frequency in the transcript under each theme, to trace the patterns that aid in addressing the research questions.

In chapter five, three structures of frequency tables were utilized. First, each participants’ response to an item on the interview was grouped into positive or negative perception and categorized under each legislation that governs the participant firm’s environmental activities. After presenting a table for every item under each theme, the researcher then assessed the cumulated relative impact of the positive and negative perceptions on each legislation that governs the participant firms’ environmental activity(ies).

The relative influence was calculated by adding participants’ responses to each item on the table vertically under each legislation. After adding the cumulated responses, the researcher calculated the relative influence of each positive or negative response on the legislation:

\[
\text{EMPA (P)} = \frac{\text{Total Positive Responses under each theme}}{\text{Total Positive + Total Negative Responses under each theme}} \times 100
\]

\[
\text{EMPA (N)} = \frac{\text{Total Negative Responses under each theme}}{\text{Total Positive + Total Negative Responses under each theme}} \times 100
\]
The above calculation was repeated for all participants that were categorized under each legislation (EMPA, FRMA, EMPA & FRMA) within each theme (Affordability, Flexibility, Uncertainty Reduction, Stakeholders’ Interaction and Stringency).

Table 3.1 The Percentage of the Cumulative Frequency of Positive or Negative Perceptions, under each Legislation

<table>
<thead>
<tr>
<th>s/n</th>
<th>CFP for each Legislation (%)</th>
<th>Relative Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>91-100</td>
<td>Highest</td>
</tr>
<tr>
<td>2</td>
<td>81-90</td>
<td>Higher</td>
</tr>
<tr>
<td>3</td>
<td>71-80</td>
<td>High</td>
</tr>
<tr>
<td>4</td>
<td>61-70</td>
<td>Medium</td>
</tr>
<tr>
<td>5</td>
<td>51-60</td>
<td>Low</td>
</tr>
<tr>
<td>6</td>
<td>50 and below</td>
<td>Minimum</td>
</tr>
</tbody>
</table>

Key: 91%-100% represent instances where a positive or negative perception most likely has the highest relative influence. Scores of (50% and below) represent instances where a positive or negative perception most likely has minimum relative influence on the legislation.

3.5.3.1. Measuring the Relative Impact of the Positive or Negative Perceptions Through a Relative Influence Scale (RIS).

There is a great degree of complexity involved in measuring the influence that a negative or positive perception may have on any program or regulation because a smaller percentage of negative perception may cause greater harm to the effectiveness of a program/regulation, compared to the greater percentage of positive perception. However, it is useful to demonstrate the extent of these responses on frequency tables, especially where it involves several stakeholders. The illustration may aid in depicting the degree of each problem. Also, categorizing the voices heard about each legislation may inform specific policy decisions (British National Audit Office (BNAO), 2016).

Thus, following a performance scorecard approach adopted from the BNAO (2016), the likely influence of a positive or negative perception about each item in the interview guide was analyzed under each related legislation. The BNAO (2016) utilized a relative
influence scale (RIS) to measure the influence of government regulations on business activities. Also, in 2010, the RIS was employed by the British Office of Communications (Ofcom) to assess Ofcom’s performance by allocating a rating to each of the identified measures (see BNAO, 2016, pp 21-22).

This thesis modified the RIS to measure the degree of the relative influence that participants’ positive or negative perceptions may have on each RBR affiliated legislation. Though the BNAO (2016) used rating ‘1 to 3’ in their assessment, the rating was modified in percentages to fit the objective of this thesis. Table 3.2 illustrates the RIS for this thesis.

3.5.3.2. The Relevance of Applying a Relative Influence Scale (RIS)

In line with the BNOA (2016), analyzing performance by relative influence provides clarity on areas of improvement\(^\text{15}\) that provides an opportunity for policymakers to inquire more about the cause of an environmental problem. With informed knowledge of the problem, different solutions may be explored, and better decisions implemented. Also, RIS improves the focus of performance assessments by enabling the assessor to distinguish measures of greater influence from those of lower influence (BNOA, 2016, p. 22).

3.6. Reliability of the Survey Instrument and the Interview Questions

Following Ramanathan et al. (2018), Yin (1989) and Straub (1989), the current study applied different measures to enhance the quality of the research methods. These measures include establishing reliable sources of the survey and interview questionnaires, adhering to standard ethical practices, and conducting a pilot test. Also, a reliability test was conducted for each research instrument. Cronbach Alpha was computed for the quantitative data, and a

\(^{15}\) The British National Audit Office (2016) utilized a relative influence scale in measuring the influence of government regulations on business activities. We adopted and redefined it to measure the relative influence that each participant’s positive or negative perception of each CSF (main themes) has on each legislation (EMPA and FRMA).
framework synthesis was performed to measure the validity of the CSF. The data reliability measures adopted in this thesis are described below.

3.6.1. Data Sources for the Survey Questionnaires and Interview Guides

To establish accurate and replicable measures, guides to the design of the survey questionnaire and interview protocol were sourced from existing studies that explored the research phenomena in different jurisdictions.

In preparing the questionnaires, key insights were drawn from government gazettes and related academic literatures. The government gazettes include: the Saskatchewan Environmental Code, which stipulates the expected outcomes of the RBR (GOS, 2014a: 2014b); the Australian Regulators (2015-2016) Performance Framework (Government of Australia, 2016); government evaluation report from the BNAO (2013); a report on administrative delay reduction plan from Canada Treasury Board (2014); Cabinet Directory on Regulatory Management from the Government of Canada (2012), and a report on Regulatory Policy Outlook from OECD (2015). The major academic literature that informed the survey and interview questions include Porter and van der Linde (1995); Ambec et al. (2011:2013); Paraskevopoulou (2012); Ramanathan (2017); Hurlbert (2013:2016), and Hurlbert & Gupta (2015). The academic research was pair reviewed.

3.6.2. Ethical Considerations

This thesis is collaborative, being that it required approval from two reputable institutions - The University of Regina and the Saskatchewan Ministry of Environment (The Ministry). The approval was necessary due to the sensitive nature of the object of inquiry, the actors involved, and the high level of confidentiality required in the research process. The Ministry administered the survey on the government of Saskatchewan website to assure
independent stakeholders of the authenticity of the research project (evidence is attached in Appendix 3.1).

For robust impact analysis, the survey was complemented by several independent interviews conducted by the researcher. Ethics approval for the interviews was obtained from the University of Regina Research Ethics Board (see Appendix 3.4). Responses from the semi-structured interviews were coded using the CSF outlined in section 2.6. To maintain confidentiality, participants were informed that any information they give consent for inclusion would be added and quoted where necessary, but no identifying information was disclosed. Thus, a pseudonym (P1, P2, etc.) was used to represent participants’ views.

3.6.3. Survey Pilot and Test Interviews

Prior to administering the survey questionnaire and conducting the interviews, pilot tests were conducted among three graduate students to gain insight on how appropriate the questions were in addressing the research problem. Straub (1989) discussed the relevance of conducting pilot tests before the main fieldwork. A pilot run allows the researcher to hear from third parties about the fitness of the questions, and to change any misaligned question. Also, it enables a researcher to estimate an approximate timeframe for completing the survey. Feedback from the pilot exercise was incorporated before the actual data collection.

3.6.4 Framework Synthesis Revisited

After identifying a global theme of environmental stewardship in the transcript, the framework synthesis was revisited. The steps in Appendix 2 were repeated, and fourteen articles were synthesized to reflect the impact of the global theme of environmental stewardship (see Appendix 3.5).
Positive evidence of environmental stewardship emerged in Ramanathan et al. (2017), Hoberg, Malkinson & Kozak (2016); Raty et al. (2016) Hurlbert (2013); Steiman (2013) and Paraskevopoulou (2012). While negative attitude towards environmental stewardship was identified in Coglianese & Nash (2017); May (2013) and Tan et al. (2018). These findings were inferred in chapters four, five and six when results from the current study compared with existing literatures. The framework synthesis unveiled evidence from at least twelve countries where the CSF served as facilitators to achieving the success of a government regulation/program. This evidence proved that each CSF applied in this thesis is reliable and can be replicated in future studies.

3.7. Limitations of the Data collection Methods and Possible Mitigation Measures

The limitations identified in the data collection methods include generalization problems, issues associated with mixed-method research, time constraints and interview specific issues.

The sample of 22 participants from a population of 629 accessible participants in the province could limit the extent to which the study could be generalized. However, the in-depth interview with experienced managers and the systematic review of their responses offered a good basis for reaching some general conclusions. Also, a sample of 125 respondents responded to the online survey sent to 629 population of stakeholders. However, only 50 responses were analyzed because some respondents initiated the survey but did not complete it.

The responses from the survey and the interview were analyzed through a mixed method. Despite the merits of mixed-methods research, there are some limitations to it. The general axiom that the strength of one research method may offset the weakness of another
when combined may not necessarily come true if the data is inaccurate (Fielding & Fielding, 1986). Also, any limitation of an individual method may influence the overall result; for instance, a common issue often encountered in online surveys is getting the respondents to respond. For this thesis, the researcher anticipated this challenge of getting stakeholders to respond online and took steps to minimize it by following the approval process that enabled the Ministry to send emails to the stakeholders. This process affirmed the authenticity of the research.

Time constraint was also an issue because some stakeholders’ availability did not fall within the survey period. This was addressed by ensuring the survey instrument was sent to a large target population (639 stakeholders) to minimize foreseeable sampling error.

Furthermore, the online survey was complemented with semi-structured interviews, which implicitly served as a means of decoding the reasons for any initial bias observed in addition to other objectives of the semi-structured interview (OECD 2012; Senlier, Yildiz & Aktas, 2009). For the interview, only nine (9) participants responded when the Ministry sent out the invitation to 639 stakeholders in August 2018. Having received ethics approval from the University, the research adopted a snowball approach to recruiting more participants. A few environmental associations were requested to reach out to their members. In response, the Saskatchewan Environmental Industry and Managers Association (SEIMA) uploaded the invitation on their website, and fifteen (15) additional participants were recruited for the interviews.

Some limitations are peculiar to the interview process. Interviewees’ response might be shaped by the researcher’s questions, which may stand the risk of the participants only expressing what they think an interviewer wants. Also, there may be the risk of participants
merely expressing what they are prepared to reveal about their perception of events (Irvine, Drew & Sainsbury, 2013). These limitations were managed by explaining the relevance of participants’ opinions and assuring them that their responses will be coded anonymously.

Some of the interviews were face-to-face and a few through the telephone. Constraints typical in the telephone interviews include some semantic issues such as language ambiguity, contested meanings and interpretations (Scheurich, 1995). Often, what a question or answer means to the interviewer may mean something different to the interviewee. Some of these limitations were experienced during the telephone interviews in this research. Where the researcher could not decipher the spoken words, further clarity was requested. Each interview was recorded after obtaining permission from the interviewee. The tape was replayed after each meeting to get the exact words. Also, a final check was done by sending the completed transcripts to the participants for reconfirmation of their responses.

Another peculiar constraint is the researcher’s bias in analyzing the transcripts; also, a computer-assisted analysis may distort meanings. These errors were minimized by cross tabulating the interview responses with findings from the online survey, a process embedded in the convergent synthesis.

Overall, the objectives of the online survey and semi-structured interview were clearly defined, and the questions were precise and straightforward.
Chapter Four: Quantitative Research Findings

4.1. Introduction

Chapter four provides a detailed description of the results from the online survey. On completion of the survey, the data was downloaded from the survey gizmo (see section 3.3) and uploaded into the Statistical Package for Social Sciences (IBM SPSS Statistics for Windows). The Likert-items and dichotomous questions were separated from the open-ended explanations and analyzed in SPSS. The open-ended explanations were analyzed in NVivo, they aided in explaining the quantitative results. Section 4.2 described how the data were categorized. Section 4.3 explained how the result of a Cronbach alpha was estimated for all thirty-seven (37) Likert-items and dichotomous questions (see appendix 3.6). Next, in section 4.4, a chi-square test was conducted to determine the degree of association between the respondents’ RBR Legislation (EMPA; FRMA) and the Likert-item choices. In section 4.5, the researcher grouped the Likert-items under related research theme (CSF) to form Likert scales, and a Cronbach alpha was computed for the Likert scales to determine their reliability. Next, descriptive statistics were computed for each Likert-scale. The average of the Likert scale under each CSF was summed as all respondents’ perceptions towards addressing the research question. In section 4.6, a spearman’s rank correlation was also conducted to determine if there were monotonic relationships amongst the CSFs. In section 4.7, findings from the open-ended questions were reported.

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16 NVivo is a software developed by QSR International for qualitative data analysis (see Bazeley, 2007; Nancy & Anthony, 2011).
4.2. Categorizing the Data

Fifty (50) respondents filled the survey, but only forty-five (45) respondents indicated the legislations that govern their environmental activities. Respondents' environmental activities were legislated either by EMPA, FRMA or both EMPA and FRMA. For instance, environmental activities such as hydrostatic testing and waste management were legislated by EMPA; forest data submission and harvesting forest products were legislated by FRMA, while a firms' forest management activity that includes construction, operation, maintenance, closure or reclamation of surface water crossings and roads involves both FRMA and EMPA legislations (GOS, 2014b).

In this dataset, all respondents who indicated that their environmental activities were governed by FRMA also chose EMPA, such that no respondent indicated that they were governed solely by FRMA. Thus, there were only two categories of respondents in the dataset – EMPA, EMPA & FRMA. Onward, the symbol ‘&’ was used in the place of ‘and’ to indicate that the researcher was referring to a group of respondents whose environmental activities were governed by two legislations, and not two groups of respondents’ choices. The absence of a solely legislated FRMA respondent may prove challenging when comparing the influence that the stakeholders' perceptions may have on the environmental activities under each legislation because practically, there should be three categories - EMPA, FRMA, EMPA & FRMA. This limitation could be compensated in chapter five, where participants’ environmental activities were legislated either under EMPA, FRMA or EMPA & FRMA were represented.

In SPSS, the legislation (EMPA; EMPA & FRMA) were coded numerically as 1 = EMPA; 2 = EMPA & FRMA. It was discovered that Thirty-three (33) respondents were
legislated under EMPA, and twelve (12) respondents were legislated by EMPA & FRMA. Due to the high level of anonymity required in the survey, no further categorization was created. Categorizing the data aids in identifying some micro impacts within each category of stakeholders that proved analytically relevant. However, the data was skewed, with a majority of 73% (33/45) participants legislated under EMPA alone, and only 27% (12/45) participants legislated under EMPA & FRMA.

Given the skewed dataset, the researcher could not conduct parametric tests; but focused on the use of non-parametric tests such as Chi-square, descriptive statistics and Spearman's rank correlation in examining the relationship between the variables. However, before conducting the tests, a Cronbach Alpha was computed to determine the reliability and consistency of the dataset.

4.3. Cronbach Alpha: A Test of Reliability

Cronbach Alpha is a measure of reliability that determines the degree to which items in a questionnaire are consistent among themselves and with the overall construct (Gay, Mills, & Airasian, 2009; George and Mallery, 2008; Bland and Altman, 1997). Cronbach’s coefficient alpha (α) is recognized as the most commonly reported estimate of internal reliability. Its value ranges from 0 to 1; as it draws closer to 1, the internal consistency/reliability of the measured construct increases. From George and Mallery (2008), it was found that an alpha (α) of .90 or higher is excellent; from .80 to .89 is good, while .70 to .79 is acceptable. An alpha (α) between .60 to .69 is questionable; .51 to .59 is poor, and an alpha (α) of .50 or less is unacceptable (p. 251). Based on these standard guidelines, a reliability analysis was conducted on the responses to all the Likert-items and
dichotomous questions to determine if they were well structured to address the research questions. Reliability was measured by the value of the Cronbach’s Alpha, which provided a result of .933, indicating an excellent reliability level.

After affirming the level of reliability and consistency of the dataset, the researcher then tested if there was a statistically significant relationship between the respondents’ Legislations (EMPA and/or FRMA) and their responses to the Likert-items. This test was conducted through a Chi-square test of independence.

4.4. The Chi-Square Test of Independence

The Chi-square test of independence is a non-parametric test that is commonly used to test the statistical independence or association between two or more categorical variables (Christensen, Johnson and Turner, 2014, p. 438). It can be used where a dataset fails some parametric assumptions such as the assumption of normality, homogeneity of variance, and dataset being too skewed (ibid).

4.4.1. Conditions for Conducting a Chi-Square Test of Independence

To conduct a Chi-square test, a contingency table (cross-tabulation) is created to study the relationships between the variables. To obtain a valid chi-square result, only categorical variables and not continuous variables are compared (McHugh, 2013; Healey Prus & Lieflander, 2019, Chapter 7). Each variable is required to have two or more categories cross-tabulated between rows and columns to show the frequency of each cell (ibid). The significance in the contingency table is interpreted using the $p$-value under the Pearson Chi-square, where there are two or more categories in the rows and columns’ However, for two by two categories, the $p$-value under the Pearson Chi-square or the Fishers’ exact test is applied (ibid).
After the Chi-square test, a ‘Crammer’s V’ was used to interpret the strength of the relationship. Crammer’s V is a measure of association that describes the importance (the effect size) of the result. The effect size can be interpreted similarly to a correlation coefficient, ranging from values of zero (0) to one (1), where ‘1’ depicts a perfect association, and ‘0’ depicts no association. (Christensen, Johnson and Turner, 2014, 439).

Furthermore, a null and alternative hypothesis is required to conduct a chi-square test. Hypothesis testing is required to test the validity of a claim that is made about a population. All hypothesis tests use a probability value (p-value) to weigh the strength of the evidence that the sample data depicts a population. The p-value ranges from 0 to 1, a p-value smaller than or equal to 0.05 ($p \leq 0.05$) provides strong evidence against the null hypothesis, which means the null hypothesis will be rejected. On the other hand, a p-value that is above 0.05 ($p > 0.05$) indicates weak evidence against the null hypothesis; hence, you fail to reject the null hypothesis (Dancey, Reidy and Rowe, 2012; Möldnera, Garza-Reyesb and Kumar, 2018). Following the assumptions above, it was hypothesized that:

**Null Hypothesis (H$_0$): The relative proportion of responses towards a Likert-item is independent of respondents’ RBR legislations (EMPA; FRMA) in the target population**$^{17}$.  

**Alternative Hypothesis (H$_1$): The relative proportion of responses towards a Likert-item is not independent of respondents’ RBR legislations (EMPA; FRMA) in the target population.**

To test the above hypothesis, a Chi-square test was conducted for each Likert-items and dichotomous questions, of which three extracts are illustrated below.

Table 4.1 presents a summary of the Likert-items and the number of valid responses(N) used for the chi-square test. Listwise deletion was applied, such that only responses with non-missing values for each RBR legislation and Likert-items were utilized.

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$^{17}$ “A target population is the population of inference minus the various groups that the research has chosen to disregard” (Schonlau et al., 2002, p. 13; see section 3.3)
<table>
<thead>
<tr>
<th>Table 4.1. Case Processing Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Likert-Item numbers</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Item5</td>
</tr>
<tr>
<td>Item6</td>
</tr>
<tr>
<td>Item12</td>
</tr>
</tbody>
</table>

**4.4.1.1. Likert-item 5**

Table 4.1 shows 45 valid responses for item5. It required respondents to indicate their consent if the alternative process provides a flexible option for their organization. The hypotheses were:

\[(H_0): \text{the relative proportion of responses regarding the flexible options that 'alternative solutions' provide to firms is independent of respondents’ RBR legislations (EMPA; FRMA) in the target population.}\]

\[(H_1): \text{the relative proportion of responses regarding the flexible options that 'alternative solutions' provide to firms is not independent of respondents’ RBR legislations (EMPA; FRMA) in the target population.}\]

A crosstabulation result from the Chi-square test for Likert-item5 (Appendix 4 Table 4.1) revealed a polarized perception. 70% (23/33) of respondents whose environmental activities are governed solely by EMPA agreed that the code provides flexible options for their organizations, while 75% (9/12) of the EMPA & FRMA respondents disagreed. However, the EMPA respondents were over 50% higher than the EMPA & FRMA respondents.

This polarized perception was shown in Appendix 4 Figure 4.1. It is most likely the negative perception was experienced in the FRMA activities, given that most of the firms...
legislated by only EMPA responded positively. For the Chi-square results, the value of the test statistics from the contingency table was 19.019 at 4 degrees of freedom, with $p = .002$ (see Appendix 4: Table 4.2). Since the computed $p$-value was less than the conventional alpha level of 0.05, it was concluded that the result was statistically significant and the relationship observed in the sample exists in the population (Christensen, Johnson and Turner, 2014, p. 416). Thus, the null hypothesis was rejected. Also, being a 2 by 4 table, the value of the Pearson Chi-square was reported and the Fisher’s exact test.

Thereafter, Crammer’s V was applied to determine the effect size of the relationship. A Crammer’s V of 0. 65 was obtained, which suggested a strong relationship between the RBR Legislations (EMPA; FRMA) and perceptions regarding the flexible options provided by the RBR ‘alternative solutions’ to their organizations.

### 4.4.1.2. Likert-item 6

Table 4.1 shows 45 valid responses (N) for item6. It required respondents to indicate if the code saved their organization money. Hence, the hypotheses:

**$(H_0)$**: the relative proportion of responses regarding low compliance cost is independent of respondents’ RBR legislations (EMPA; FRMA) in the target population.

**$(H_1)$**: the relative proportion of responses regarding low compliance cost is not independent of respondents’ RBR legislations (EMPA; FRMA) in the target population.

A cross-tabulated result from the Chi-square test for Likert-item6 revealed that a majority of the respondents (52% (17/33) of the EMPA and 75% (9/12) of FRMA) disagreed that the code saved their organization money. When a further explanation was inquired, an EMPA respondent complained that approvals took too long and, in several cases, they lost potential land sales and development. Another EMPA respondent added that
“the Corrective Action Plans (CAP)\(^{18}\) regarding property sales may restrict future development of properties, which may be misunderstood by financing institutions and purchasers”, thereby retarding returns on investment or savings towards compliance with the RBR. Another important observation was that 21% of the EMPA respondents responded that item6 does not apply to their organization, which may suggest that they did not apply the alternative solution, and thus could not determine if it saved them money.

Though there were fewer positive responses to item6, some respondents (27% EMPA and 16% EMPA & FRMA) agreed that the code had saved their organization money. See Appendix 4: Table 4.3 and Figure 4.3 for the tabular and chart presentation of the responses to item6.

For the Chi-square results, the value of the test statistics from the contingency table was 15.298 at 4 degrees of freedom, and the \(p\)-value was 0.004 (Appendix 4: Table 4.4). The computed \(p\)-value was less than the conventional alpha level of 0.05, which indicated a statistically significant result (Christensen, Johnson and Turner, 2014, p. 416). The result signifies that the views observed in the sample existed in the population; thus, the null hypothesis was rejected. A Crammer’s V of 0.58 was obtained for the effect size, suggesting a moderately strong relationship between the RBR Legislations (EMPA or FRMA) and respondents’ perception regarding low compliance cost.

The result indicated that RBR (the alternative solution) had not saved some firms’ money. However, this perception was relative to each organizations’ understanding of savings. Some alternative solutions may require investments that yield returns over time. In

\(^{18}\) “corrective action plan means a plan that details the methods employed to prevent, minimize, mitigate, remedy or reclaim adverse effects (Environmental Management and Protection Act, (EMPA) 2010, p. 3)
such an instance, it may be preferable to discount the returns on investment (ROI) in environmental activities to their present value, given the number of useful years for such savings. Thus, a further investigation that involves examining firms’ ROI on specific environmental activities overtime may be required to complement the result of a perception survey in other to provide a more accurate estimate that measures if RBR is cost-efficient.

4.1.3. Likert-item 12

Table 4.1 shows 45 valid responses (N) for Likert-item12. It inquired if the respondents believe that the Ministry understands and engages with their firm? Hypothesis:

(H₀): the relative proportion of responses regarding respondents’ belief respondents believe that the Ministry understands and engages with their organizations is independent of their RBR legislations (EMPA; FRMA) in the target population.

(H₁): the relative proportion of responses regarding respondents’ belief respondents believe that the Ministry understands and engages with their organizations is not independent of their RBR legislations (EMPA; FRMA) in the target population.

A crosstabulation result from the Chi-square test for Likert-item12 (Appendix 4: Table 4.5) revealed a polarized perception. 76% (25/33) of the EMPA respondents agreed that the Ministry understood and engaged with their organizations, while 83% (10/12) of the EMPA & FRMA respondents disagreed. However, the EMPA respondents were over 50% higher than the EMPA & FRMA respondents.

The perception was illustrated in a chart (Appendix 4: Figure 4.5). For the Chi-square results, the value of the test statistics from the contingency table was 21.937 at 4 degrees of freedom with $p = 0.001$, indicating a statistically significant result (Appendix 4: Table 4.6). Thus, it was concluded that the relationship observed in the sample existed in the population, and the null hypothesis was rejected. For the effect size, a Crammer’s V of 0.7
was obtained. It shows a strong relationship between the RBR Legislations (EMPA or FRMA) and respondents’ perceptions regarding the Ministry’s interaction with their organization.

In summary, respondents’ views on most of the Likert-items were statistically significant, while a few were not. To compute the overarching result, the following steps were taken: first, the researcher grouped the Likert-items under each research theme (CSF) that aligned with their constructs to form Likert-scales. Next, a Cronbach alpha was conducted for the Likert-scales to determine their internal reliability, then, descriptive statistics were computed, and the correlation coefficients of the CSFs were determined.

4.5. Transforming Likert-items to Likert scales

In this section, the Likert-items and dichotomous responses were grouped under related themes (CSF) to form Likert-scales (see Appendix 4: Table 4.7). For instance, in the affordability Likert scale, three related items were grouped together: (1) item6 inquired directly if the code saves the firm money; (2) for item18 the researcher assumed that accountability is associated with the cost of complying with the regulation, and (3) for item24, it was assumed that getting maximum returns of the investment in any environmental activity is one of the most important needs of a firm. Thus, these three items to RBR’s affordability. Likewise, other related Likert-items were grouped to form associated Likert-scales: the Likert-scale for uncertainty reduction comprises of seventeen (17) related Likert-items; the flexible regulatory requirement’s Likert-scale has two (2) related Likert-items. Stakeholders’ interaction has four (4) Likert items, and the stringent regulatory requirement’s Likert scale has eleven (11) Likert-items. After grouping the
responses into their respective Likert-scales (CSF), a Cronbach Alpha of the total Likert-scale was computed.

### 4.5.1. Cronbach Alpha for the Likert-Scales

A Cronbach alpha was required to determine the internal reliability of the Likert-scales in addressing the research question. The estimated Cronbach alpha for the Likert-scales was .838, which indicated an acceptable reliability level.

### 4.5.2. Descriptive Statistics

The descriptive statistics conducted for each CSF include the minimum and maximum score, range, mode, mean and standard deviation, as shown in Table 4.2. Row one describes the number of valid responses that were computed. It was observed that not all the 37 Likert-items and dichotomous questions were filled by each respondent. Thus, a Listwise deletion was applied for missing values (George & Mallery, 2008, p. 50). The implication of the descriptive statistics results for each CSF is explained below.

#### Table 4.2 Descriptive Statistics for each CSF

<table>
<thead>
<tr>
<th></th>
<th>Affordability</th>
<th>Uncertainty Reduction</th>
<th>Flexible regulatory Requirement</th>
<th>Stakeholders' Interaction</th>
<th>Stringent Regulatory Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. N Valid</td>
<td>47</td>
<td>50</td>
<td>48</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>1. N Missing</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2. Mean</td>
<td>2.6773</td>
<td>2.6474</td>
<td>2.6771</td>
<td>2.6483</td>
<td>2.7360</td>
</tr>
<tr>
<td>3. Mode</td>
<td>3.00</td>
<td>2.00*</td>
<td>3.00</td>
<td>2.50</td>
<td>3.00</td>
</tr>
<tr>
<td>4. Std. Deviation</td>
<td>0.50290</td>
<td>0.40658</td>
<td>0.74726</td>
<td>0.57791</td>
<td>0.30692</td>
</tr>
<tr>
<td>5. Range</td>
<td>2.17</td>
<td>1.71</td>
<td>3.00</td>
<td>2.75</td>
<td>1.38</td>
</tr>
<tr>
<td>6. Minimum</td>
<td>1.50</td>
<td>1.64</td>
<td>1.00</td>
<td>1.00</td>
<td>1.88</td>
</tr>
<tr>
<td>7. Maximum</td>
<td>3.67</td>
<td>3.35</td>
<td>4.00</td>
<td>3.75</td>
<td>3.25</td>
</tr>
</tbody>
</table>

a. Multiple modes exist. The smallest value is shown

#### 4.5.2.1. The Minimum and Maximum Score; the Range and its Implication

Rows 5, 6, and 7 in Table 4.2 represent the range, minimum and maximum score for each Likert-scale, respectively. The dispersion of the minimum and maximum scores (with
a minimum of 1 and a maximum of 4) depicts stakeholders polarized perception regarding the effectiveness of RBR in fostering innovation and social learning. The maximum scores indicate a strong positive belief that RBR had foster innovation. On the other hand, the minimum scores indicate that RBR had not fostered innovation and social learning. For instance, the flexibility Likert-scale comprise of two Likert-items (Appendix 4: Table 4.7) that inquired about stakeholders’ perceptions regarding the use of alternative solutions, the minimum response to this Likert scale was ‘1’ and the maximum response was ‘4’. When the researcher requested a further explanation regarding ‘flexible regulatory requirements,’ a sharp contrast was observed in the respondent explanations. One of the respondents who disagreed that RBR has fostered innovation and social learning gave feedback that it is “very prescriptive and time-consuming.” He further explained that “the forest service is set in their ways, and it’s hard to convince them that there are other acceptable ways of doing things, and if you try, then your approval gets delayed and delayed.” On the flip side, one of the respondents who believe that RBR has fostered innovation and social learning explained that the review process for their alternative solution “was well-received by experienced Ministry of Environment (MOE) staff.” The above responses reveal the plurality of extreme choices inherent in perception surveys, hence the need to conduct additional statistical analysis to ensure a more robust result.

4.5.2.2. The Mean Value and its Implication

The mean value is the value that is numerically closest to all the scores in the dataset. It could be relied upon in providing an estimate of the general perception from a perception survey (see Guimaraes and Sato, 1996). Guimaraes and Sato (1996) examined
the business benefits from environmental protection in the United States, the authors
grouped the responses from a perception survey into broad categories and used the average
of all the Likert-items as a measure for total benefits. Following Guimaraes and Sato (1996),
the researcher grouped the Likert-items into themes (by transforming the Likert-items into
Likert-scales), and then computed the average of the Likert-scales as the overall measure of
stakeholders’ perception that assesses if RBR has effectively fostered innovation and social
learning in Saskatchewan. The following metrics in Table 4.3 was used for reporting the
result as follows:

‘Each mean value that falls within the range of 0.01 and 1’ was interpreted as a strong
likelihood that RBR has not fostered innovation and social learning. ‘Each mean value that
falls within the range of 1.01 and 2’ was interpreted as a likelihood that RBR has not
fostered innovation and social learning. ‘Each mean value that falls within the range of
2.01 and 3’ was interpreted as a likelihood that RBR has fostered innovation and social
learning. Each composite mean that falls within the range of 3.01 and 4’ was interpreted as
a strong likelihood that RBR has fostered innovation and social learning.

Table 4.3. Metrics to Measure RBR Induced Innovation and Social Learning

<table>
<thead>
<tr>
<th>s/h</th>
<th>Mean Value for each Likert-Scale (CSF)</th>
<th>Likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.01 – 4</td>
<td>Positive &amp; Strong</td>
</tr>
<tr>
<td>2</td>
<td>2.51 – 3</td>
<td>Positive</td>
</tr>
<tr>
<td>3</td>
<td>2.01 – 2.5</td>
<td>Positive but weak</td>
</tr>
<tr>
<td>4</td>
<td>1.01 – 2</td>
<td>Negative</td>
</tr>
</tbody>
</table>

Key: A total mean value between 0.1 - 2 indicates no likelihood that RBR has effectively fostered innovation. Mean values between 2.01 - 2.5 indicate positive but weak likelihood; positive likelihood (2.51 – 3); positive and strong likelihood (3.01 - 4) that RBR has effectively fostered innovation.

Table 4.3 shows that the higher the value of the mean above ‘2’, the stronger the
likelihood of RBR to effectively foster innovation and social learning. Approximately,
Table 4.2 presents a mean value of 2.67 for affordability; a mean value of 2.65 for
uncertainty reduction; a mean value of 2.67 for flexibility; a mean value of 2.65 for
stakeholders’ interaction, and a mean value of 2.74 for regulatory stringency, and a
composite mean of 2.68 for all the CSF combined. These results imply a positive likelihood
that RBR has fostered innovation and social learning. These results were supported by extracts from the open-ended statements provided by respondents. Examples of RBR induced innovations cited by respondents include: “developing a use for dead standing softwood and use of non-utilization spec wood”; “the use of drones to conduct regen surveys rather than actual ground survey plots” by an EMPA & FRMA respondent, and “the development of salt management plan” by an EMPA respondent (quotes from the explanatory section of the online survey).

Despite the acknowledgement of innovative practices by some respondents, few respondents expressed concerns about certain aspects of the code that require significant improvement. A common concern is a requirement to amend the Saskatchewan Environmental Quality Guideline (SEQG), to make it more user-friendly while providing relevant documents that are easily accessible to stakeholders.

Between the extreme views on agreeing and disagreeing that RBR has fostered innovation is a mid-point where some respondents raised concern that their alternative solutions were yet to be approved. One respondent explained thus: “We have asked the Forest Service to allow us to use drone flights to replace hardwood stocking surveys. This was innovative, but we're still asked to do surveys despite showing a history of stocking compliance when it comes to hardwood.”

The above examples regarding how RBR induced innovation and the suggested areas of improvement provide some evidence that explains why the mean value was at the borderline of agreeing that RBR has fostered innovation and social learning and slightly above the borderline of disagreeing with the premise.
4.5.2.3. The Mode and its Implication

The mode was 3 (agree), except for the reduction of uncertainty reduction that had multiple modes slightly above 2 (between ‘disagree’ and ‘agree’). Table 4.2 illustrates that there appear to be a significant number of stakeholders who agreed that RBR had fostered innovation and social learning. However, a few respondents who do not agree that RBR has fostered innovation opined that Saskatchewan RBR was yet to evolve into an actual results-based system. One of the respondents explained that organizations are held to a strict 100% compliance, which is impossible by any standard. Similarly, another respondent complained about close monitoring and compliance. Concerns of these nature are common in regulatory systems, which might skew the result of the survey. However, drawing from the losses experienced in the United States and New Zealand regarding flexible regulations that were not closely supported with stringent monitoring, it becomes expedient to temper their enthusiasm for results with constant vigilance (stringency) (see Coglianese & Nash, 2017; Cho, Laine, Roberts & Rodrigue, 2016; May 2003). This objective can be achieved by monitoring some private-sector tactics that may run counter to the actual regulatory goals (Coglianese & Nash, 2017).

4.5.2.4. Standard Deviation and its Implication

Standard deviation provides estimates of the average distance of each score from the mean in squared units (Dancey, Reidy and Rowe, 2012). The smaller the value of the standard deviation, the smaller the data spread; the larger the standard deviation, the larger the data spread (ibid). Table 4.2 shows that the standard deviation follows a similar pattern with the range. Each Likert-scale with a higher range has a higher standard deviation,
confirming the sharp contrast observed in the dataset regarding regulatory flexibility in section 4.5.2.1.

Section 4.5 provided results of the descriptive statistics of each Likert-scale. Recall that these Likert-scales consist of Likert-items that were grouped under related CSFs. To study the relationship within these CSFs, the researcher conducted a Spearman’s rank correlation.

4.6. Estimating the Interconnectivity of the CSFs

Through a Spearman’s rank correlation, a correlation coefficient was computed to describe how the CSF are associated with each other. The researcher determined if a positive ranking of one CSF (for instance: stakeholders’ interaction) could predict a positive ranking of another CSF (reduction of regulatory uncertainties). The objective of understanding the relational direction of each CSF is to determine their strength and influence in enabling RBR to foster innovation and social learning.

4.6.1. Spearman's rank correlation

The Spearman's rank correlation measures the strength and direction of the association between two continuous or ordinal variables.\(^{19}\) It is a nonparametric version of the Pearson correlation.\(^ {20}\) The Spearman rank correlation does not assume a normal distribution of the dataset. Thus, it can be used in cases where the assumptions of the Pearson correlation (continuous-level variables, normality, linearity, and heteroscedasticity) are not met.\(^{21}\)


\(^{20}\) A Pearson correlation is a number between -1 and 1, which indicates the extent of how two variables are linearly related. The Pearson correlation is also called the product-moment correlation coefficient (Christensen, Johnson and Turner, 2014, p. 396-397).

\(^{21}\) https://www.statisticssolutions.com/spearman-rank-correlation/
Instead of a linear relationship (as the case of Pearson correlation), the Spearman's correlation determines if a monotonic relationship exists between two variables. A monotonic relationship exists when the values of two variables in a dataset increase or decrease simultaneously (Sercovich and Teubal, 2008, p.3). As the value of one variable increases, so does the value of the other variable, depicting a positive correlation (ibid).

Also, Spearman’s rank correlation is not very sensitive to outliers. Outliers are extreme observations within a dataset that do not follow the common pattern in the dataset. The existence of outliers could be determined through the measures of dispersion above, including the standard deviation and the range (Dancey, Reidy and Rowe, 2012). Since Spearman’s correlation is not sensitive to outliers, a valid result could be obtained when used to determine the relationship between the CSF due to the highly dispersed dataset in the survey.

Through the Spearman’s rank correlation, a matrix table was created, and coefficients estimated to determine whether monotonic relationships exist among the CSFs. See Table 4.4 for the correlation coefficient of each CSF, their sample size, and significant values. The value of the correlation coefficient ‘r’ ranges from -1 to +1; the greater the value of ‘r,’ the stronger the relationship (ibid).

Conventionally, a Spearman rank correlation hypothesizes that there is no (monotonic) relationship between two variables [in a population] - the null hypothesis, while an alternative hypothesis posits that there is a (monotonic) relationship between two variables [in a population]. Thus, to estimate the Spearman rank correlation from the dataset, these hypotheses were assumed:
**H₀**: there is no (monotonic) relationship between the CSF (affordability; reduced uncertainty; regulatory flexibility; stakeholders’ interaction; regulatory stringency) in the target population.

**H₁**: There is a [monotonic] relationship between the CSF (affordability; reduced uncertainty; regulatory flexibility; stakeholders’ interaction; regulatory stringency) in the target population.

<table>
<thead>
<tr>
<th></th>
<th>Affordability</th>
<th>Uncertainty Reduction</th>
<th>Flexible regulatory Requirement</th>
<th>Stakeholders’ Interaction</th>
<th>Stringent Regulatory Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Affordability</td>
<td>1.000</td>
<td>.753**</td>
<td></td>
<td></td>
<td>.327*</td>
</tr>
<tr>
<td>2 Uncertainty Reduction</td>
<td>.753**</td>
<td>1.000</td>
<td>.706**</td>
<td>.683**</td>
<td>.327*</td>
</tr>
<tr>
<td>3 Flexible regulatory Requirement</td>
<td>.706**</td>
<td>.711**</td>
<td>1.000</td>
<td>.690**</td>
<td>.322*</td>
</tr>
<tr>
<td>4 Stakeholders’ Interaction</td>
<td>.683**</td>
<td>.643**</td>
<td>.690**</td>
<td>1.000</td>
<td>.262</td>
</tr>
<tr>
<td>5 Stringent Regulatory Requirement</td>
<td>.327*</td>
<td>.242</td>
<td>.322*</td>
<td>.262</td>
<td>1.000</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed); **. Correlation is significant at the 0.01 level (2-tailed).

a. Listwise N = 47

Following the conventional practice in hypothesis testing, a ‘p-value’ of 0.01 and 0.05 were applied to determine if the null hypothesis could be rejected or not.

4.6.1.1. Correlation: Affordability and the Reduction of Uncertainties

There was a significant strong positive correlation between the reduction of regulatory uncertainties and affordability (lower compliance cost), at $r = 0.753; p < 0.01$. The result implies that as regulatory uncertainty reduces, compliance costs most likely decrease. In support of these statistics, respondents explained that the acceptable solution in RBR had minimized delays in permit approvals. The enhanced approval process saved time and resources, which enabled stakeholders to channel their productive hours and resources to improving business processes and enhancing their competitiveness. Thus, the time savings translates to lower compliance cost.
Included in the reduction of regulatory uncertainty Likert-scale were inquiries about participants’ experience regarding the approval process for ‘alternative solutions.’ For each respondent, whose firm has employed an alternative solution, the researcher inquired if the application process for approval was timely (Likert-item33). If the information requested by the Ministry was reasonable (Likert-item34), and if the feedback they received was adequate (Likert-item35, see Appendix 4: Table 4.7). In item 33, 55% (18/33, EMPA) and 55% (7/12, EMPA & FRMA) respondents said it does not apply to their business, which implied that they did not use an alternative solution. Thus, the researcher focused the analysis on the remaining 45% (fifteen (15) EMPA; five (5) EMPA & FRMA) respondents from each category. In this subset, a higher percentage of the respondents replied positively that the application process was timely, reasonable information was requested with adequate feedback from the Ministry. The positive response from item33 was 83% (14/15) EMPA and 60% (3/5) EMPA & FRMA; for item34: 75% (9/12) EMPA and 60% (3/5) EMPA & FRMA, and for item 35: 75% (9/12) EMPA and 80% (4/5) EMPA & FRMA were all positive. These percentages show that the positive responses for ‘RBR alternative solutions’ outweighed the negative responses.

For the affordability Likert scale, most participants unanimously opined that the code had not saved their firms money. However, in Likert-item 24, most EMPA respondents (81%: 25/31) agreed that the Ministry is responsive to their firms’ needs.

When the positive responses from the affordability Likert-scale combine with the positive responses from the uncertainty Likert-scale, it was concluded that the Ministry was interested in enabling the firms to protect the environment effectively by reducing perceived regulatory delays that translates to savings, improved business processes and innovation.
Though 75% (9/11) EMPA & FRMA respondents did not agree that the Ministry is responsive to their firms’ need, when measured in aggregate, the positive responses outweighed the negative, depicting a positive likelihood that RBR fostered innovation. With a correlation coefficient of 0.753, where $p < 0.01$, the null hypothesis that there is no (monotonic) relationship between regulatory uncertainties and affordability (lower compliance cost) was rejected.

4.6.1.2. **Correlation: Stakeholders’ Interaction and Uncertainty Reduction**

There was a significant positive correlation between stakeholders’ interaction and the reduction of regulatory uncertainties, at $r = 0.643; p < 0.01$, which implies that stakeholders’ interaction most likely reduces uncertainties in regulatory requirements. This statistic justifies the findings regarding some remarkable steps the Ministry made in enhancing stakeholders’ interaction. First, during the code development, the Ministry engaged with stakeholders. Second, to enhance transparency, the Ministry noted that all information, data, test results, reports, returns, records and responses submitted to the Ministry will be accessible for review by the public, including non-governmental organizations and research organizations, except where an organization indicates that it is a proprietary information or trade secret (GOS, 2009a, p.2). Third, the Ministry engaged with the environmental associations to promote platforms where different stakeholders could voluntarily present their alternative solutions and risk management approaches to environmental protection. Fourth, the Ministry staff members provided adequate feedback when clarifications were sort. These steps were means of ensuring effective interaction amongst stakeholders, and they influenced some of the high ratings in the Likert-items.
However, in the process of enhancing effective communication, the Ministry launched a Saskatchewan Environmental Quality Guideline (SEQG) on the government website; stakeholders complained that it was difficult to navigate the guideline and requested for a more user-friendly guide. Also, stakeholders anticipated more communication; they acknowledged that the Ministry staff were apt at responding to enquiries; however, they anticipate the Ministry to send emails to them when key changes or additions are made on the code, in addition to effecting the changes on their website, in other to enable a more proactive communication.

In the balance of probability, the above results revealed that RBR has enhanced stakeholders’ interaction, which aided in reducing some level of uncertainties, though there are apparent areas of improvement. Thus, the mean for the reduction of uncertainties and stakeholders’ interaction was both 2.65, indicating a positive likelihood that RBR has fostered innovation and social learning. Also, the null hypothesis of no (monotonic) relationship between stakeholders’ interaction and regulatory uncertainties was rejected.

4.6.1.3. Correlation: Flexible Regulatory Requirements and Uncertainty Reduction

There was a significant strong positive correlation between flexible regulatory requirements and the reduction of regulatory uncertainties, at $r = 0.711; p < 0.01$. Given the statistics, one may conclude that flexible regulatory requirements most likely reduce regulatory uncertainties. In practice, this relationship requires an additional CSF to make it effective. From Table 4.4, a strong positive correlation between flexible regulatory requirements and stakeholders’ interaction confirms that an increase in stakeholders’
interaction is most inherent in a flexible regulatory regime, and stakeholders’ interaction reduces uncertainties in regulatory requirements. Thus, a positive monotonic correlation between flexible regulation and stakeholders’ interaction ($r = 0.960$) leads to a positive monotonic correlation between flexible regulatory requirements and the reduction of regulatory uncertainties ($r = 0.711$).

The trio relationship above is essential, because some firms may prefer prescriptive regulation since it gives precise details of how to protect the environment. However, when given flexible options, they look forward to interacting with other stakeholders in order to deliberate and clarify some areas that might be obscure to them. Thus, flexible regulatory requirements improve stakeholders’ interaction, and stakeholders’ interaction aids in reducing uncertainties; therefore, flexibility reduces uncertainties. Essentially, most of the CSF are best combined than in isolation. Given the above premise, the null hypothesis that there is no (monotonic) relationship between flexible regulatory requirements and the reduction of regulatory uncertainties was rejected.

**4.6.1.4. Correlation: Flexibility and Stakeholders’ Interaction**

There was a significant positive correlation between flexible regulatory requirements and stakeholders’ interaction, at $r = 0.69; p < 0.01$. This implies that flexible regulatory requirements most likely enhance stakeholders’ interaction. This finding is consistent with the tenet of RBR, for instance, during the introduction of RBR, the Ministry contacted over 138 stakeholders several times, including eighteen face to face meetings (GOS, 2009b).
This demonstrated a willingness to embrace change, imbibe flexibility and leverage on the use of sophisticated environmental science and technology (GOS, 2014a, p. 5).

However, after the implementation of the code, findings from this research revealed that the Ministry’s interaction with stakeholders was mainly through environmental associations such as SEIMA and the Saskatchewan Chambers of Commerce. Also, respondents desire more direct interactions with the regulator, as one of the few participants explained that the Ministry should “provide workshops for people to attend and learn about the code.”

Further to the interaction with stakeholders, the flexibility to use alternative solutions for environmental protection was made available to stakeholders. However, being a new development in Saskatchewan, some stakeholders expected more interaction, as this could aid in reducing some regulatory uncertainties and lower compliance costs.

The above illustration shows that stakeholders’ interaction was encouraged by RBR flexible regulatory requirements, and there was a statistically significant correlation at $r = 0.69; p < 0.01$. Thus, the null hypothesis that there is no (monotonic) relationship between regulatory stringency and affordability (lower compliance cost) was rejected.

4.6.1.5. Correlation Stringent Regulatory Requirements and Affordability

There was a significant positive weak correlation between regulatory stringency and affordability (lower compliance cost), at $r = 0.327; p < 0.05$. This result implies that adequate regulatory stringency may compel stakeholders to be more discrete in complying with RBR requirements, which may eventually reduce compliance costs. The correlation is
positive but weak because the financial benefits of regulatory stringency to a firm is most likely revealed in the long run.

When a further explanation was inquired regarding the stringency Likert-scale, some responses to the Likert-items in the scale were polarized while others followed a similar pattern. Some of the EMPA & FRMA respondents complained about the current monitoring and control procedure. They asserted that they were being monitored as if they are still on a prescriptive system, which may imply they prefer an alternative solution that is not closely monitored but is more results-based. Contrarily, some EMPA respondents preferred more acceptable solutions with detailed processes.

Despite the varying thoughts, most responses were uniformly positive because the questions comprised several aspects of stringency and compliance requirements that resonates with the respondents. For instance, Likert-item15 inquired if respondents have confidence in the use of QPs, while item16 asked if the use of QPs helps ensure regulatory compliance? This Likert-items received significant positive responses: 94% (30/32) EMPA and 55% EMPA & FRMA for item15, and 91% (29/32) EMPA and 73% (8/11) EMPA & FRMA for item16.

However, some concerns were raised about the cost of employing the service of a QP. The New Zealand experience of leaky buildings (May 2003) help to illustrate that the use of QPs might increase compliance cost in the short run, but in the long run, they may enable the organization to follow the due process at a cheaper rate, rather than to create unintended negative consequences. Thus, with a correlation coefficient of $r = 0.327$, and $p < 0.05$, it was concluded that adequate regulatory stringency has a significant moderate
monotonic relationship with affordability. Hence, the null hypothesis that there is no (monotonic) relationship between regulatory stringency and affordability was rejected.

The monotonic movement of the Likert scales (CSF) in similar directions increased the strength of their inter-connection in enabling RBR foster innovation and social learning. These findings provide evidence that aids in addressing the primary and secondary research questions, which will be discussed in specific terms in chapter six when the quantitative and qualitative results are converged.

4.7 Findings from the Open-ended questions

In addition to the Likert-items, the researcher made inquiries about some key issues that were not ranked in the survey; these items were removed from the SPSS dataset and analyzed in the NVivo software. They include (1) best practices for code improvement; (2) comparing the RBR in Saskatchewan to the environmental regulations in other jurisdictions; (3) compliance incentives.

4.7.1. Best Practice for Code improvement

For continuous improvement of the current and future codes, the researcher inquired about some possible recommendations that may support in mitigating any perceived RBR weakness. The feedback was grouped into four themes (See Appendix 4: Table 4.8). Also, participants provided relevant information that may inform the development of additional code chapters. However, a few of the suggestions require a more in-depth investigation. For instance, some EMPA respondents requested for more acceptable solutions (similar to prescriptive regulation), while a majority of the EMPA & FRMA respondents preferred the code to be less prescriptive and open to the idea that there are different ways to achieve the
desired results. Thus, an inquiry into specific code chapters requiring the amendments above and why they are necessary may inform future code development.

### 4.7.2 Comparing RBR to other Jurisdictions’ Regulations

The author asked the respondents to compare RBR with the regulations of other jurisdictions in Canada. Some respondents replied that they have not looked around or have not followed what other provinces are doing carefully. However, the researcher was able to gather some relevant points from thirteen (13) respondents. The responses were polarized: eight (8) respondents believed that implementing RBR positioned Saskatchewan as a pacesetter when compared to other provinces’ regulations, but five (5) participants complained that RBR is behind certain provinces. Below are some illustrative responses to this inquiry.

**Positive Perceptions:**

- *RBR in Saskatchewan appears to be more collaborative with the industry and balances economic activity with environmental outcomes.*
- *Reasonable. Staff are approachable to ensure priority can be placed on priority projects.*
- *Compares well - usually timely and with technical expertise and common sense.*
- *It is amongst the best. Alberta is fragmented; BC is a red tape monster; Manitoba is archaic; Ontario is convoluted.*

**Negative Perceptions:**

- *Convoluted compared to Alberta*
- *10 years behind Alberta, 20 behind BC*
- *We are lagging behind other jurisdictions. While some codes have reduced wait times, other permitting requirements have held or increased wait times.*

From the above responses, Saskatchewan received a higher positive response when compared to other jurisdictions in Canada; however, the sample may not be statistically representative due to the low response rate. Being a study that is focused on encouraging
continuous improvement, the negative perceptions may provide an opportunity for the Ministry to critically compare RBR with the regulations of other provinces to identify areas of improvement. It also provides an opportunity for increased stakeholders’ interaction within and outside Saskatchewan, with a core objective of enhancing environmental protection.

4.7.3. Incentives to Encourage Compliance

The incentives to encourage compliance addresses one of the central objectives of any regulatory framework. When aligned with this study, the researcher asked what incentives the Ministry could explore to encourage compliance within the RBR regime (secondary research question B)? Response to this question includes providing some financial benefits, timely feedbacks, increased stakeholders’ interaction, increased education and communication amongst others. Below are some illustrative responses:

i. **Increased education and communication:**
   - Use metrics, such as a list of company performance in groups/ranges of results (60-70, 71-80, 81-90, 91-100). Provide a # or % reduction that correlates to the performance metrics.

ii. **Strengthen stringent requirements:**
   - Compliance is compliance ... there have been years of effort to educate people about compliance and giving them breaks and teaching them what is acceptable and what isn’t... enough already. Deliberate and open defiance of the legislation and the code need to be dealt with. Quit holding industries hand, quit letting them make excuses for deliberate and open non-compliance and tell them that's okay, we understand.

iii. **Enhanced Flexibility:**
   - Look at actual impacts (big picture) instead of reacting after a perceived miss-step without following through and understanding if there was an impact on the big picture.
However, there seems to be a conflict between stringency and flexibility. Some EMPA & FRMA respondents suggest enhanced flexibility, while some EMPA respondents prefer more stringency. In response to these contradicting views, research has shown that leaving out some controls until the result is achieved may compromise the original intent of environmental protection. Hence, there is a need to temper the enthusiasm for results (flexibility) with constant vigilance (stringency) (see Coglianese & Nash, 2017; Cho, Laine, Roberts & Rodrigue, 2016; May 2003).

**4.8. Summary of Quantitative Findings**

In this chapter, the researcher conducted a Chi-square test, descriptive statistics, correlation coefficients and reviewed open-ended questions in the survey. The sample chi-square tests were statistically significant (section 4.4.2), and the descriptive statistics provided a positive likelihood that RBR has fostered innovation and social learning (section 4.5.2). Despite the acknowledgement innovation by some respondents, few respondents expressed concerns about some aspects of the code that require significant improvement (section 4.5.3i).

Next, a Spearman’s rank correlation coefficient revealed statistically significant monotonic relationships amongst all the CSF\(^2\). The monotonic movement of the CSF in a similar direction increased the strength of their inter-connection in enabling RBR foster innovation and social learning.

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\(^2\) except for a few instances with stringent regulatory requirements that were not statistically significant, which may have occurred by chance (see Table 4.11).
In summary, the overarching result estimated through a combination of the descriptive and inferential statistics, and the open-ended questions revealed a strong polarized perception. At one extreme, the respondents who understood RBR and have employed the regulation to their favour provided strong positive responses, while others disagreed and agreed to some Likert-items. However, the value of the modal score revealed a general acceptance level, which may have been skewed by the higher percentage of the EMPA. EMPA comprised 73% of the respondents and were more positive. The EMPA & FRMA respondents, on the other hand, had a common voice that anticipated more effective communication (to reduce regulatory uncertainties). In general, all the respondents anticipate the Ministry to engage more with the stakeholders proactively and to provide avenues for stakeholders to learn more about the code. They also look forward to the continuous improvement of the code.
Chapter Five: Qualitative Research Findings

5.1 Introduction

There is no specific technique for presenting the results of qualitative data. The technique adopted depends on the research objectives and the nature of the data collected (Guest, MacQueen & Namey, 2014). Fundamentally, each technique applied should be robust enough to describe trails of how the primary data were analyzed to enhance transparency (Hills, 2000; Sharts-Hopko, 2002). Amidst several techniques of presenting qualitative research findings, this thesis applied (1) a thematic network analysis (TNA), (2) complemented by theme frequency tables in reporting its research findings. This chapter commences by describing how the interview data were categorized (section 5.2) and interview responses assigned to themes (section 5.3). Next, the themes were explored (5.4) to create a thematic network (5.5), and a summary of the interview results (section 5.6).

5.2 Data Categorization

Having completed the interviews, the transcripts were categorized using three criteria. First, the researcher assessed the frequency of the interview responses that fit into the main themes (the CSFs) and observed patterns of negative and positive responses. The transcripts were then grouped into positive and negative responses. Some responses that were unrelated to the research phenomena were grouped as unclassified. Frechtling and Sharp (1997) recommend that responses that do not relate to the research objectives, however fascinating, should not be incorporated into the final report. Hence, the thesis focused on analyzing its findings based on classifiable responses. Second, the responses were grouped under each firms' affiliation to the legislation by using data extraction forms to record the frequency of
the positive or negative responses under each category of Legislation that governs the environmental activities of each participants’ firm. In total, twenty-two (22) participant transcripts were collated, from which eleven (11) participating firms’ environmental activities were governed by the EMPA only, three (3) were governed by FRMA only, and eight (8) were governed by EMPA & FRMA. Third, the participating firms were further categorized to determine participants who were company representatives or consultants. Categorizing the data aided in identifying some micro impacts within each category of stakeholders; however, to keep the anonymity of the participants, they were not further categorized. The categories are presented in Table 5.1

Table 5.1. Composition of Participants

<table>
<thead>
<tr>
<th>RBR Legislation/Type of Firm</th>
<th>Company</th>
<th>Consultant</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMPA</td>
<td>6</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>FRMA</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>EMPA &amp; FRMA</td>
<td>6</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>8</td>
<td>22</td>
</tr>
</tbody>
</table>

5.3. Assigning Responses to Themes

The transcripts were sorted in multiple ways repeatedly to uncover emerging patterns. Each response was assigned to related themes and subthemes. The themes were reviewed to ensure they were discrete (non-repetitive) in other to reduce the data into a precise set of significant themes that summarize the results (Attride-Sterling, 2001). At this juncture, a great deal of the researcher’s interpretative skills was applied; also, reflective notes about the patterns that emerged in the data were recorded. Extracts of how the transcripts were recorded under its corresponding theme and subtheme are shown in Appendix 5: Tables 5.1 and 5.2.
As the transcripts were interpreted, cross-referenced and grouped into themes, the perception shared by each participant was uncovered. In total, the researcher recorded five hundred and ten (510) responses from the transcript; 70% (358/510) were classified responses, and 30% (151/510) were unclassified responses. Following Frechtling and Sharp (1997), only the classified responses were interpreted and then used in constructing the thematic network.

5.4. Exploring the Thematic Network

Inferences from recent literature revealed a positive relationship between environmental regulations and firms’ innovation (Ramanathan et al., 2017; Weiss and Anisimova, 2018; Albrizio, Kozluk, and Zipperer 2017). Also, positive perceptions of public programs were found to correlate with social learning (Hurlbert, 2013). However, a few studies observed some negative perceptions of the regulation versus innovation relationship (Hoberg, Malkinson & Kozak, 2016). Also, there were instances where some private firms were reluctant to interact with other independent stakeholders (Axelsson et al., 2013). Drawing insights from previous perception studies (Ramanathan et al., 2017; Hoberg, Malkinson & Kozak, 2016), this study grouped its key findings from the interviews into subthemes of positive and negative perceptions.

Appendix 5: Tables 5.1 presents how the positive subthemes emerged and were assigned to research themes (CSF). They include; continuous improvement under the flexibility CSF, formal networks under stakeholders’ interaction, effective communication under reduction of regulatory uncertainty, low compliance cost under affordability and positive stringency under regulatory stringency. Appendix 5: Tables 5.2 presents how the negative subthemes
emerged. They include limited improvement due to flexible regulation, negative effects of stakeholders’ interaction, increased uncertainty, high compliance cost under affordability and some lax in stringency. Also, the relative influence of these perceptions on RBR legislations was calculated thus: the themes were first analyzed individually; next, a frequency of all the themes were tabulated, and their cumulative influence on RBR’s ability to foster innovation and social learning was estimated.

5.4.1. Theme 1: Affordability

In the context of this thesis, affordability describes how a regulatory framework may enable firms to comply with the regulation in a least-cost approach while maintaining a high environmental standard (GOS, 2009a). Affordability emerged as a priori theme from several studies but was often referred to as lower compliance cost (Hoberg, Malkinson & Kozak, 2016, p. 4; Porter and van der Linde, 1995). Affordability was also cited as one of the guiding principles of RBR (Wittrup and Murphy, 2012, p. 3).

Given the relevance of ‘affordability’ in exiting literature, its inclusion as RBR guiding principle, and it’s significance in firms’ compliance decision; it became essential to inquire if RBR has enabled firms to achieve regulatory outcomes affordably (Kitching, Hart & Wilson, 2015; Hoberg, Malkinson & Kozak, 2016). Thus, the researcher asked each participant if there were any economic benefit of RBR to their firms, and if the code saved their organization money (Table 5.2, item 7 and item 7i)?

5.4.1.1. Describing Table 5.2.

From Table 5.2, Column (a and b) represents the items from the interview guide. Column (c) shows the dominant subtheme from responses assigned to each theme. Columns
(d), (e) and (f) show the number of participant responses under each RBR legislation that governs their firms’ environmental activities. Finally, column (g) summarizes the cumulative responses of each theme. This structure is similar in all the theme frequency tables in chapter five.

Table 5.2 Theme Frequency Table Responses under Affordability

<table>
<thead>
<tr>
<th>(a) Item</th>
<th>(b) Questions from Interview Guide</th>
<th>(c) Dominant subtheme</th>
<th>(d) EMPA Total=11</th>
<th>(e) FRMA Total=3</th>
<th>(f) EMPA &amp; FRMA Total=8</th>
<th>(g) All Responses Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Is there any economic benefit of the regulatory reform to your business?</td>
<td>Affordability-low compliance cost</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>7i</td>
<td>Does the code save your organization money?</td>
<td>Affordability-low compliance cost</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Total responses under affordability</td>
<td></td>
<td>8</td>
<td>3</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Percentage of total classified Response under Affordability</td>
<td></td>
<td>69%</td>
<td>31%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.2 shows that the two items (7 and 7i) received 29 classified responses, out of which four (4) participants responded that there were no current economic benefits (item 7, column g), and five (5) responded that the code does not save them money (item 7i, column g). On the contrary, twenty (20) participants provided positive responses to the two questions. These divergent views gave rise to two Subthemes under affordability: the high cost of compliance (negative perception) and low cost of compliance (positive perception).

5.4.1.2. Subtheme 1a: High Cost of Compliance – Negative Perception

From Table 5.2, 31% of participants replied that RBR does not proffer current economic benefits (item 7), and it does not save their organization money (item 7i). Below is an illustrative response from participants (p7) who said that RBR increased his company’s compliance cost:
“Previously, we were not required to do ambient air quality monitoring, but under the code, the Ministry asked us to demonstrate that we are in compliance. We are part of an air zone association where compliance is demonstrated, but under the code, we had to initiate our monitoring, which will cost us money. As part of seeking approval, we employ consultants to prepare the documents. Also, the cost of time lost is significant.”

A company’s representative provided the above feedback. Contrarily, consultants believe it saves their clients (companies) money. Within the same subtheme under affordability, two consultants (p5 and p6) responded that “RBR may lose consultants some money because they require less time to provide the services to the clients. It saves our clients some money because they know what they need to get the job done...”

The negative responses under affordability are consistent with some evidence from British Columbia (BC) in a study that assessed the behavioural responses of foresters regarding the impact of RBR in BC. The authors (Hoberg, Malkinson, Kozak, 2016) reviewed the first 65 Forest Stewardship Plan (FSP) approved by the BC government as of March 2007, and also interviewed the foresters. They found that the foresters in BC complained of increased compliance costs due to the requirement to employ and pay professionals (ibid p.5).

A critical assessment of these findings (both in Saskatchewan and BC) revealed the possibility of increased compliance cost in the short run, but a reduction of compliance cost in the long run because in the short run companies may pay consultants more in other to meet the requirements of proving their ‘alternative solutions.’ Thus, in the short run, the company spends more, and the consultants might earn more. However, in the long run, with proven methods, the company may not be required to pay extra sums to consultants. In such a case, the consultants’ assertion of RBR saving their clients’ money becomes true. However, one of the main objectives of RBR is to encourage the use of sophisticated
science and technology for environmental protection (GOS, 2014a, p.5). Adopting sophisticated science and technology may encourage consultants to advance novelty; the companies, in turn, may need consulting services to ensure that the alternative solutions proffered always conform with the regulatory requirements. This process is essential because not following due diligence may result in huge negative consequences to the company, and the economy at large, which may exceed the amount payable to consultants (see the New Zealand Leaky Building saga article by May (2003)).

5.4.1.3. Subtheme 1b: Low Cost of Compliance

Table 5.2 represents 69% (20/29) positive perspectives that emerged from the affordability theme (see column g). The positive responses posit that RBR proffers current economic benefits and saves their organization money. Three important influencing factors emerged in this subtheme, which includes time savings, clarity in regulatory requirements, and the ability to choose alternatives. Below are some illustrative quotes about the affordability features of RBR:

P1 - Quick turnaround time for permitting. P6 - There is an economic benefit because companies don’t feel threatened by the ambiguity of the regulation and if approvals take less time. P20 - Yes, the alternative ways of doing things saved us money. P21 - The regeneration survey we now do by air. Another company is proposing the use of drones to do a similar thing, where you take samples and don’t have to measure 100% of the area. Thus, it can save you money.

From the above statements, the productive hours saved were accredited to the reduction in approval time when RBR was implemented, especially for the ‘acceptable solution.’ Delays in the approval process was a significant setback pointed by stakeholders.
before RBR was implemented (Wittrup and Murphy, 2012). In response, the Ministry reduced some administrative bureaucracies to shorten approval time (GOS, 2014a, p5).

Under the prescriptive process, the regulatory requirements were being interpreted by different environmental protection officers (see GOS, 2014a: 2014b; GOS, 2009a). Contrarily, participants acknowledged that RBR provides a more consistent approach because it documents guidelines required for the acceptable solutions in the code. Thus, consistent guidelines saved clients' productive time, which translated to save money. In summary, positive perceptions outweighed the negatives.

5.4.1.4. The Relative Influence of the Perception of Compliance Cost on RBR Legislations

To assess the relative influence of participants’ perceptions on how they could affordably comply with RBR, the researcher applied a relative influence scale (RIS). By applying the RIS (section 3.5.3.1), it was interpreted that 73% of the responses on affordability represented a positive high relative influence on RBR’s ability to foster firms’ innovation activities under EMPA; 100% responses represented a maximum positive relative influence on RBR’s ability to foster firms’ innovation activities under FRMA. Finally, 57% of the responses on affordability represented a positive low relative influence on RBR’s ability to foster firms’ innovation activities under EMPA & FRMA (see Appendix 5: Table 5.3).

5.4.2. Theme 2: Reduced Uncertainties in Regulatory Requirements

Uncertainty reduction was contextualized as the ability of a regulation to reduce the risks of financial losses from investments on environmental protection projects (Porter and van der Linde, 1995, p. 113). Both the government and firms suffer some financial setbacks
associated with uncertainties. Wittrup and Murphy (2012) reported that approximately $12 million was estimated as an annual loss to the Saskatchewan government from an internal provincial study in 2005. The financial loss was attributed to missed opportunities due to regulatory delays (ibid, p.2). Uncertainties induced by prescriptive regulations was one of the reasons for the reform to RBR; thus, the researcher inquired if RBR has reduced regulatory uncertainties. See the questions in Table 5.3.

**Table 5.3. Theme Frequency Table - Responses under Uncertainty Reduction**

<table>
<thead>
<tr>
<th>(a) Item</th>
<th>(b) Questions from Interview Guide</th>
<th>(c) Dominant subtheme</th>
<th>(d) EMPA</th>
<th>(e) FRMA</th>
<th>(f) Both</th>
<th>(g) All Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total=11</td>
<td>Total=3</td>
<td>Total=8</td>
<td>Cumulative</td>
</tr>
<tr>
<td>4</td>
<td>Do you believe the Ministry communicates its code requirements effectively?</td>
<td>Uncertainty reduced-effective communication</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>4iii</td>
<td>Are you informed of code updates in a timely fashion?</td>
<td>Uncertainty reduced-effective communication</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>13</td>
<td>5</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Total number of responses (items 4 plus 4iii)</td>
<td></td>
<td></td>
<td>18</td>
<td>2</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Cumulative percentage of 'P &amp; N' for each legislation from columns d, e &amp; f</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Keys: P=Positive Perception; N= Negative Perception; C= Classified responses; Unc= Unclassified response.

In total, thirty-three (33) responses were collated from the two items, of which seven (7) were negative, and 26 were positive perceptions. The theme was divided into two subthemes described below.

5.4.2.1. **Subtheme 2a: Reducing Uncertainties in the RBR Through Effective Communication – Positive Perception**

Table 5.3 shows that most of the participants gave positive perceptions regarding effective communication. For instance, participants said the Ministry staff were good at returning calls and emails. Also, their responses revealed the use of multiple communication channels. Below are some illustrative quotes from participants:

*P1*: “*When the code was initiated, there was a great outreach. In developing the code, the development group involved a large cross-section of those involved in using the code.*”
P3: “In areas of code amendment, they have done a good job of communicating with the industry. We have a key role in the development and implementation of the code.”

Furthermore, it was discovered that the Saskatchewan Environmental Industry Manager’s Association (SEIMA) acts as a communication branch for the Ministry and provides regular updates to SEIMA members. However, there were some negative perceptions, as well.

5.4.2.2. Subtheme 2b: Ineffective Communication Induces Uncertainty in RBR – Negative Perception

There were five negative responses to regarding effective communication mechanism, of which three participants legislated by EMPA, and two legislated by EMPA & FRMA. When the code was being initiated, the Ministry reached out to stakeholders; however, a few participants said that effective communication declined at the implementation stage, as expressed below:

P7: “Sometimes we miss things; we are not included where we need to be.”
P21: “I can find information on their website because I know where to go. However, some requirements come in the form of correspondence of directives from individual government staff members, rather than as part of code or standard, which makes me wonder about the process of making new standards. For example, there was a recent new requirement for companies to put up kilometre marker signs along the road, every two kilometres during active wood hauling operations, for safety reasons. This was said to be a provincial requirement but was not proposed or vetted through any provincial standard or code...”

In general, the researcher observed that negative perceptions were fewer than the positive perceptions, and the regulator reached out to the firms through five different media, demonstrating an increasing effort to enhance effective communication. Despite the Ministry’s effort to enhance communication, the concerns raised by participants regarding communication provided an opportunity to assess the feedback process through a learning-loop concept. The concept of a learning loop describes the feedback loops in a communication and learning process. Loop learning ranges from zero, single, double to
triple-loop learning (Hurlbert and Gupta, 2015; Armitage et al., 2008).

From items ‘4 and 4ii’ (Table 5.3), a few of the negative responses revealed that information was passed on to stakeholders and learning may have occurred. Given stakeholders’ concern despite the relayed information, it suffices to say that the learning that took place may have been centred around a single loop. A single learning loop is concerned with incremental changes and improvement in existing routines (Hurlbert and Gupta, 2015). Single-loop learning is becoming obsolete as contemporary stakeholders become increasingly more aware of their environment. Thus, they desire an extension of the learning process to double-loop learning\textsuperscript{23} where social learning occurs and aids in reducing the uncertainties in regulatory requirements.

5.4.2.3. The Relative Influence of Participants Perceptions on the Reduction of Uncertainties in RBR

To assess the relative influence of participants’ perceptions on the reduction of uncertainty induced by RBR, the researcher applied a relative influence scale (RIS). The RIS was expressed as follows: 72% of the responses under the theme of uncertainty reduction represented a positive high relative influence on RBR’s ability to foster firms’ innovation activities under EMPA; 100% responses represented a maximum positive relative influence on RBR’s ability to foster firms’ innovation activities under FRMA. Also, 85% of the responses represented a positive higher relative influence on RBR’s ability to foster firms’ innovation activities under EMPA & FRMA (Appendix 5: Table 5.4).

\textsuperscript{23} In the RBR framework, double-loop learning may occur within the alternative solution segment of the regulation, where firms can proffer customized solutions towards solving a complex environmental problem. Double-loop learning is needed where there is scientific certainty but no consensus on the relevant norms and values, or where there is some scientific uncertainty, but no consensus on the norms to addressing the problem (Hurlbert and Gupta, 2015, p. 103).
5.4.3. Theme 3: Flexibility

A significant objective of testing for flexibility was to determine if stakeholders were utilizing the option of ‘alternative solutions’ in RBR. The choice of an alternative solution may propel process re-engineering and continuous improvement. Simultaneously, it may translate to some innovation activities, and possibly enhance social learning if firms interact with other firms. Thus, the researcher asked the participants five questions on regulatory flexibility. Table 5.4 illustrates the findings under this theme.

Table 5.4 Theme Frequency Table - Responses under Regulatory Flexibility

<table>
<thead>
<tr>
<th>(a) Item</th>
<th>(b) Questions from Interview Guide</th>
<th>(c) Dominant subtheme</th>
<th>(d) EMPA</th>
<th>(e) FRMA</th>
<th>(f) Both</th>
<th>(g) All Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>What kind of improvement have you seen as a result of RBR?</td>
<td>Flexibility-Continuous Improvement</td>
<td>3 4 2 0 6 2</td>
<td>11 6 17 5 22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2ii</td>
<td>Can you tell me what innovation you see that was fostered by the RBR?</td>
<td>Flexibility-Continuous Improvement</td>
<td>3 4 2 0 5 2</td>
<td>10 6 16 6 22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Do you prefer alternative solutions?</td>
<td>Flexibility-Continuous Improvement</td>
<td>3 3 2 1 2 2</td>
<td>7 6 13 9 22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3ii</td>
<td>Have you used an alternative solution when carrying out environmental activities</td>
<td>Flexibility-Continuous Improvement</td>
<td>7 0 2 0 4 3</td>
<td>13 3 16 6 22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Since RBR was implemented, have you made any suggestions for its improvement to the Ministry</td>
<td>Flexibility-Continuous Improvement</td>
<td>6 2 2 0 7 1</td>
<td>15 3 18 4 22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total of all items</td>
<td></td>
<td></td>
<td>22 13 10 1 24 10</td>
<td>56 24 80 30 110</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number of responses (items 2, 2ii, 3, 3ii, 12)</td>
<td></td>
<td></td>
<td>35 11 34</td>
<td>70% 30%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Keys: P=Positive Perception; N= Negative Perception; C=Classified responses; Unc= Unclassified response

In total, eighty (80) responses were collated from the five items, of which twenty-four (24) were negative while fifty-six (56) were positive perceptions towards flexible regulatory requirements. The findings were divided into two subthemes described below.
5.4.3.1. Subtheme 3a: Flexible Regulatory Requirements Enhance Continuous Improvement

Most of the participants responded that they had seen improvements, which may lead to innovation in their environmental protection activities. They explained that the permitting process has become more efficient, with improved timelines, improved online processes and clearer guidelines. These positive responses depict some remarkable improvement within the first phase of deploying the RBR.

When the inquiry was narrowed to specific innovation induced by RBR, the researcher received fewer responses. This was still remarkable for the first phase of implementing a reformed regulation. Below are some examples of innovation activities:

**P2:** The move from physical removal of contaminated sites to focus on using science on contaminated sites.

**P9:** Alternative Solutions, such as leaving the soil on the ground. We used to do a lot of remediation, now we do some risk assessment, examining the risk that leads it there, such that we can save a lot of money.

**P10:** Yes, we are getting a face closure without going through the phase of digging and dumping, not disturbing the environment when it is not necessary. Especially for hydrocarbon. We have been working on a crash site that happened in Northern SK. We got acceptance from the Ministry on getting a closure.

**P21:** We used to do regeneration surveys on harvested areas by going to the field to manually measure trees and record the data. We can now assess regenerating forest areas using aerial surveys instead. An aircraft (plane) flies over regeneration forest areas taking high-resolution photographs. Back at the office, those photos are looked at on computers in 3D, and software tools are used to measure the heights and densities of trees. The aerial method allows us to assess the regeneration of forest areas that we can’t get to by road (such as areas across swamps that were harvested in the winter when the ground was frozen). This solves some of the operational/logistical problems encountered when carrying out ground-based surveys.

In one of the notable responses, a consultant proposed an alternative solution but was turned down by a client. On completion of the project, the client paid higher than it would
have been if the proposed alternative solution was used. This event unveiled the need for increased stakeholders’ interaction involving consultants and companies alike. Increased stakeholders’ interaction may enhance double-loop learning (section 2.5.2 and 5.4.2.2).

In another instance, one of the participants from a company said all their environmental protection activities were done by QPs (consultants), and they rely on their expertise and knowledge on RBR. However, they had a site which they were considering for divestment but did not know if proposing an alternative solution will affect the property sale. Filling the gap of ‘not knowing’ may involve an increased interaction with other stakeholders to increase firms’ knowledge regarding alternative solutions.

Furthermore, some participants explained that the flexibility required in RBR allowed them to decide and apply some least-cost options. In summary, the above positive responses provided evidence that stakeholders are utilizing the alternative solutions in RBR, and that flexibility is a CSF that may enable RBR to foster innovation. Despite the positive response, some participants believed that flexible requirements increased regulatory uncertainties.

5.4.3.2. Subtheme 3b: Regulatory Flexibility Limits Continuous Improvement – Negative Perceptions

Some participants responded that they had not seen any improvement, which invariably means no innovation in response to inquiries about flexible regulatory requirements. When asked if they prefer acceptable or alternative solutions (item 3), one of the participants under EMPA responded in favour of acceptable solutions. He explained that: "Acceptable solution is very straight forward and minimizes the wait time for approval but as soon as you try to do any alternative solution because there is no clear guide on how and what to do, it takes a lot of time for us to do what may not even satisfy the Ministry."
“They put a few rules in place, but minimal guidance. I don’t attempt to do it because it is too open (p15).”

The response of ‘p15’ contrasted with the perception of ‘p20 and p21,’ who explained that the alternative solution was economically beneficial to them in section 5.4.1.3. The contrasting view prompted the researcher to re-examine the category of these participants. It was found that ‘p20 and p21’ were solely legislated under FRMA, and p15 was legislated under EMPA. The EMPA participant worked on contaminated sites. In a similar tone, another EMPA participant (p16) who worked on contaminated sites raised concerns about uncertainties due to some vagueness in the guidelines for contaminated sites. Participant ‘p15’ further explained that they have used an alternative solution (item 3) but prefer an acceptable solution (item 3ii) due to the approval timeframe. However, another participant (p3) whose firm was legislated by EMPA & FRMA was in favour of the alternative solutions. He perceives that the acceptable solution was too prescriptive - "We have proposed alternative solutions, sometimes the acceptable solution is a bit too prescriptive, which is not the intent of RBR."

The varying response from p15 and p3 provided an opportunity to evaluate how to address the uncertainty gap relating to the approval process on specific projects such as contaminated sites. One of the participants under EMPA who complained about the approval process for contaminated sites (p10), explained that the province of British Columbia (BC) has Contaminated Sited Approved Professionals (CSAP). The CSAP provides a comprehensive review of how risks may be mitigated.

The findings under flexible regulatory requirements imply that a flexible regulation that encourages stakeholders’ interaction through formal networks may aid in reducing the
uncertainties that are perceived in the approval process of contaminated sites. Cues may be drawn from Hurlbert (2013). She found that rural farmers in Saskatchewan were able to decipher solutions relating to a wicked problem of drought in their farmlands through consistent interactions. Also, they solicited for government funds to expedite an adaption and mitigation process.

**5.4.3.3. The Relative Influence of the Perception of Flexible Regulatory Requirements on RBR Legislations**

The issues regarding contaminated sites were evaluated with the CSFs, and some recommendations were proffered. When RIS was applied (see section 3.5.3.1), the researcher observed that 63% of the responses to flexible requirements in RBR represented a positive medium relative influence on RBR’s ability to foster firms’ innovation activities under EMPA, and 91% responses represented a positive maximum relative influence on RBR’s ability to foster firms’ innovation activities under FRMA. Finally, 71% of the responses to flexible requirements in RBR represented a positive high relative influence on RBR’s ability to foster firms’ innovation activities under EMPA & FRMA.

**5.4.4. Theme 4: Stakeholders’ Interaction**

Continuous interaction amongst independent stakeholders produces useful information that may enable government to make changes or improve the way of implementing the regulation/programs accordingly (Hurlbert 2013, p.12). These changes may improve firms’ processes in protecting the environment and enhance business competitiveness (Porter and
van der Linde, 1995). Also, learning about new concepts in the industry may influence how government tailors the direction of innovation through the regulation.

Given its relevance, the researcher inquired if RBR has fostered stakeholders’ interaction in Saskatchewan (see Table 5.5: items 3iii, 6, 6i and 18). Findings from this theme provided insights that aided in addressing the primary research question of what ways the RBR has fostered social learning in Saskatchewan since its implementation in 2015. This section provided suggestions on the factors that may enhance social learning (secondary questions c). It also suggested possible ways of improving the RBR to build more capacity for social learning (secondary questions d).

Table 5.5 Theme Frequency Table - Responses on Stakeholders’ Interaction

<table>
<thead>
<tr>
<th>(a) Item</th>
<th>(b) Questions from Interview Guide</th>
<th>(c) Dominant subtheme</th>
<th>(d) EMPA</th>
<th>(e) FRMA</th>
<th>(f) Both</th>
<th>(g) All Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total=11</td>
<td>Total=3</td>
<td>Total=8</td>
<td>Cumulative</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>P</td>
<td>N</td>
<td>P</td>
<td>N</td>
</tr>
<tr>
<td>3iii</td>
<td>If you have used alternative solutions, would you be willing to share how you developed your alternative solutions with other companies?</td>
<td>Stakeholders interaction-formal network</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Have you attended any seminar(s) that discuss several ways of managing environmental resources?</td>
<td>Stakeholders interaction-formal network</td>
<td>10</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6i</td>
<td>Is any of the seminars related to the Saskatchewan Environmental Code/RBR?</td>
<td>Stakeholders interaction-formal network</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>Does RBR foster social learning?</td>
<td></td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>26</td>
<td>7</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Total number of responses (items: 3iii, 6,6i, 18)</td>
<td></td>
<td>33</td>
<td>9</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cumulative percentage of 'P &amp; N' for each legislation from columns d, e &amp; f</td>
<td></td>
<td>83%</td>
<td>17%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Keys: P=Positive Perception; N= Negative Perception; C=Classified responses; Unc= Unclassified response.

From Table 5.5, sixty-five (65) responses were collated from four questions, of which 83% (54/65) were positive, and eleven 17% (11/65) were negative perceptions.
5.4.4.1. Subtheme 4a: Positive Effects of Stakeholder’s Interaction

The researcher asked participants if they would be willing to share how they developed their alternative solutions with other companies (item 3iii, Table 5.5). This item was a follow-up question for items 3 and 3ii from Table 5.3 that inquired if participants preferred and have used acceptable or alteration solutions under the flexibility theme. Some participants responded that they had used alternative solutions. A follow-up question (item 3iii, Table 5.5) was asked to test for social learning. In response, only thirteen participants indicated that their firms had used alternative solutions, and 92% (12/13) participants said they were willing to share their experiences. Also, 46% (6/13) participants said they have already shared it at the SEIMA.

Contrarily, evidence from some jurisdictions reported stakeholders’ reluctance to formal interactions (Axelsson et al., 2013; Paraskevopoulou, 2012). The prior studies may have biased the researcher to believe there might be a high level of unwillingness for stakeholders to interact formally in Saskatchewan. Thus, the researcher reiterated the same question in items 6 and 6i (about stakeholders’ interaction) after branching off to inquire about uncertainties in regulatory requirements (see interview guide, Appendix 3.4). This was systematically done to be reassured of the responses regarding independent stakeholders’ interaction. Thus, in item 6, the researcher asked if the participants have attended seminars regarding environmental protection? Nineteen (19) participants responded, and 95% (18/19) were in the affirmative. Also, some of the participants belong to more than one environmental association. Next, the researcher narrowed the inquiry to know if any of the seminars were related to the RBR? Nineteen participants responded, and 84% (16/19) said yes. Below are some responses:
P6, P9, P11: Yes, we have given a talk on it in a conference
P7: Yes. Worked on Wildfire plan. When we develop one, we are happy to share. It’s about complying with the legislation
P21: Yes, we described this alternative solution in a general way without giving away any competitive or trade secrets. The company is open to sharing the idea in general terms (e.g. It has to be high-resolution photos of XX quality). We shared the specifications, rather than exactly how to do the surveys.

Amidst the high level of stakeholders’ interactions, Saskatchewan firms were still conscious of maintaining confidentiality and not lax at giving away trade secrets. For instance, one of the participants explained how they presented their alternative solution but was cautious about sharing applied knowledge and not their competitive advantage.

However, there were some hesitations when the researcher asked if the participants believed that RBR had fostered social learning (item 18). Most of the participants requested to understand how social learning was being contextualized. Thus, the researcher described social learning as “a change in perception (an advancement in knowledge) that occurs through an interactive process when experiences and values are shared among independent stakeholders.”

At this juncture, participation dropped to fifteen (15), and nine (9) participants were in the affirmative. Intuitively, some elements of social learning were already observed in participants’ positive responses about formal networking and knowledge sharing in their environmental associations. Also, the researcher wanted to know if participants believed and understood that social learning was taking place. In response, some stakeholders said they had shared and are willing to share information about risk assessment. The researcher observed that several participants had a kin interest in RBR when it was introduced, while they mentioned that social learning might occur amongst larger firms that are familiar with the code, but smaller firms still require some guidance.
5.4.4.1i. Barriers to Social Learning – Participants Responses

In addition to inquiring if RBR has fostered social learning, the researcher asked a follow-up question to know the possible limitations that could prevent social learning. This item (18i) was not classified under positive or negative perception but was necessary to advance knowledge. Some key factors identified were communication gaps, trust and individual perceptions as follows:

P5 - If they have got better communication to the outside world. Use social media to communicate more on what RBR is and what difference it's making for SK. It has the potential to do it, but I do not think it is there yet. P6 - It could stop social learning if the trust is not there anymore. The Ministry should be out talking about the effectiveness of the process and make the public know they are monitoring.

In summary, the positive responses on stakeholders’ interaction provided some evidence that some stakeholders are utilizing the option of alternative solutions in the RBR, which might foster innovation. Despite the remarkable positive responses, a few participants disagreed with knowledge sharing through stakeholders’ interaction.

5.4.4.2. Subtheme 4b: Negative Effects of Stakeholder’s Interaction

A few participants believed that sharing knowledge through stakeholders’ interaction might increase free riding. When asked if participants were willing to share how they developed their alternative solutions (item 3iii, Table 5.5), one participant said no, that it is the firms’ competitive advantage. Ironically, the participant is a member of SEIMA and had attended seminars related to the RBR.

When asked if RBR has fostered social learning (item 18), 40% (6/15) participants said no, explaining that the exchange of information was not enough to foster social learning. There was a significant negative response to item 18, contrary to the 92% (12/13)
who said they were willing to share how they developed their alternative solutions, and a few of them had already shared the information (section 5.4.4.1).

Despite the lack of understanding that social learning might occur or have been occurring in formal networks, stakeholders’ interaction recorded an 83% high positive and 17% negative perception when the frequency in each item (3iii, 6, 6i and 18) were accumulated.

5.4.4.3. The Relative Influence of the Perception of Stakeholders’ Interaction on the RBR Legislations

Through the RIS, 79% of the responses to the theme of stakeholders’ interaction was found to represent a positive high relative influence on RBR’s ability to foster firms’ innovation activities under EMPA; 56% of the responses represented a positive low relative influence under FRMA. Finally, 96% of the responses to the theme of stakeholders’ interaction represent a positive maximum relative influence on RBR’s ability to foster firms’ innovation activities under EMPA and FRMA (see Appendix 5: Table 4.5).

5.4.5. Theme 5: Stringency

There is a polarized thought about stringent regulatory requirements. On the one hand, there is evidence that strict regulations with detailed processes restrict firms’ environmental investment decisions and could retard firms’ decisions to commercialize products into the market (Wittrup and Murphy, 2012). On the other hand, if regulations become flexible and minimize strict monitoring, some firms may take advantage of the relaxed stringency (Coglianese & Nash, 2017).

To create a balance between stringent and flexible regulatory requirements, Porter and van der Linde (1995) demonstrated that mandatory regulatory requirements might compel firms to discover cost-efficient solutions that enhance compliance. Also, while complying with environmental regulations, firms’ production processes may improve, and the quality
of their products may increase simultaneously, leading to process and product innovation (ibid). Thus, the combination of strict regulatory requirements combined with firms’ ability to proffer their compliance processes is made possible in a flexible but stringent regulation (ibid; Coglianese & Nash, 2017). Over time, the benefits from complying with strict regulatory requirements may offset the cost of compliance, stimulate innovation and enable firms to remain competitive (ibid).

Given the inference from previous studies, the researcher inquired about the presence and effect of stringent requirements in RBR through probing questions (see Table 5.6).

Table 5.6. Theme Frequency Table: Stringent Regulatory Requirements

<table>
<thead>
<tr>
<th>(a) Item</th>
<th>(b) Questions from Interview Guide</th>
<th>(c) Dominant subtheme</th>
<th>(d) EMPA</th>
<th>(e) FRMA</th>
<th>(f) Both</th>
<th>(g) All Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total=11</td>
<td>Total=3</td>
<td>Total=8</td>
<td>Cumulative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>N</td>
<td>P</td>
<td>N</td>
<td>P</td>
<td>N</td>
<td>C</td>
</tr>
<tr>
<td>14</td>
<td>Do you believe that compliance with the code is being monitored by the ministry with an appropriate frequency and level of detail?</td>
<td>Stringency-positive</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>15i</td>
<td>Do you think non-compliance issues are handled in a fair and timely manner?</td>
<td>Stringency-positive</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>Do you feel the RBR model makes you more accountable than the prescriptive model?</td>
<td>Stringency-positive</td>
<td>10</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>What do you think about the use of a Qualified Person?</td>
<td>Stringency-positive</td>
<td>9</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>10i</td>
<td>How do you see your role as a qualified person (QP), and do you feel it improves environmental protection?</td>
<td>Stringency-positive</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>Qualified persons only: What does it mean to you to certify an alternative solution?</td>
<td>Stringency-positive</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>11i</td>
<td>Is the 3-year license renewal adequate or be reviewed?</td>
<td>Stringency-positive</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total number of responses (items:14, 15 &amp; 15i, 9,10i,11,11i)</td>
<td>34</td>
<td>6</td>
<td>9</td>
<td>1</td>
<td>28</td>
<td>3</td>
</tr>
<tr>
<td>Cumulative percentage of ‘P &amp; N’ for each legislation from columns d, e &amp; f</td>
<td>88%</td>
<td>12%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Keys: P=Positive Perception; N= Negative Perception; C=Classified responses; Unc= Unclassified response,
5.4.5.1. Subtheme 5a: Positive Effects of Stringent Regulatory Requirements

The stringency theme comprises of perceptions regarding compliance and the active roles that QPs play in the compliance process (see table 5.6). Responses to items 8 and 9 depicted how the compulsory requirement for a QP to certify an alternative solution increased firms’ accountability in Saskatchewan. There was a consensus that active QP participation puts more reliant on the professionals to prepare the Environmental Protection Plan (EPP). Also, it gives room for an auditable process and increases stakeholders’ accountability.

In item 14, the researcher inquired if participants believed that the Ministry monitored code compliance with an appropriate frequency and level of detail? In their response, participants recognized that the Ministry’s auditing process has improved, and how the Ministry allows firms to conduct their Corrective Action Plans (CAP).

In terms of accountability, participants acknowledged their stewardship to the environment with 89% (16/18) positive response (item 8). Also, some participants responded that they have always been accountable. They asserted that their accountability to the environment did not change when they moved from a prescriptive regulation to RBR, but the process of achieving the regulatory requirements changed.

For items on QP participation, when asked how firms perceive the mandatory use of QPs to certify their alternative solutions, all participants who responded were on the affirmative. The general feedback on ‘item 9 aligns with participants’ response on item 8 (Table 5.6), revealing their allegiance to environmental stewardship, accountability and prudence. Some illustrative comments regarding the inclusion of QPs include:
p2- Excellent. It should have been done back 25 years ago. The use of unqualified persons has cost us millions. Without knowing, we hired unqualified persons, and it cost us millions. p11- It’s a good thing because of the accountability factor, but it puts more pressure on you to recommend the right steps moving forward.

The participants who are QPs believe their involvement in certifying alternative solutions advance environmental science and technology (items 10i;11;11i). They highlighted the importance of having a back stub where the alternative solution they propose does not work well. Also, they expressed a high level of responsibility through the certification they make regarding alternative solutions. In item 11i, QPs agreed to the requirement for regular professional development. Most QPs are Engineers. Participants who are not engineers were not satisfied with Engineers being offered a blanket approval to become QPs, while other scientists submit applications to become QPs. This issue unveiled the need for increased stakeholders’ interaction to clarify the grey areas amongst QPs and provide opportunities to collectively deliberate on possible areas of improvement.

5.4.5.2. Subtheme 5b: Negative Effects of Stringent Regulatory Requirements

Most perception about active QPs’ involvement was mainly positive, except for a few participants who said the decision of who should be a QP should not be made by the government. They suggested that there should be a committee to make the decision. Also, they complained that a QP’s decision might be overruled by a regulator who may be less qualified.

In terms of timeliness (item 15i), participants observed some delays from the Ministry’s EPOs due to staff shortage. They were concerned that the delay costs them money. One participant explained that “For the Landfill, we have 3 or 4 EPOs which is not enough, given the amount of Landfill we accumulate. They need to increase their human
Also, participants who experienced non-compliant issues responded that non-compliance was handled timely but unfairly (item 15i). They believed that the effect of stringent regulations distorted the decision to commercialize their products/services.

In general, the cumulative positive perception of stringent regulatory requirements was 88%. This high percentage was boosted by a high positive perception of QPs (see Appendix 5: Table 5.7). Active QP participation could be perceived as a significant improvement in policies regarding participatory governance. Providing opportunities for the regulated community to proffer reliable solutions increases their level of accountability and stewardship. However, it is pertinent for the government to listen to negative feedback objectively and decipher incentives that are not reprimanding but motivating, to ensure effective solutions to identified problems.

5.4.5.4. The Relative Influence of Stringent Regulatory Requirements on the RBR Legislations

Through the RIS (see section 3.5.3.1), it was found that 85% of the responses about stringent regulatory requirements represented a positive higher relative influence on RBR’s ability to foster firms’ innovation activities under EMPA; 90% of the responses represented a positive higher relative influence on RBR’s ability to foster firms’ innovation activities under FRMA. Finally, 90% of the responses about stringent regulatory requirements represented a positive higher relative influence on RBR’s ability to foster firms’ innovation activities under EMPA & FRMA.
5.4.6. Questions with Multi-Themes: Innovation Framing and RBR Best Practices

There were additional inquiries that were not dominated by individual themes and were represented as multi-themed (Table 5.7). To keep the responses within the research objectives, this section started with a description of what innovation means to the participants. In their contextualized definitions of innovation, the researcher identified some common features of process innovation, such as increased efficiency, measured by the time and money saved. Also, some participants opined that innovation mainly occurs when alternative solutions are employed. Below is an illustrative definition:

*Innovation will mean an alternative solution that allows you or a person to reach the desired outcome by using techniques not previously used that results in saving time, money or level of effort.*

The contextualized definitions served as a base to proffering RBR best practices, compliance incentives and RRB comparison with other environmental regulations.

**Table 5.7 Theme Frequency Table – Multi-theme Responses**

<table>
<thead>
<tr>
<th>(a) Item</th>
<th>(b) Questions from Interview Guide</th>
<th>(c) Dominant subtheme</th>
<th>(d) EMPA Total=11</th>
<th>(e) FRMA Total=3</th>
<th>(f) Both Total=8</th>
<th>(g) All Responses Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>2i</td>
<td>What does innovation mean to you?</td>
<td>Framing Innovation</td>
<td>P 0 N 7</td>
<td>P 0 N 2</td>
<td>P 0 N 17</td>
<td>P 0 N 17 C 17 Unc 5 All 22</td>
</tr>
<tr>
<td>13</td>
<td>Is there any other best practice(s) you could suggest for future code development?</td>
<td>Flexibility: Uncertainty reduction: stakeholders' interaction: Stringency</td>
<td>P 0 N 6</td>
<td>P 0 N 3</td>
<td>P 0 N 16</td>
<td>P 0 N 16 C 16 Unc 6 All 22</td>
</tr>
<tr>
<td>13i</td>
<td>How can you compare RBR with the regulations of other provinces and countries that regulate similar environmental activities?</td>
<td>Flexibility-Continuous Improvement</td>
<td>P 0 N 1</td>
<td>P 0 N 4</td>
<td>P 0 N 14</td>
<td>P 0 N 14 C 14 Unc 8 All 22</td>
</tr>
<tr>
<td>16</td>
<td>What are some incentives the Ministry could explore to encourage compliance?</td>
<td>Affordability: Uncertainty reduction: stakeholders' interaction: Stringency</td>
<td>P 0 N 5</td>
<td>P 0 N 3</td>
<td>P 0 N 14</td>
<td>P 0 N 14 C 14 Unc 8 All 22</td>
</tr>
<tr>
<td>17</td>
<td>Does RBR foster Innovation?</td>
<td></td>
<td>P 0 N 4</td>
<td>P 0 N 2</td>
<td>P 0 N 12</td>
<td>P 0 N 12 C 12 Unc 2 All 22</td>
</tr>
<tr>
<td></td>
<td>Total number of responses (items: 2i, 13, 13i, 16, 17)</td>
<td></td>
<td>P 0 N 23</td>
<td>P 0 N 6</td>
<td>P 0 N 29</td>
<td>P 0 N 29 C 29 Unc 1 All 110</td>
</tr>
<tr>
<td></td>
<td>Cumulative percentage of ‘P &amp; N’ for each legislation from columns d, e &amp; f</td>
<td></td>
<td>P 0 N 29</td>
<td>P 0 N 11</td>
<td>P 0 N 30</td>
<td>P 0 N 30 C 30 Unc 10 All 100</td>
</tr>
</tbody>
</table>

122
For best practices (item 13), participants’ suggestions that may aid in the continuous development of RBR include the unification of government processes regarding environmental regulations, improved online services and continuous training (see Appendix 5: Table 5.8).

Furthermore, RBR was compared to the regulations in other jurisdictions. This inquiry (item 13) received the least response because most of the participants explained that they have not followed what other provinces are doing carefully. However, polarized responses were recorded. Four participants believed that implementing RBR positioned Saskatchewan as a pacesetter, but five (5) participants complained that RBR is behind certain provinces.

Below are some illustrative statements in relation to this inquiry.

**Positive Perceptions:**

*P1: Saskatchewan is leading and setting the pace*

*P6: When RBR was proposed, they made sure the regulation was in collaboration with the federal govt. The environmental assessment review process was developed as a complement of RBR. Saskatchewan generally is trying to make it clear what is required for compliant. Saskatchewan keeps it simple. Saskatchewan code sets the pace; Yukon, Ontario, and Alberta were looking closely at it. The Alberta deputy says they are working to become an outcome-based regulator.*

**Negative Perceptions:**

*P10: Public documents we can reference from the framework are required. Saskatchewan seems behind Alberta and the Federal Govt. Alberta has so many resources. Alberta has more information on how to derive specific guidelines. BC has a Contaminated Site Approved Professional (CSAP) association; it takes more accountability under this process.*

These responses provide opportunities for two possible solutions. First, to critically compare RBR with the regulations of other provinces in other to identify areas of improvement. Also, it provides an opportunity for increased stakeholders’ interactions.
within Saskatchewan and outside Saskatchewan, with a core objective of enhancing environmental protection.

**Item 16: Incentives to Enhance Compliance – Response to Secondary Question B.**

This item addressed one of the central objectives of any regulatory framework - compliance. It aligns with the secondary research question (B), which is focused on deciphering some incentives that the Ministry may explore to encourage compliance. Some valuable suggestions were proffered to include financial benefits, awards and recognition, timely feedbacks, increased stakeholders’ interaction, increased education and communication amongst others (see Appendix 5.1)

Putting it all together, the researcher inquired if RBR has fostered innovation. The objective of this inquiry was to match participants’ responses with the overarching research result. Most of the participants believe that RBR is inherently designed to foster innovation and allows flexibility for professional initiatives. One participant explained that it enables companies to think outside the box and come up with solutions.

However, some participants said they had not seen innovation, as expressed below:

“Innovation will be good, but we are trying to sell properties. An Innovation approach to contaminated sites will take a long time and increased financial risk. Unfortunately, we are always going through the lowest denominators. I have not seen anything new after the code implementation. The scope of the code didn’t change. It didn’t expand to new things that could lead to innovation. P16).”

Furthermore, the researcher asked a follow-up question to determine the possible factors that may limit RBR induced innovation. In response, some participants pointed to two main factors – approval and timeliness. One participant explained that “the biggest detriment to innovation is the bureaucracy of getting the alternative solutions approved. The timeliness because we deal with a lot of short horizons.” Also, another participant
explained that the issue of trust might deter innovation. He continues: “it depends on a high level of trust: for the regulator to trust that the process will work. And if there is anyone who abuses the process, such could be dealt with according to the law.”

However, research has shown that it may be better to scrutinize any proposed alternative solution. Lessons can be drawn from some unintended consequences experienced in other jurisdictions (see Coglianese & Nash, 2017; Cho et al. 2018; May 2003; Meacham, 2010). Thus, it is vital to avoid being overwhelmed by the quest for timeliness without proper scrutiny and monitoring.

Despite the above limitations, most participants believe that RBR provides flexible options, and business processes can be improved through alternative solutions. Also, alternative solutions could be specific to business situations, and would not matter if ‘firm A’ has a template, while ‘firm B’ is a bit informal, provided they accomplish the result.

5.4.6.1. The Relative Influence of Multi-theme Perceptions on the RBR Legislations

Though it was complex to estimate the relative influence of the multi-theme perception since they were not assigned to a specific theme; however, their effect was relevant to the overarching result.

Using a RIS (see section 3.5.3.1), it could be interpreted that 79% of the responses that relate to innovation framing and jurisdictional comparison (Table 5.7) represented a positive high relative influence on RBR’s ability to foster firms’ innovation activities under EMPA. 100% of the responses represented a maximum positive relative influence on RBR’s ability to foster firms’ innovation activities under FRMA. Finally, 90% of the responses that relate to innovation framing and jurisdictional comparison represents a positive higher
relative influence on RBR’s ability to foster firms’ innovation activities under EMPA & FRMA.

5.5. Themes summarized in a Thematic Network

The CSFs are most effective in synergy. The cumulative thematic effect demonstrated that each theme (CSF) in isolation might not achieve the level of effectiveness that was pulled together by all the CSFs. For instance, some participants said that flexible requirements in RBR increased uncertainty in achieving expected regulatory outcomes, especially where firms chose ‘alternative solutions’ (see section 5.4.2.2 and 5.4.3.2). Meanwhile, uncertainties could be reduced when stakeholders regularly interact to deliberate and proffer solutions to some environmental problems (Hurlbert, 2013).

Also, increased uncertainty in regulatory requirements may increase the cost of compliance (section 5.4.1.1 and 5.4.2.2). However, uncertainty could be minimized when stakeholders are more informed (section 5.4.4.1). During the interview, the researcher observed that some participants presented their alternative solutions in environmental associations. These presentations may aid in reducing uncertainties, and serve as evidence that RBR possesses the potential to reduce uncertainty through stakeholders’ interaction (section 5.4.4.1).

Since stakeholders’ interaction may reduce uncertainty, and a reduction in uncertainty brings clarity, which may reduce the cost of compliance, it is most likely that stakeholders’ interaction may reduce the cost of compliance. Also, stakeholders’ interaction is most likely enabled in a flexible regulatory regime. It thus implies that a flexible regulation (RBR) that enhances stakeholders’ interaction may reduce the uncertainty presumed in the regulation.
However, it is pertinent for the regulator to monitor the system amidst flexibility to avoid similar incidents that have occurred in jurisdictions where the regulator allowed for flexibility in the regulation without proper monitoring (see section 5.4.5).

Table 5.8 illustrates the collective positive and negative perceptions computed from the organizing themes. The relatively high percentages of acceptance regarding the reduction of regulatory uncertainties (79%), stakeholders’ interaction (83%), stringent regulatory requirements (88%), and response to the multi-theme items (90%) demonstrated a high level of stewardship towards environmental protection (see Table 5.9). In general, the high level of CSF shapes how RBR fosters firms’ innovation activities, and advances social learning.

Table 5.8. Cumulative Frequency Table on RBR Effectiveness to Foster Innovation

<table>
<thead>
<tr>
<th>s/n</th>
<th>Organizing Themes</th>
<th>EMPA (Total=11)</th>
<th>FRMA (Total=3)</th>
<th>Both (Total=8)</th>
<th>All Responses</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>P</td>
<td>N</td>
<td>P</td>
<td>N</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>Affordability</td>
<td>8</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>Uncertainty Reduction</td>
<td>13</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>Flexibility</td>
<td>22</td>
<td>13</td>
<td>10</td>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td>4</td>
<td>Stakeholders’ Interaction</td>
<td>26</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>23</td>
</tr>
<tr>
<td>5</td>
<td>Stringency</td>
<td>17</td>
<td>6</td>
<td>4</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>6</td>
<td>Stringency-Qualified Persons</td>
<td>17</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>7</td>
<td>Multi-theme</td>
<td>23</td>
<td>6</td>
<td>11</td>
<td>0</td>
<td>29</td>
</tr>
</tbody>
</table>

Total: 126 | 40 | 41 | 6 | 123 | 23 | 290 | 68 | 358 | 151 | 510

Keys: P=Positive Perception; N= Negative Perception; C=Classified responses; Unc= Unclassified response.
Table 5.9

<table>
<thead>
<tr>
<th>Cumulative Thematic Influence on RBR Effectiveness to Foster Innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Positive Perception</td>
</tr>
<tr>
<td>Negative Perception</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Where A=Affordability; F=Flexibility; UR=Uncertain Reduction; SI=Stakeholders' Interaction; S=Stringency; QP=Qualified Persons; M=Multi-theme responses

5.5.1. The Global Theme of Environmental Stewardship.

The consistent positive perceptions of the organizing themes in their interaction and interdependence projected a global theme of environmental stewardship, as stakeholders increasingly assumed ownership and accountability for their actions. They unanimously accepted the role of QPs required for advancing environmental science and technology that may stimulate innovation. In section 5.4.3.1, participants gave examples of some firms’ innovation activities that were fostered by RBR. These responses informed the primary research question of what innovation has been fostered by RBR. The other segment of the primary research question asked if RBR fosters social learning? Participants’ acceptance to share how they developed their alternative solutions in environmental associations served as a pointer to addressing the research question on social learning (see section 5.4.4.1).

Having explored the organizing themes, a thematic network was created to summarize the findings (see Table 5.9 and Figure 5.1). The thematic network diagram visualizes the research findings. It was designed to allow the dominant perceptions to feed into the global theme, trailing from the subthemes. The relative influence of each percentage that feeds into the global theme was calculated from Table 5.8 and 5.9. Since the findings in this thesis had consistent positive perceptions, the global perception becomes positive environmental stewardship.
Thus, the cumulative positive perceptions within the CSFs demonstrated that RBR had fostered innovation. Inherent in the interview transcripts was a passion for true stewardship towards the environment. Environmental Stewardship increases stakeholders’ accountability. When stakeholders assume accountability, they become more proactive in proffering novel solutions and advance science in protecting the environment, and eventually foster firms’ innovation activities. Also, environmental Stewardship may increase stakeholders’ trust in the system and enhances social learning.

**Figure 5.1 Thematic Network of the Subtheme, Organizing and Global Theme**

Keys: Positive Perceptions in each subtheme = Blue cubes; Negative Perceptions in each subtheme = Orange cubes. Organizing themes = Critical Success Factor = light green ellipses; Global theme = Lemon circle.
5.6. Summary of Findings from the Semi-Structured Interview

From the transcripts, some results that aided in addressing the primary and secondary research questions were revealed. First, the CSFs also termed the organizing themes, informed RBR’s ability to shape the innovation activities of firms – Research Question ‘A.’

The first organizing theme was affordability. Results from the interview revealed a contentious case of increased compliance cost in the short run and decreased compliance cost in the long run, where a firm employs an alternative solution and strives to innovate. However, this was not always the case because participants confirmed that some alternative solutions saved firms more money than acceptable solutions, even in the short run.

The second organizing theme is the reduction of uncertainties in the RBR requirements. It was found that the Ministry contacted the stakeholders through five different media (see section 5.4.2.1), yet some participants complained of not being included in the communication links. Thus, the researcher suggested the adoption of a double-loop learning approach to enhance effective communication amongst all stakeholders (see 5.4.2.1 and 5.4.2.2).

Flexible regulatory requirement was the third organizing theme. This theme revealed how firms’ use of alternative solutions had stimulated some innovations (see section 5.4.3.1). An example of innovation was from a firm that previously conducts regeneration surveys by manually measuring trees on the field. After implementing RBR, they employed aerial surveys for high-resolution photographs. When they get back to the office, they access the photos and use software tools to measure the heights and densities of trees. Notably, the aerial method helped solve some logistic problems previously encountered
when conducting ground-based surveys. It enabled the firm to access swampy forest areas that may be inaccessible by road in winter when the ground was frozen.

However, two significant issues were identified. The first was between two stakeholders - a consultant proposed an alternative solution that may lead to substantial cost savings for a client, but it was not presented for the Ministry’s approval because the client (a company) did not understand if it will save them money. However, when the conventional method was adopted instead of an alternative solution, it ended up costing the company more money. Probably, if the company utilized the opportunity of interacting with other stakeholders (for instance in environmental associations), and witnessed other stakeholders’ presentations, the company may most likely trust the recommendations of its consultant. This experience positioned stakeholders’ interaction as a veritable tool in a flexible regulation that may catalyze innovation.

The second case was a request for clarity in the approval process for contaminated sites and the need for additional guidelines (5.4.3.2). The researcher found that some EMPA participants who work on contaminated sites preferred more guidelines and acceptable solutions (an inflexible option) than alternative solutions (a flexible option). They explained that the absence of a clear guide makes them spend a lot of time to do what may not satisfy the Ministry (5.4.3.2 and 5.4.4). To solve this problem, it was not clear if interactions amongst firms alone might be a veritable solution. Guiding each film when they present their challenges individually to the Ministry may solve some problems, but a more effective impact may involve creating clusters to engage and deliberate the affected industries (see Porter and van der Linde, 1995, p.111). This step may foster a more robust rather than
piecemeal solution, thereby revealing the relationship between flexible regulatory requirements, stakeholders’ interaction and the reduction of regulatory uncertainties.

In the fourth organizing theme, stakeholders’ interaction was identified because eleven (11) out of twelve (12) participants who responded that they had used an alternative solution affirmed that they were willing to share applied knowledge of how the alternative solution was developed, and some had already shared it in their environmental associations. Furthermore, some of the participants belong to one or more environmental associations. However, an interesting discovery was that amidst the level of stakeholders’ interactions, firms consciously maintained confidentiality, and not giving away tangible trade secrets – a necessary factor for business competitiveness. While acknowledging the essence of business competitiveness, the Ministry may serve as a catalyst to encourage stakeholders who are willing to share their alternative solution experiences, to enhance a comparative analysis of approaches that may advance environmental science and reduce uncertainties.

In the case of stringent regulatory measures in RBR, despite some discrepancies between fairness and timeliness amongst participants who were issued a non-compliant notice (5.4.5.2), there was a general acceptance of the mandatory involvement of QPs to enhance the quality of environmental protection (5.4.5.3).

From responses to the multi-theme items, the researcher witnessed a genuine commitment to environmental stewardship. For RBR best practices, participants’ responses include the need for additional code chapters, regular review of the code, unifying the government processes on environmental regulations, improving online services, increasing stakeholders’ interactions to discuss compliance issues, and continuous training, among others.
When asked for suggested incentives to enhance compliance (secondary research question B), the participants suggested the provision of financial benefits, awards, timely feedbacks, increased stakeholders’ interaction, increased education and effective communication (Section 5.4.6, item16).

In a balance of probabilities, the interview transcripts provided high positive perceptions to all the interview items, revealing a high level of CSF that shapes how RBR fosters firms’ innovation activities and advances social learning. However, responses to ‘item 13i’ that inquired how RBR could be compared to the regulations of other jurisdictions was inconclusive, requiring further research to critically compare RBR and the environmental regulations in other jurisdictions.
Chapter six: Result Convergence and Conclusion of the Research

6.1. Introduction

Chapter six concludes the research by converging results from the survey and semi-structured interviews (see Campbell et al., 2011). The convergence includes cross-tabulating the research results, with the CSF (as rows) and the survey and interview results (as columns). Through the cross-tabulation, the primary and secondary research questions were addressed (section 6.2). Next, some policy recommendations were proffered (section 6.3). Also, some contribution to science (section 6.4), and the limitations of the study (section 6.5) were discussed, section 6.6 identified some areas of future research, and the chapter was summarized in section 6.7.

6.2. Recalling the Research Questions

This thesis focused on assessing the effectiveness of RBR in governing firms’ environmental activities in Saskatchewan. Section 1.4.2 presents some expected outcomes from RBR with emphasis on results and the provision of ‘alternative solutions.’ The emphasis on results and the provision of alternative solutions were expected to give room for in-depth research and development, which may induce firms’ innovation activities towards environmental protection.

This thesis assessed if RBR has led to firms’ innovation activities, especially where a firm decides to follow an alternative solution in achieving the regulatory outcome. Also, stakeholders’ interaction was found to be necessary for advancing innovation. The level of stakeholders’ interaction required to advance innovation is one that instigates a social learning process that questions assumptions and considers alternative options. Thus this
study assessed if social learning has occurred amongst stakeholders since RBR was implemented. A primary research question was formulated as follows.

6.2.1. The Primary Research Question

In what ways has RBR fostered innovation activities and social learning in Saskatchewan since its implementation in 2015.

To address the primary research question, five CSFs were deduced from existing literatures. The CSFs were critically reviewed (section 2.6, Table 2.6) to aid in addressing the research questions. In chapter four (section 4.5; 4.6), the mean value of the CSF and a Spearman’s rank correlation coefficients were estimated. It was found that all the CSF had a statistically significant positive correlation, except the stringent regulatory requirements that had a weak positive correlation with other CSFs (section 4.6.1). The weak positive correlation was related to stakeholders’ doubt of the business benefits associated with stringent regulatory measures. However, the mean value for stringency was the highest when compared to other CSFs due to the unanimous agreement towards employing the service of QPs to enhance compliance (Table 4.2). This result implies that complying with stringent regulatory requirements may improve business competitiveness in the long run. When compared to existing studies, the result is consistent with Paraskevopoulou (2012). In her study, Paraskevopoulou found that Henkel\(^{24}\), a German chemical industry experienced increased business competitiveness by complying with environmental regulations (Section 1.3). On the contrary, not complying with stringent regulatory requirements has proven to deter business competitiveness in the long run. For instance, in the US., Volkswagen defaulted in the emissions requirement set by the EPA. In response, Volkswagen paid huge

\(^{24}\) https://www.henkel.com/
remedial sums and suffered some losses in its business competitiveness (Coglianse & Nash, 2017).

When the results were aggregated to address the research question, the correlation coefficients for all the CSF was statistically significant. In general, the monotonic movement of the CSF in a similar direction increased the strength of their convergence in enabling RBR to foster firms’ innovation activities and social learning. Also, the descriptive statistics in chapter four provided a positive likelihood that RBR has fostered firms’ innovation activities (see section 4.5.2.2). An example is “the use of drones to conduct regeneration surveys rather than actual ground survey plots.”

In terms of social learning, when respondents’ perception regarding the Ministry’s interaction with their organization was inquired, the researcher observed a polarized response. Results from a Chi-square test of independence showed that 76% (25/33) of the EMPA respondents agreed that the Ministry understands and engages with their organizations, while 83% (10/12) of the EMPA & FRMA respondents disagreed. In aggregate, the result was positive, possibly because the EMPA respondents were over 60% higher than the EMPA & FRMA respondents (see section 4.4.1.3). Given the polarized findings on the likelihood of social learning, the researcher suggested some policy recommendations (see section 6.3).

Having completed a quantitative analysis of the survey, the researcher analyzed the semi-structured interview. Compared to the survey results, findings from the interview

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25 Volkswagen programmed onboard computers to calibrate their engines one way to satisfy the required emissions test in EPA laboratories, afterwards, they re-calibrate their engines automatically to achieve better fuel economy when the trucks were on the road, despite increasing emissions above the mandated level (Coglianse & Nash, 2017, p. 33).

26 Except for a few instances with stringent regulatory requirements that were not statistically significant, which may have occurred by chance (see Table 4.11).
revealed a consistent positive pattern for the five CSF. Also, a passion for true stewardship towards the environment was inherent in the interview transcripts (section 5.5). Environmental Stewardship was found to have increased stakeholders’ accountability. It enabled some stakeholders to display a sense of ownership and proactiveness to proffering novel solutions to advance science in protecting the environment, which simultaneously fostered innovation activities. See section 5.4.3.1 for examples of innovations cited by the participants.

In addition to the innovation activities, the researcher observed that the presence of environmental stewardship increased some stakeholders’ trust in the system. Also, it encouraged formal interactions through networks such as the Saskatchewan Chambers of Commerce and SEIMA. Collaboration in these networks may enhance social learning. However, a few participants (40%, 6/15) pointed out that the exchange of information was not enough to foster social learning (see section 5.4.4.2). This result from the interview is similar to the perception of some EMPA & FRMA participants in the survey.

When the quantitative and qualitative results were juxtaposed, the researcher found that some firms’ innovation activities have occurred. For social learning, some level of stakeholders’ interaction existed; however, there was a need to improve upon stakeholders’ collaboration that may advance social learning. See Table 6.1 for a summarized result of the survey and interviews. The table serves as a reference point in addressing the research questions and provides some literature where the CSFs emerged.

Table 6.1 shows a 2.68 mean of means for the CSFs from the survey results. Given the decision rule (Table 4.3), an overarching mean of 2.68 represents a positive likelihood that RBR has fostered firms’ innovation activities. Also, from the interview transcript, an 80%
weighted average of positive perceptions towards the CSFs represents a high relative influence on RBR’s ability to foster firms’ innovation activities under EMPA and/or FRMA (See section 3.5.3.1; Section 5.5 and Figure 5.1). However, few respondents expressed concerns about some aspects of the code that require significant improvement (see section 4.5.3.2), hence the policy recommendation in section 6.3.

Table 6.1. Juxtaposing Results from the Survey and the Semi-Structured Interview

<table>
<thead>
<tr>
<th>s/n</th>
<th>Critical Success Factors (CSF)</th>
<th>Primary Research Results</th>
<th>Existing Literatures that employed each CSF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Online Survey</td>
<td>Interview</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mean value (see section 4.5.2, and Table 4.2)</td>
<td>Percentage of positive perceptions (see section 5.5, and Table 5.21)</td>
</tr>
<tr>
<td>1</td>
<td>Stringent regulatory requirements</td>
<td>2.74</td>
<td>88%</td>
</tr>
<tr>
<td>2</td>
<td>Flexible regulatory requirements</td>
<td>2.68</td>
<td>70%</td>
</tr>
<tr>
<td>3</td>
<td>Stakeholder interaction</td>
<td>2.65</td>
<td>83%</td>
</tr>
<tr>
<td>4</td>
<td>Uncertainties reduction</td>
<td>2.65</td>
<td>79%</td>
</tr>
<tr>
<td>5</td>
<td>Affordability (Low compliance cost)</td>
<td>2.68</td>
<td>69%</td>
</tr>
<tr>
<td></td>
<td>Multiple theme responses</td>
<td>*</td>
<td>90%</td>
</tr>
<tr>
<td></td>
<td>Environmental stewardship</td>
<td>**</td>
<td>***</td>
</tr>
<tr>
<td></td>
<td>Mean of means/weighted positive perceptions</td>
<td>2.68****</td>
<td>80%*****</td>
</tr>
</tbody>
</table>

Table Key:
* Multiple themes (all the CSFs) emerged in responses to the open-ended questions of the survey (see section 4.7); however, the mean value was not estimated (section 4.7.1 and 4.7.3).
** The term ‘Environmental stewardship’ was not explicitly stated in the survey responses; however, by encouraging the use of QPs and accepting accountability to each certification made regarding alternative solutions was perceived as expressing good stewardship towards environmental protection.
*** The consistent positive perceptions of the organizing themes in their interaction and interdependence projected a global theme of environmental stewardship (section 5.5.1)
**** The mean of means was calculated thus: (2.74+2.68+2.65+2.65+2.68)/5 = 2.68
***** The weighted average positive perception was calculated thus: [(88+70+83+79+69+90)/6] * 100 = 80%
6.2.2. Secondary research question ‘B.’

Regulatory induced innovation comes from complying with the regulation; what are some incentives the Ministry could explore to encourage compliance within the RBR framework?

In response to the secondary research question ‘B,’ some incentives that may encourage compliance were elaborated in chapters four and five. They include funding, timely feedback, increased stakeholders’ interaction, increased education/training, effective communication, awards and recognition (see section 4.7.3, and section 5.4.5.4: item 16). From these incentives, stakeholders’ interaction was found as a binding force to enhancing other compliance incentives such as increased education, effective communication and timely feedback. Also, stakeholders’ interaction may reduce some level of regulatory uncertainties, which will, in turn, reduce the cost of compliance. Reduced compliance costs may compensate for the provision of direct financial benefits and save the government some revenue while improving business knowledge about the regulation.

6.2.3. Secondary research question ‘C.’

What are the factors that may enhance social learning within the regulatory framework?

The two common factors identified to enhance social learning in this context were trust and formal networks. Trust is imperative for social learning to occur. Pretty and Ward (2001) enumerated two forms of trust - mutual and social trust. They described mutual trust as the trust between individuals who are familiar with each other, while social trust was described as the trust that exists amongst individuals who are not familiar with each other but have confidence in the social structure within which they interact. Social trust exists where individuals are willing to collaborate towards a common goal even if they disagree at
some point (Tsaang et al., 2009). Social trust is required for a stakeholder to understand that his permit is not refused because of his particularity but because there is not enough proof that the proposed process will be effective. On the other hand, social trust should propel the regulator to trust that the alternative process will work, and if anyone abuses the process, such could be dealt with according to the law (interview participants 6 and 21). This level of trust is driven by continuous interaction within a network of stakeholders, as seen in Hurlbert (2013, p. 12), where the formation of a group plan (through formal networks) overcame the distrust of producers in the system.

Results from the survey and interviews revealed that stakeholders interacted through formal networks, such as SIEMA and Saskatchewan Chambers of Commerce (see section 5.4.4.1). Through continuous interaction within networks, trust could develop (Hurlbert and Gupta, 2015). The results also revealed a significant level of trust in the system because participants explained that they belong to at least one environmental association where members have presented the techniques adopted in their alternative solutions. Only one respondent reported distrust in the system when asked about his experience regarding the review of alternative solutions. Having a single negative response when compared to fifty (50) survey respondents and twenty-two (22) interview participants might be a case of demonstrating that the proposed alternative solution will lead to an equal or greater protection of the environment when compared with the acceptable solution (see Wittrup & Murphy, 2012, p. 5). Other notable concerns were complaints about delays in approval but not expressly stated as distrust. Given the above results, the researcher found that trust within a network of stakeholders may enhance social learning.
6.2.4. Secondary research question ‘D.’

What are the possible ways of improving the RBR to build more capacity for social learning?

Response to the secondary research question ‘D’ is incorporated in the policy recommendations section 6.3.

6.3 Policy Implications and Recommendations

Findings from the survey and interviews may enable policymakers to hear from those most affected by the RBR. In turn, the policymakers may ascertain if there are areas of concern to be addressed and assess the performance of the regulation from the recipients’ perspective. Also, stakeholders’ feedback may inform future regulatory reforms and business practices. For instance, evidence from a household survey conducted in the United Kingdom by Kitching (2006) revealed that individuals’ perceptions of business regulations influenced business start-up decisions. Another study compared stakeholders’ perception of regulations in the United Kingdom and the United States. It was discovered that financial firms made investment decisions in these jurisdictions partly due to the perception of regulatory design, implementation and enforcement (McKinsey and Company, 2007). Thus, a positive perception may promote respect for the regulation, enhance compliance and influence business investment decisions.

From the primary findings, some positive implications and some limitations were identified: a detailed explanation of the positive impacts of RBR was explained in section 5.4. They include: (1) firms’ innovation activities (see section 5.4.3.1), (2) Cost savings in the short and long run (see section 5.4.1.3), (3) increased stakeholders interaction in environmental associations (see section 5.4.4.1), and (4) increased knowledge of environmental protection (through alternative solutions and stakeholders’ interaction).
On the other hand, limitations observed were divided into actual and potential limitations. The actual limitations found include: (1) delay in the approval of some alternative solutions (section 5.4.3.2), (2) uncertainty in some RBR flexible requirements (see section 5.4.1.2), (3) need for increased stakeholders’ collaboration (section 5.4.4.2). The potential limitations include: (1) the possibility of free-riding by non-innovative firms (see Paraskevopoulou, 2012); (2) possible unlawful tactics of non-compliance for business profit (see Coglianese & Nash, 2017; Cho et al. 2018). Given these limitations, the researcher suggested enhancing stakeholders’ collaboration to mitigate some negative impacts on the effectiveness of RBR.

6.3.1. Enhancing Stakeholders’ Collaboration

The enhancement of stakeholders’ collaboration may take two forms: (1) stakeholders’ collaboration administered through environmental associations, and (2) stakeholders’ collaboration involving the Ministry’s participation.

6.3.1.1. Stakeholders Collaboration in Environmental Associations

Collaboration through environmental association is particularly important in a regulation where firms may propose their alternative solutions. For instance, in the RBR regime, firms that were responsible for an environmentally impacted site were required to conduct a corrective action plan (CAP) 27. A CAP is akin to a risk mitigation measure because environmentally impacted sites may cause an adverse effect. CAP details the methods employed to “prevent, minimize, mitigate, remedy or reclaim adverse effects”

27 “corrective action plan means a plan that details the methods employed to prevent, minimize, mitigate, remedy or reclaim adverse effects (Environmental Management and Protection Act, (EMPA) 2010, p. 3)
At the status quo, each firm is responsible for preparing its CAP. However, preparing a CAP might delay the implementation of certain environmental projects, which might cause the firms to lose money. This setback may explain one of the reasons for some respondents’ complaint that ‘RBR does not save their organization money.’ Thus, to reduce the uncertainties around RBR, reduce delayed approvals for alternative solutions, and enhance the quality of submissions, the researcher recommended the formation of a collaborative risk management process (CRMP) for related environmental activities.

6.3.1.1i. Collaborative Risk Management Process (CRMP)

The reduction of uncertainties around RBR and the reduction of the delays in approving alternative solutions could serve as incentives to encourage stakeholders’ collaboration. Stakeholders’ collaboration may occur in defined spaces. Aye et al. (2016) suggested the use of an interactive web-Geographic Information System (web-GIS) platform integrated with a multi-criteria evaluation tool. In the place of a multi-criteria evaluation tool, this thesis proposes the formation of a collaborative risk management committee (CRMC) for related environmental activities at an initial stage; however, after some progression, the CRMC may decide to create a web-based multi-criteria evaluation tool that builds on their collaborative expertise in the risk mitigation process.

The CRMC may serve as a hub where information regarding the hazards, risks and mitigation measures proffered by various stakeholders on related environmental activities are deliberated, with the objective of suggesting potential collaborative risk management
processes (CRMP)\textsuperscript{28}. The CRMC will develop decision criteria in arriving at the CRMP. Figure 6.1 provides a logic model\textsuperscript{29} that explains the potential inputs, activities, outputs, outcomes and final impacts of implementing a CRMP.

**Figure 6. 1 A Collaborative Risk Management Process (CRMP) Logic Model**

<table>
<thead>
<tr>
<th>INPUTS</th>
<th>ACTIVITIES</th>
<th>OUTPUTS</th>
<th>OUTCOMES</th>
<th>IMPACTS</th>
</tr>
</thead>
</table>
| 1. Actors: SEIMA/ASFP, the CRMC (QPs and interested parties: stakeholders and non-partisan organizations)  
2. Suggested Hazards; potential risks and Mitigation measures  
3. Resources: Meeting platforms – face to face/online | 1. Providing online suggestions.  
2. Periodic review of online suggestions.  
3. Periodic face to face meeting to deliberate on the suggested hazards, risks and mitigation measures (2 to 4 times per annum) | 1. Initial CRMP document for each related environmental activity.  
2. Updated CRMP | 1. Increase in compliance.  
2. Improved/Reduced Correction Action Plans (CAP).  
3. More efficient use of productive hours | (A) Positive:  
1. Enhanced environmental protection with positive economic, social, health and safety impacts.  
2. Enhanced environmental stewardship  
3. Social Learning  
4. Innovation  
(B) Negative:  
1. Potential free riding |

Key: CRMC = Collaborative Risk Management Committee; SEIMA: Saskatchewan Environmental Industry and Managers Association; ASFP = Association of Saskatchewan Forestry Professionals; QPs = Qualified Persons

\textbf{a. Inputs:}

From the logic model in figure 6.1, the input stage comprises of all the relevant resources, both material and intellectual, that is required for a successful CRMP (Frye and Hemmer, 2012, p. 13). The input stage shows that the CRMC comprises the QPs (who certify alternative solutions), representatives from industries who are members of an environmental association such as SEIMA or SFPA, and non-partisan organizations that represent the communities impacted by the environmental activities. The Ministry is not part of the CRMC because, in the RBR model, the onus is on firms and QPs to ensure that

\textsuperscript{28} The CRMP may be described as a combination of potential hazards, risks and mitigation measures suggested by different stakeholders within specific environmental protection activities to reduce the likelihood and impact of the risk if it eventually occurs.

\textsuperscript{29} Logic models are useful tools for describing the results expected from an intervention program (Frye and Hemmer, 2013, p. 12); in this case, the preparation of the CRMP.
an alternative solution is equal or better than an acceptable solution that was stipulated by the Ministry.

b. Activities and Outputs:

For the activity stage, an activity flow chart may be prepared to illustrate the CRMP. Interested stakeholders may voluntarily forward potential hazards, risks and mitigation measures to a CRMP online platform within SEIMA. This platform will be accessible to the CRMC, who may review the potential mitigation measures against agreed benchmarks and compare it with other jurisdictions practices. Upon review, the CRMC may formally forward the mitigation measures to the SEIMA representatives who may check its consistency with the association’s ethics, provincial and federal bylaws and send the reviewed document back to the CRMC. The CRMC may incorporate any change and then make it available for review by interested stakeholders within a specified period. After some amendments, the CRMC then makes the final output available to interested SEIMA members. A similar process may be applied in the ASFP.

c. Outcomes and Impacts

The CRMP may aid in the submission of high-quality applications that could reduce the delays in approval time for alternative solutions; improve/reduce CAPs; increase regulatory compliance and may free up productive hours, which were initially employed in preparing CAPs.

The impact of CRMP includes enhanced environmental protection with positive economic, social, health and safety impacts, which is consistent with the strategic goal of the Ministry (GOS, 2017). Other impacts include: enhanced environmental stewardship and advancement in social learning because the potential outcome and impacts of CRMP may
encourage stakeholders’ collaboration – a response to the secondary research question ‘D.’ Ultimately, the provision of CRMP may enable SEIMA and ASFP members to reduce their compliance costs, thereby meeting significant business needs, and eventually foster innovation.

However, most stakeholders’ collaborative programs highlight concerns about potential free-riding (Axelsson et al., 2013; Paraskevopoulou, 2012). Such practice could be managed by ensuring that only stakeholders who are members of each association, and who provide practicable and valuable suggestions in the process will have access to the final CRMP document. Thus, the CRMC may set a minimum criterion of what is practicable and valuable in related environmental activities to ensure that members proffer valuable suggestions.

6.3.1.2. Stakeholders’ Collaboration with the Ministry’s Participation

Compliance is at the core of any regulation; as such, most programs that the Ministry organizes for stakeholders focus on enhancing compliance. Section 4.7.3, and section 5.4.5.4: item 16 provided examples of different compliance approaches that the Ministry may implement. The compliance approaches include stakeholders’ interaction and increased training, amongst others. In the case of stakeholders’ interaction, the Ministry could take a cue from how the British National Audit Office (BNAO) engages stakeholders online in making inclusive policy decisions (United Nations Department of Economic and Social Affairs, 2016: 2002). In terms of training, insights may be drawn from the Workplace Safety and Health Council in Singapore (2008) that provides funding for small and

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30 The training is funded through a risk management assistant fund (RMAF) for companies with 200 or lesser employees; the companies can send two supervisory staff for a risk management course (Ministry of ManPower, Singapore, 2008).
medium-sized enterprises (SME) to attend risk management training towards human health and safety. In Singapore, each SME sends two supervisory staff for the risk management course, and the attendees interact with one another (ibid). Training venues may serve as networking media. Thus, formal training organized by the Ministry may enhance stakeholders’ interaction, collaboration and eventual social learning.

6.4. Contribution to Science

This research advanced science in three ways. First, the framework synthesis conducted in chapter two, aided in confirming the reliability of the CSFs in fostering firms’ innovation activities (section 2.6). The result of the synthesis revealed that existing studies utilized one or two CSFs in describing the effectiveness of a program or regulation. For instance, Ramanathan et al. (2017) focused on the benefits of flexible regulatory requirements, while Cho et al. (2018) emphasized on the need to maintain stringent regulatory requirements. This thesis advanced these studies by encapsulating five major factors found to be critical in ensuring the successful implementation of a regulation because measuring each factor separately may provide a partial effect that may deter the expected outcomes within RBR.

Second, this research advances science by improving the methodology of Ramanathan et al. (2017). Ramanathan et al. conducted an in-depth interview to examine the relationship between environmental regulations, firms' innovation and private sustainability benefits. They made some a priori assumptions that informed their research design from Porter and Van der Linde (1995). In a similar light, this research took its cue from the PH. The difference between Ramanathan et al., (2017) and this study is in the research design and methodology because a survey was administered in addition to an in-depth interview. Also, the concept of
social learning was not included in their study. In advancing Ramanathan et al. (2017), this thesis provided a robust perception of innovation by unveiling the benefits of stakeholders’ collaboration in upholding environmental stewardship and fostering innovation.

Third, based on the findings from this thesis, recommendations were made (see 6.3), which includes the creation of a CRMP through the CRMC platform. The CRMC provides a platform for stakeholders to deliberate on possible hazards, risks and mitigation measures. Thus, knowledge may diffuse between organizations through the CRMC with an objective to enhance environmental protection, advance social learning and foster innovation.

6.5. Study Limitations

Four limitations were identified in this research. First, the study was based on observations from a particular jurisdiction (Saskatchewan), which may be difficult to generalize, and compare with other jurisdictions; this limitation was minimized through a framework synthesis. In the framework synthesis, a conceptual framework (CSFs) was determined. Using each CSF as a point of reference, related studies from several jurisdictions were juxtaposed to determine how the CSFs may address the research question, and how it may be replicated in other jurisdictions. It was found that the CSFs facilitated the successful implementation of regulations/programs. It suffices that the CSFs applied in this thesis are reliable and can be replicated in future studies (see section 2.6).

Second, the primary data of this study was based on stakeholders’ perceptions, which might be biased. For instance, the survey responses may be shaped by factors other than the effectiveness of the regulation. Factors such as the economic climate of a
respondents’ organization, prior expectations, a respondent political party standpoint and other unrelated circumstances may distort objective responses. This limitation was minimized by adopting a mixed-method approach to enable the research to have a robust representation.

The third limitation is the issue of the low response rate (see section 3.3). The American Association for Public Opinion Research (2016) defined response rate as the ratio of the number of respondents to the target population. When computing the response rate of the sample data in this thesis, the stakeholders who were “out of office” and could not fill the survey were included in the denominator and treated as eligible non-respondents (see Sakshaug et al. 2019, p. 575). Thus, the response rate was 9% (50/639), see section 3.3. Using a confidence level of 95% to construct a confidence interval based on the computed sample mean (2.68), with an objective of extrapolating the sample mean to the target population parameter, a 13.32% margin of error (sampling error) was found (Christensen, Johnson and Turner, 2014, p.411; Healey, Prus and Lieflander, 2019, Chapter 6). Given a sample mean of 2.68, and a sampling error of 13.32%, it is most likely that the population mean might be between 2.32 and 3.04. From the metrics Table 4.3, the range (2.32 and 3.04) falls between the ‘agree’ and ‘strongly agree’ options in the survey guide, implying that RBR has most likely fostered innovation.

On the contrary, if a 5% sampling error is estimated as an ideal estimate for a target population of 639 stakeholders on a 95% confidence level, then a more representative sample size would require 241 responses. The response rate will be approximately 38% (241/639), compared to a 9% (50/639) response rate in the current study. This limitation
could be minimized through increased stakeholder’s participation. It is envisaged that as stakeholders’ interaction increases through a collaborative risk management process (and other schemes), independent forums such as collaborative risk management committee could be created where stakeholders may become more willing to share their experiences (section 6.3.1). Also, academics could source data directly from stakeholders in the forums, take control of the data and administer the surveys directly to enhance participation. For instance, when the Ministry sent out a request to invite the 629 stakeholders (population frame) for a semi-structured interview, only 9 participants indicated interest. However, during the interview, the author adopted a snowball approach and requested a referral from one of the participants, and he referred the author to SEIMA. From SEIMA, 15 additional participants were recruited for the interviews. Similarly, it is possible that the survey sample size could have been larger if the author had direct access to the environmental associations and administered the survey independently.

Fourth, in assessing an overall perception of how RBR has been enabling firms to achieve their business objectives while preserving the environment, the study met a current need of the Ministry, which was aimed at examining if RBR was working effectively. However, a common limitation in this type of broadly scoped study is its inability to narrow deeper into each code chapter to analyze specific code related constraints longitudinally.

6.6. Future Research Directions

Given the limitations relating to the broad scope of the study, the researcher proposed future research that could consider specific code chapters in detail. For instance, under
FRMA, the study may examine the impact of RBR on specific areas such as timber supply and industry competitiveness (see Hoberg et al. 2016). Also, from the survey, some EMPA respondents requested more acceptable solutions, while a majority of the EMPA & FRMA respondents preferred the code to be less prescriptive and more results-based. Given this polarized thought, research that examines specific code chapters where the polarity is identified might inform future code development. For instance, under EMPA, the study may focus on examining why participants required more guidelines related to contaminated sites. From the interviews, one participant suggested the need for a group of approved professionals to collectively consider the problems of contaminated sites as done in BC (section 5.4.3.2). This point led to another possible research area of comparing specific chapters in Saskatchewan RBR to related environmental regulations of other jurisdictions in other to identify potential areas of improvement.

6.7 Chapter Summary

Chapter six converged the qualitative and quantitative data and summarized the stakeholders’ perceptions regarding the effectiveness of RBR in fostering innovation and social learning. Having conducted a comprehensive literature review and evaluated the data through a mixed-method, it was discovered that RBR has fostered some firms’ innovation activities, also referred to as process innovation by some scholars (Weiss & Anisimova, 2018).

For social learning, some stakeholders’ interactions existed; however, a need to advance social learning through stakeholders’ collaboration was evident. Thus, the researcher recommended the formation of a collaborative risk management committee
(CRMC) that comprises of stakeholders within related environmental activities. The CRMC may deliberate on collaborative risk management processes (CRMP) with the objective of enhancing environmental protection, reducing non-compliance, advancing social learning and innovation.

Also, the result of this study was compared with related research (see Appendix 6.1). Comparing the findings from the most related studies was aimed at demonstrating the reliability of the CSF adopted in this thesis. Having provided practical studies from at least twelve countries (Appendix 6.1 and Appendix 2, Table 2.2) where the CSFs served as facilitators to achieving the success of a government regulation/program, it suffices that the CSF applied in this thesis is reliable and can be replicated in future studies.

Thus, the research findings and the suggested policy recommendations may inform future policy decisions in regulating environmental protection activities in Saskatchewan and other jurisdictions that are currently implementing or proposing to implement the RBR.
References


Borrini-Feyerabend, G., Pimbert, M., Farvar, M., Kothari, A., & Renard, Y. (2004). Sharing power: Learning by doing in co-management of natural resources throughout the world. IIED and IUCN/CEESP/CMWG.


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Paraskevopoulou, E. (2012). Non-technological regulatory effects: Implications for innovation and innovation policy. Science Direct. 41(6), 1058-1071. DOI: https://doi.org/10.1016/j.respol.2012.03.018


Appendix 1: RBR Features and Expected Outcomes

Appendix 1. Table 1.1. Porter and van der Linde (1995) Inferences and RBR Features

<table>
<thead>
<tr>
<th>An Innovative Regulation</th>
<th>RBR Features (GOS, 2014a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide a maximum opportunity for innovation, by leaving the approach to innovation to industry and not the standard-setting agency</td>
<td>Designed to enhance creative reasoning and allows for knowledge formation which may induce innovation</td>
</tr>
<tr>
<td>Fosters continuous improvement, rather than locking in any particular technology</td>
<td>Designed to ensure continuous improvement through regular updates to the code</td>
</tr>
<tr>
<td>Reduces the uncertainty that investments to enhance environmental protection will be valuable</td>
<td>Reducing uncertainty is akin to increasing assurance: QPs certify alternative solutions offered by firms</td>
</tr>
</tbody>
</table>


Following Houghton (2016a) framework synthesis, five CSF were deduced mainly from Porter and van der Linde (1995) and Hurlbert (2013). Though they were not referred as CSF in these literatures; however, their specific roles fit into the definition of CSF, which are the key factors required for a successful accomplishment of a project, program or regulation (section 2.4.1). The CSF was positioned as a priori themes in this thesis. To augment the reliability of the CSF in interpreting the research results, the researcher sourced qualitative evidence where the CSF has been employed in related literatures where stakeholders’ perceptions regarding the impact of regulations on firms’ innovation and social learning were explored.

Synthesizing qualitative evidence is useful because it enables the integration of isolated qualitative research findings of specific phenomena from different jurisdictions in other to provide meaningful explanation of the findings of such phenomena in the currently researched jurisdiction. It also provides a broader picture of the factors that facilitate successful outcomes of the researched phenomenon. Below are some steps followed in conducting the framework synthesis of this thesis.

2.1.1. Step one: Develop a conceptual framework

A conceptual framework is essential for conducting a framework synthesis because it guides the analysis and interpretation of finding (Houghton, 2016a; Carroll et al., 2013). The conceptual framework for this thesis is the CSFs developed to provide guidance on how the concepts of regulatory stringency, flexibility, affordability, uncertainty reduction, and stakeholders interaction can be integrated to foster innovation and advance social learning.

First, the definition of each CSF is described in Table 2.2 in the body of the research. The Table also presents an objective view of the advantages and the disadvantage of each CSF in theory (practical evidences are provided in section 2.6)
2.1.2. Step two: Review Team and Advisory group

A review team and an advisory group is recommended for conducting any qualitative evidence synthesis (Lloyd Jones, 2004; Evidence for Policy and Practice Information and Co-ordinating Centre, (EPPI-Centre), 2010;). In this thesis, the conceptual frame work (CSF) was reviewed by three independent researchers: a graduate research student, a research librarian, and the primary researchers’ supervisor, all in the University of Regina, Saskatchewan, Canada. At least two of the reviewers have excellent track records on qualitative research and subject area expertise, in the concept of innovation, social learning and the use of NVivo software. The researcher met each reviewer at separate occasion to encourage an independent review of how the conceptual framework (CSF) was develop, and to avoid influencing each other’s thought in the screening process for related literatures.

2.1.3. Step three: Search for Articles in Database, using Specific Search Criteria

Qualitative evidence literatures that applied at least one CSF were sourced through a comprehensive and exhaustive search technique. The researcher explored several databases that were linked through the University of Regina, Canada. These databases include: Proquest, Public Library of Science (PLOS); Science Direct, Canadian Business and Current Affairs (CBCA); Social Science Research Network (SSRN). The search terms used for amassing the literatures included all possible combinations of the following: (Environmental Regulations and Firms’ Innovation; Environmental, Firms’ Innovation and social learning, Outcome-based/Performance based Environmental Regulations). To amass recent studies where each CSF was applied, the researcher sourced only literatures written after Porter and van der Linde (1995). Thus, a year of publication parameter was set from 1996 to 2018. The literatures selected were mainly supported by raw data, revealing practical evidence from other jurisdictions (Finfgeld-Connett, 2003). Approximately 1,200 were first selected, but after reading through the topics and key words, the articles were narrowed down to 225; uploaded into a Zotero reference management software, and subsequently exported to NVivo version 12, where the articles were screened.

2.1.4. Step four: Screening the uploaded Articles

In this stage, (a) the amassed articles were reduced to the final selection for the synthesis. (b) Also, a data extraction form that displayed the key characteristics of each selected articles was generated. (c) Finally, a quality appraisal was conducted to determine the effect that each research findings could have on the current study.

a. Screening for the Final Articles

In the first stage of screening, the researcher used the ‘text search query’ on the explore menu in NVivo to search for the term ‘quantitative,’ and a quick check was done to remove the quantitative literatures whose data were sourced from secondary database. However, studies that conducted primary research such as survey were retained. Also, mixed-method studies that applied both qualitative and quantitative methods were retained, especially those studies that involved the use of primary data. Other searches done to reduce the literatures to more related studies include a search for each CSF, such as: ‘stringency; flexibility; affordability; uncertainty; interaction.’ When searching for regulatory flexibility, two search terms were used – ‘flexibility and performance-based’ because all performance-based regulation are flexible. For affordability, the search terms used were affordability and compliance cost. Finally, for stakeholders’ interactions, the search terms were trust and network (research found that trust and networking are associated with stakeholders’ interaction (Hurlbert, 2013; Axelsson et al. 2017)). Finally, twelve articles closely related to the CSF were selected for the framework synthesis, while the remaining articles were referenced where necessary.
(b) Data Extraction Form

During the screening process, a data extraction form was created to provide cogent information of the twelve articles selected. The data extraction form had columns for the author, year of publication, country of research, the focus of the research and method applied. All studies were conducted between 2003 and 2018 from twelve different countries in total, of which nine articles focused on a single country: Canada (three articles), China, England, New Zealand, Spain, Sweden, and the United States. Three other articles used more than one country in their case studies, for instance Argentina, Canada and Chile in Hurlbert and Gupta (2015); China and England in Ramanathan et al. (2017), and Finland, Norway and Sweden in Raty et al., (2016). This selection revealed that the CSF was recognised in different countries, making it a valid tool for assessing the effectiveness of a regulation in the current jurisdiction of study (Appendix 2, Table 2.2 displays each article that demonstrated how CSF applied to their research phenomena).

Creating a data extraction form enabled the researcher to fit each research findings into the conceptual framework (in this case the CSF), including verbatim quotes from Participants in their studies. This technique was similarly applied in previous framework syntheses conducted by Carroll et al. (2011) and Houghton (2016a). All the selected literatures focused on at least one CSF relevant to this thesis. The data collection for three selected articles were mixed. Other articles conducted interviews, except for one study that collected data through online survey (Hoberg et al., 2018), and two that retrospectively narrated specific environmental problems such as the Volkswagen emissions scandal in the USA (Coglianese & Nash, 2017), and the case of leaky buildings in New Zealand (see May 2003). Though these two studies did not interview participants or conduct a survey, the depth of knowledge and robustness of their studies, and lessons learnt regarding the cited cases were relevant to informing policy decisions, especially in the area of maintaining considerable stringency amidst a flexible regulation, hence the studies were included in the selection.

(c) Quality Appraisal of Selected Literatures

A quality appraisal to determine the effect that each research findings could have on the current study was done through NVivo ‘text search’ query in its’ explore menu. This search revealed the number of times each CSF was mentioned in each article (see Appendix 2 Table 2.1). This exercise is in line with Altheide (1996) use of a frequency table in a thematic analysis.

Appendix 2 Table 2.1 depicts the result of the ‘text search’ query in NVivo. The key terms used in different literatures to represent each critical success factor (CSF) were different but with similar meanings. Thus, words with similar meanings were used to carry out the search depicted on table. For instance, under stakeholders’ interaction, the researcher used the words Networking and Trust to search for instances where stakeholders’ participation occurred. Under Affordability, the researcher searched for the terms affordable, and compliance cost.

However, knowing the number of times that a key word appears in an article might not be enough to measure its relevance to the current study, hence the researcher further used a critical appraisal tool to complement the selection process. An appraisal tool commonly used in qualitative synthesis is the Critical Appraisal Skills Programme (CASP, 2006) designed by the British Public Health Resource Unit (see CASP, 2018). The CASP tool provides cogent questions that relate to the principles or assumptions that characterises qualitative research, which include the clarity of a report, rigors undertaken in its methodology, the depth of the study’s conceptual framework and paradigmatic coherency (Campbell et al., 2011; Valderas et al., 2012; Jordan et al, 2015).

Also, the researcher read through the abstracts and methodologies of selected articles. Only articles that undertook primary research were selected, except for two articles that applied a narrative case studies method to describe real-life environmental pollution scandals in the United States (Coglianese & Nash, 2017) and New Zealand (May 2003). This rigorous literature screening process was thoroughly done until the studies were narrowed down to twelve journal articles.
### Appendix 2 Table 2.1

#### The Frequency of Occurrence for each CSF in the Selected Articles using NVivo 12.

<table>
<thead>
<tr>
<th>s/n</th>
<th>Authors &amp; Year</th>
<th>Country of Study</th>
<th>Stringency</th>
<th>Flexibility</th>
<th>Affordability</th>
<th>Uncertainty</th>
<th>Stakeholders' Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Axelsson et al. (2013)</td>
<td>Sweden</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Cogliansese &amp; Nash (2017)</td>
<td>United States</td>
<td>18</td>
<td>20</td>
<td>32</td>
<td>68</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>Cho et al. (2018)</td>
<td>United States</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Hoberg et al. (2018)</td>
<td>Canada</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Hoberg, Malkinson &amp; Kozak (2016)</td>
<td>Canada</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>6</td>
<td>Hurlbert &amp; Gupta (2015)</td>
<td>Argentina, Chile &amp; Canada</td>
<td>9</td>
<td>44</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Hurlbert (2013)</td>
<td>Canada</td>
<td>3</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>May (2003)</td>
<td>New Zealand</td>
<td>11</td>
<td>2</td>
<td>76</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>Paraskevopoulou (2012)</td>
<td>Spain</td>
<td>23</td>
<td>3</td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>Ramanathan et al. (2017)</td>
<td>China &amp; England</td>
<td>8</td>
<td>11</td>
<td>7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Tan et al. (2017)</td>
<td>China</td>
<td>19</td>
<td>12</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Raty et al. (2016)</td>
<td>Finland, Sweden &amp; Norway</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>Steiman (2013)</td>
<td>United States</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Number of times each CSF appeared in each Article: 106 | 46 | 56 | 159 | 21 | 28 | 48 | 93 | 43

**Key:** C=Compliance; S=Stringency; F=Flexibility; p-b=performance-based; A=Affordable; CC=Compliance Cost.

In addition to guiding how article were selected, CASP aided in conducting a sensitivity analysis that determined the quality of each article regarding its relationship with each CSF (Houghton 2016a:2016b). It is assumed that articles with more CSF will have more impact on the overarching synthesis findings. Thus, the density of coding each CSF was identified in three categories (high, medium, and low) for all selected articles. Articles that explored at least three of the CSF were tagged as ‘high’, articles that explored two CSF were tagged medium, and articles that explored only one CSF were tagged as ‘low’. The researcher leveraged on Altheide (1996) to suggest that the more an item is mentioned in an article the more relevant it is in achieving the objective of the research.

See Section 2.6, Section 3.6.4 and Appendix 3.5 for a summary of the reliability of the CSFs.
## Appendix 2, Table 2.2. Characteristics of the Fourteen (14) Selected Studies for the Framework Synthesis

<table>
<thead>
<tr>
<th>Authors/Year/Country of study</th>
<th>Type of Report</th>
<th>Focus of the study</th>
<th>Methods</th>
<th>Sample</th>
<th>Critical Success Factors (CSF) Identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axelsson et al. (2013), Sweden</td>
<td>Journal</td>
<td>The authors aimed to enhance social learning for sustainable landscapes by evaluating experiences from 18 local development initiatives implemented in Bergslagen, Sweden. The sustainable landscape initiative was designed to unite different stakeholders’ efforts by developing multi-level collaboration and learning for sustainable landscapes in Bergslagen, Sweden.</td>
<td>(1) Participant Observation in meetings and workshops. (2) Semi-structured interviews</td>
<td>The authors mapped out 285 activities regarding sustainable landscapes that took place in Bergslagen, Sweden between 2000 and 2012, and interviewed 18 key actors involved in the program. Also, they collected data through observations and discussions with stakeholders in Bergslagen.</td>
<td>1. Stakeholders interaction</td>
</tr>
<tr>
<td>Cho, Laine, Roberts &amp; Rodrigue (2018), United States</td>
<td>Journal</td>
<td>The study projects the need for accountability and transparency in company’s environmental sustainability reports. Drawing on a self-presentation theory and its frontstage/backstage analogy, they contrasted the frontstage sustainability discourse of a sample of large U.S. oil and gas firms to their backstage corporate political activities. They result suggested that the sampled companies’ sustainability report on environmental stewardship and responsibility contrasted sharply with their less visible but proactive political strategies to allow oil exploration within sensitive environmental areas. They do this by influencing legislators to vote for pass the Arctic National Wildlife Refuge (ANWR) Bill. A Bill designed to allow oil exploration within the most sensitive environmental areas in the Wildlife Refuge.</td>
<td>Document Content Analysis</td>
<td>In total, 21 corporate sustainability reports of seven US oil companies were collected. For the quantitative data, they accessed the corporate political action committees (PACs) contribution amounts from oil and gas firms received by members of the 109th U.S. Congress House of Representatives. They examined if legislators receiving significant campaign contributions from the PACs of the seven oil and gas companies were likely to vote in favor of opening ANWR to allow drilling to take place.</td>
<td>1. Stringency. 2. Negative Environmental Stewardship</td>
</tr>
<tr>
<td>Coglianese &amp; Nash (2017), United States</td>
<td>Journal</td>
<td>A focus on Volkswagen scandal. An extensive analysis of U.S. diesel emissions control that depicts how performance-based regulation works in action. The study revealed some limitations found in the performance-based regulation and recommend that policymakers temper their enthusiasm for performance standards with constant vigilance (stringency) to monitor some private-sector tactics that run counter to the actual regulatory goals.</td>
<td>Narrative Case study</td>
<td>An in-depth retrospective study of the united states federal government's efforts to regulate diesel emissions. The U.S. Environmental Protection Agency (EPA) discovered that diesel truck engine manufacturers such as Volkswagen programmed on-board computers to calibrate their engines one way to satisfy the required emissions test, afterwards, they re-calibrate their engines automatically to achieve better fuel economy when the trucks were on the road, despite increasing emissions above the mandated level (p. 33).</td>
<td>1. Stringency. 2. Flexibility. 3. Affordability 4. Negative Environmental Stewardship</td>
</tr>
<tr>
<td>Authors/Year/Country of study</td>
<td>Type of Report</td>
<td>Focus of the study</td>
<td>Methods</td>
<td>Sample</td>
<td>CSF Identified</td>
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<tr>
<td>Hoberg, Peterson St-Laurent, Hagerman &amp; Kozak (2018). Canada</td>
<td>Journal</td>
<td>The paper described the results of a web-based survey that revealed the levels of public support for the implementation of eight forest carbon mitigation strategies in British Columbia’s forest sector. It also examined and quantified the influence of the factors that shape the public support. Trust in scientists and experts, including government agencies and environmental groups was found as being instrumental in understanding the risk perception of climate change.</td>
<td>Online Survey</td>
<td>A total of 1484 completed surveys (90% completion rate) were collected between January 23 and 30, 2017. This total excluded any respondent who do not believe that climate change exists (n = 16, 1.07% of total respondents). They were excluded because the authors perceived that an individual who do not believe climate change exist may not be interested in completing a survey about the strategies to mitigate climate change (p. 7)</td>
<td>1. Uncertainty. 2. Stakeholders interaction</td>
</tr>
<tr>
<td>Hoberg, Malkinson &amp; Kozak (2016). Canada</td>
<td>Journal</td>
<td>The authors examined the response of regulated entities to results-based regulation (RBR) introduced in British Columbia, Canada. They analyzed the operational plans produced through the first round of implementing the new regulatory framework to determine if there was some form of innovation and interviewed key foresters.</td>
<td>(1) Document Review (2) Online Survey (3) Semi-structured Interview</td>
<td>The authors first reviewed the first 65 Forest Stewardship Plans (FSPs) approved by government as of March 15, 2007. Afterwards, a web-based survey was sent to the foresters who developed each of the 65 FSPs, to elicit the rationale behind their choice of practices and willingness to innovate. Subsequently, four FSPs were selected as case studies for in-depth interview through phone in 2011, after the initial data review.</td>
<td>1. Stringency. 2. Flexibility. 3. Environmental Stewardship</td>
</tr>
<tr>
<td>Hurlbert &amp; Gupta (2015). Argentina, Chile and Canada</td>
<td>Journal</td>
<td>As one of the remedies to solving complex environmental problems, the authors aimed to address the conditions under which stakeholders’ participation is likely to be effective what it can achieve in different circumstances. The authors developed a split ladder of participation (SLP) that explains the nature and goal of stakeholders’ participation in four typical circumstances. They then tested the SLP in cases of water governance in Mendoza, Argentina, Coquimbo, Chile, and Alberta and Saskatchewan, Canada.</td>
<td>(1) Semi-structured Interview (2), Document Review</td>
<td>The authors conducted a case study research between 2012 and 2014 by reviewing the literature and policy documents on water governance in four jurisdictions (Mendoza, Argentina), Coquimbo, (Chile), and Alberta and Saskatchewan, Canada). They also conducted 25 interviews with key policy and water governance stakeholders.</td>
<td>1. Uncertainty. 2. Stakeholders interaction</td>
</tr>
<tr>
<td>Hurlbert (2013). Canada</td>
<td>Journal</td>
<td>The author explored how policymakers and stakeholders perceived policy framing and adaptation to climate change, social learning and stakeholders’ participation regarding two successful Agri-environmental programs in Saskatchewan, Canada.</td>
<td>Semi-Structured but open-ended interview</td>
<td>240 rural agricultural producers in Saskatchewan, Canada were interviewed in 2010.</td>
<td>1. Stakeholders interaction. 2. Uncertainty reduction. 3. Affordability. 4. Environmental Stewardship</td>
</tr>
<tr>
<td>Authors/Year/Country of study</td>
<td>Type of Report</td>
<td>Focus of the study</td>
<td>Methods</td>
<td>Sample</td>
<td>CSF Identified</td>
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<tr>
<td>May (2003). New Zealand</td>
<td>Journal</td>
<td>The authors described a case of leaky buildings in New Zealand after the performance-based building regulation was introduced in New Zealand in 1992. He provided a cautionary tale of a flawed performance-based regulatory regime, which allowed for flexibility without sufficient accountability, and thus dragged the regime to its Achilles heel.</td>
<td>Narrative Case Study</td>
<td>A narrative case study of New Zealand leaky building saga that began in mid-1990.</td>
<td>(1) Stringency-limited. 2. Flexibility. 3. Uncertainty. 4. Negative Environmental stewardship</td>
</tr>
<tr>
<td>Paraskevopoulou (2012). Spain</td>
<td>Journal</td>
<td>In this study, Evita Paraskevopoulou explored the influence that non-technological regulations have on innovation and their potentials as inputs for innovation policy. She demonstrated that regulations can contribute to the achievement of targets set by innovation policy while innovation policy measures can facilitate the compensation of negative regulatory implications for innovation.</td>
<td>Semi-Structured interview</td>
<td>26 industry representatives and policy makers, NGOs and industrial associations were identified, and 35 interviews were conducted. The difference number was because some interviewees held dual roles as managers in the company and members of the board of associations.</td>
<td>(1) Stringency 2. Environmental stewardship 3. Uncertainty. 4. Stakeholders interaction</td>
</tr>
<tr>
<td>Ramanathan, He, Black, Ghabadian, Gallear (2017). China and England</td>
<td>Journal</td>
<td>The authors examined the relationships between environmental regulations, firms’ innovation and private sustainability benefits. They unraveled how a firm's environmental actions of improving its private benefits of sustainability could be influenced by its relationship with the government who enacts regulations to maximize public sustainability.</td>
<td>Semi-structured interview</td>
<td>Using nine case studies of the UK and Chinese firms, the authors interviewed fourteen participants - six with UK firms and eight with Chinese firms. The in-depth interviews with the selected companies were conducted between September 2009 and July 2014 (p. 82).</td>
<td>(1) Stringency. (2) Flexibility. (3) Environmental stewardship</td>
</tr>
<tr>
<td>Tan, Chung, Shi, Chiud (2017) China</td>
<td>Journal</td>
<td>The authors examined some unintended consequences of ecological civilization (EC) regulation on firms’ operations and performance. They defined EC as an environmental regulation that set metrics and indicators for firms to create more wealth using less energy. Meanwhile, firms may manipulate the metrics to meet their own interests or to cover their failure to meet the various pressures of achieving the expected targets (p.46)</td>
<td>Semi-structured interview</td>
<td>The study adopted the use of a case study with six Chinese firms, where in 14 participants were interviewed between 2013 and 2014</td>
<td>(1) Stringency. (2) Flexibility. (3) Uncertainty (4) Environmental Stewardship</td>
</tr>
<tr>
<td>Authors/Year/Country of study</td>
<td>Type of Report</td>
<td>Focus of the study</td>
<td>Methods</td>
<td>Sample</td>
<td>CSF Identified</td>
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<tr>
<td>Kitching, Hart &amp; Wilson (2015). England</td>
<td>Journal</td>
<td>The authors contributed to contemporary debates concerning the impact of regulation on small business performance. They were informed by critical realism to theorize regulation as a dynamic force which enables and also constrain performance. An effect that depends on how firms adapt to regulations, and on how firms interact with various stakeholders.</td>
<td>Semi-structured interview</td>
<td>The authors conducted face-to-face semi-structured interviews with 124 small and medium-sized business owners and managers. Each organization employed 1 to 249 people in a variety of sectors, located mainly in London but also in the southeast, southwest, Leicester and Leeds.</td>
<td>(1) Stringency. (2) Affordability (3)Environmental Stewardship</td>
</tr>
<tr>
<td>Raty et al. (2016). Finland, Sweden and Norway</td>
<td>Journal</td>
<td>The authors explored how companies operating in the Nordic wood products value chains used environmental performance measures in their environmental policy and communication with their customers and other stakeholders to project the image of their business while maintaining environmental stewardship (p10).</td>
<td>Semi-structured interview</td>
<td>The authors collected the data for their study through interviews from 37 wood product companies (16 in Finland, 9 in Norway and 12 in Sweden) during the summer of 2011 in Finland, Sweden and Norway</td>
<td>(1) Stringency. (2) Environmental Stewardship</td>
</tr>
<tr>
<td>Steiman (2013). United States</td>
<td>Management Review</td>
<td>The article explained how Kingfisher, one of Europe’s largest home improvement retailers aspire to create a net positive impact on the environment by &quot;putting more back in than it took out. A scheme it termed a Positive Strategy: Where Environmental Stewardship Meets Business Innovation Practices (p.1)</td>
<td>Interview with Nick Folland (Kingfisher)</td>
<td>The author conducted only one interview with Nick Folland.</td>
<td>Environmental Stewardship</td>
</tr>
</tbody>
</table>
Appendix 3: Thematic Network Analysis (TNA) Guide

Attride-Sterling provided a detailed step-by-step guide of the TNA. She divided the TNA into three broad stages, which includes data reduction; data exploration, and the integration of the explored data. This thesis modified the TNA steps in Attride-Sterling (2001) to fit its objectives.

Beginning from the data reduction stage, each transcript was studied; also, new themes were identified. Next, the interview data were categorized and assigned to themes, from which theme frequency tables and the thematic network was generated and explored to reveal connections and emerging patterns that were relevant for addressing the research question. The data reduction stage is described in chapter three. The remaining stages were presented in chapter five to avoid duplicating the report.

Data Reduction: Presenting a large qualitative data can be complex and challenging; however, researchers recommend reducing qualitative research data to manageable codes (Lee and Fielding, 1996). Thus, the TNA commences with data reduction. At this stage, the researcher developed a coding framework. Depending on the research objectives, the coding framework may be based on pre-established criteria from a priori themes that emerge from existing literatures (a deductive approach); it may be based on key issues from the interview transcripts (an inductive approach) or the researcher may combine both approaches (deductive-inductive approach) (Braun and Clark, 2006; Guest, MacQueen & Namey, 2014). This thesis adopted a deductive-inductive coding framework. In the data reduction stage, the researcher identified the deductive-inductive themes. Next, a consistent pattern of negative and positive perception was observed throughout the transcripts; thus, the researcher categorized participant responses by their positive or negative perceptions under each theme. The responses were also categorised by the legislation that each participant’s firm is affiliated with. Appendix 3, Table 3.1 describes how the themes used for the TNA were generated.
## Appendix 3: Table 3.1 Definition of the inductive Themes

<table>
<thead>
<tr>
<th>Main Themes (Deductive Themes)</th>
<th>Subthemes (Inductive Themes)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stringency</td>
<td>Stringency-positive</td>
<td>Strict regulatory measures promote firms’ innovation activities and social learning</td>
</tr>
<tr>
<td></td>
<td>Stringency-limit</td>
<td>Strict regulatory measures distort firms’ innovation activities and social learning</td>
</tr>
<tr>
<td>Flexible Regulatory Requirements</td>
<td>Flexibility enhances continuous improvement</td>
<td>Flexible regulatory requirements enhance continuous improvement, which in turn influences firms’ innovation activities and social learning</td>
</tr>
<tr>
<td></td>
<td>Flexibility Limits Continuous Improvement</td>
<td>Flexible regulations limit continuous improvement, which in turn limit firms’ innovation activities and social learning</td>
</tr>
<tr>
<td>Affordability</td>
<td>High compliance cost</td>
<td>Higher compliance cost reduces the propensity to innovate.</td>
</tr>
<tr>
<td></td>
<td>Low compliance cost</td>
<td>Lower compliance cost increases the propensity to innovate.</td>
</tr>
<tr>
<td>Uncertainties in Regulatory Requirements</td>
<td>Uncertainty reduction – effective Communication</td>
<td>Effectively communicated regulatory requirements reduces uncertainty and increases innovation and social learning</td>
</tr>
<tr>
<td></td>
<td>Uncertainty increment – ineffective Communication</td>
<td>Ineffectively communicated regulatory requirements increases uncertainty and distorts innovation and social learning</td>
</tr>
<tr>
<td>Stakeholders Interaction</td>
<td>Stakeholders Interaction -positive effect</td>
<td>Stakeholders’ interaction enables the formation of formal networks, which enhances social learning and increases the propensity to innovate</td>
</tr>
<tr>
<td></td>
<td>Stakeholders Interaction-negative effect</td>
<td>Stakeholders interaction might increase free-riding, whereby stakeholders use the information of other stakeholders to their own advantage, reducing the competitive advantage of innovating firms</td>
</tr>
<tr>
<td></td>
<td>*Environmental Stewardship</td>
<td>Environmental Stewardship increase accountability, trust and enhances continuous improvement, which increases responsible use of environmental resources and possibly increase the creation of novel ideas and advances social learning</td>
</tr>
<tr>
<td></td>
<td>*Environmental Stewardship is not a subtheme but the global theme that emerged from the interview transcripts.</td>
<td>**</td>
</tr>
</tbody>
</table>
Appendix 3.1. Online Survey Notification (Government of Saskatchewan)

Saskatchewan Environmental Code Performance Survey

The Saskatchewan Environmental Code was implemented approximately three years ago. The development of the first edition of the code was a collaborative effort involving representatives from companies, industry associations, government ministries and agencies at all levels, environmental organizations, First Nations and Métis communities, academia and individuals. The Ministry of Environment commends the commitment and contribution made by more than 200 experts and industry leaders on the development of the code.

The Ministry continues to work with the Code Advisory Committee on additional code chapters. To better inform future direction, we are seeking direct feedback from you, our stakeholders, regarding your experience with the code. Your feedback will help to establish a baseline for future assessments of code performance and client satisfaction, and contribute to continuous improvement of the code and supporting legislation. Your participation is voluntary.

Your anonymous results will be compiled into a summary report that will help improve the code and its future chapters.

The results of this survey will also be used for a Master’s Thesis from the Johnson-Shoyama Graduate School of Public Policy, University of Regina, entitled: Assessing the Effectiveness of Results-based Regulations in Fostering Innovations and Social Learning: A Focus on the Saskatchewan Ministry of Environment.

If you have any questions regarding the survey, please email saskcodesecretariat@gov.sk.ca.

Thank you for your cooperation and assistance. We appreciate your time and effort to provide feedback.

Please complete the survey no later than August 8, 2018.
Appendix 3.2. Saskatchewan Environmental Industry and Management Association

WELCOME TO THE SASKATCHEWAN ENVIRONMENTAL INDUSTRY AND MANAGERS ASSOCIATION HOME PAGE!

SEIMA is the voice of the Environmental Industry in Saskatchewan. We provide networking, communication and educational opportunities to our members, and our goal is to foster the growth of Saskatchewan’s environmental sector through support and success of our members and their operations.

Saskatchewan Environmental Code Interviews

Anonymous member (Administrator) | 20 Sep 2018 11:04 AM

Dear Stakeholders,

You should have received an email from the Saskatchewan Environmental Code team on August 20, 2018, regarding a semi structured interview for an independent research that seeks to assess the performance of the Saskatchewan Environmental Code (code) since inception.

We strongly encourage you to participate in the interview. Your participation will be reported anonymously, with an objective to give constructive feedback for the future improvement of the Saskatchewan results-based regulatory program. Each Interview will be approximately 30 minutes. The Interviews will be conducted either in person or by phone. It was initially slated to end September 30 but is extended to the month of October.

https://www.seima.sk.ca/News-Events/5682644
Appendix 3.2 continues

Jane Chris Akpan, graduate student from the Johnson-Shoyama Graduate School of Public Policy at the University of Regina, will be conducting the interviews. In addition to preparing a report for the ministry, the results of these interviews will be used for her Master’s thesis titled: *Assessing the Effectiveness of Results-based Regulations in Fostering Innovations and Social Learning: A Focus on the Saskatchewan Ministry of Environment*.

If you are interested in providing your perception of the code performance in this research exercise, please contact Jane at Akpan22j@uregina.ca by September 30, 2018 to set up an interview time. This interview is voluntary. Being a university approved research, the University of Regina requires a consent form to be signed.

If you have any questions regarding the survey, please contact Jane at 306-450-8575.

Sincerely,

Patrick Legg

SEIMA
Appendix 3.3. Ethics Approval

Notice of Ethical Review

Principal Investigator: Akpan, Jane
LOR File: 2018-099
Date: July 5, 2018
Title: Assessing the Effectiveness of Results-Based Regulations in Fostering Innovation and Social Learning: A Focus on the Saskatchewan Ministry of Environment

Thank you for your submission to the Research Ethics Board. Your project has been reviewed. Approval is withheld until the REB is satisfied that all revisions and requests for clarification have been addressed.

- Please address the following questions/suggestions by adding your response below each section of this form.
- Attach the revised materials requested using either track changes, highlighting, or bolded text to indicate the changes.
- **DO NOT** resubmit the REB application form.

Dear Jane Akpan,

Thank you for your application for this exciting research project. We have conducted our initial review and have a few comments, questions or suggestions about the application.

Please provide additional information on the following:

<table>
<thead>
<tr>
<th>Section</th>
<th>Comment/question/suggestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8.1</td>
<td>Please revise the start date to REB approval date and confirm that research has not begun.</td>
</tr>
<tr>
<td>3.2</td>
<td>Who will conduct the interviews, where will they be recorded, who will transcribe?</td>
</tr>
<tr>
<td>4.1.2</td>
<td>Please ensure that you use single recipient email or BCC.</td>
</tr>
<tr>
<td>4.7</td>
<td>Please explain how you will ensure that there is no link established between comments and employment in the company.</td>
</tr>
<tr>
<td>5.1</td>
<td>Is it possible that a participant may speak out against the policy, procedure or noncompliance issues in their workplace, and by using a staff email address for say transfer of transcripts, and could jeopardize their employment?</td>
</tr>
<tr>
<td>6.2.2</td>
<td>How will prospective participants be identified? Will they be randomly selected?</td>
</tr>
<tr>
<td>6.2.3</td>
<td>How will you obtain the email addresses of participants?</td>
</tr>
<tr>
<td>7.3</td>
<td>Please explain what are you referring to when you state you will send the results. Are you going to send the final publishable paper, the analyzed data...?</td>
</tr>
<tr>
<td>8.3.2</td>
<td>How will data security be maintained during transportation? (locked briefcase, kept on person, password protected, encrypted, etc.)</td>
</tr>
<tr>
<td>8.3.5</td>
<td>How will electronic files be deleted to ensure security?</td>
</tr>
</tbody>
</table>

**Consent Form**
- Objectives – should state that data will be published, presented, used for thesis etc. Benefits – Should state there are no direct benefits to the participant. It may be beneficial to provide a warning regarding limited confidentiality and participant’s employee email.
- Please proofread for grammar.

**Recruitment**
- Need Recruitment materials (email to request 5/18/18) - Received 5/29/18 – added to file after being sent to reviewers.

Attention to these items should enhance and move your application towards full approval for you to begin this important research. Thank you in advance for attending to these matters.

Regards,
Notice of Ethical Review

Raven Sinclair, BA, CISW, BISW, MSW, PhD
REC Chair
Appendix 3.4. Interview Guide

Assessing the Effectiveness of Results-Based Regulations in Fostering Innovation and Social Learning: A Focus on the Saskatchewan Ministry of Environment

Thank you for agreeing to participate in this interview and for being willing to share your experiences with me on this topic. You may decline to answer questions that you feel uncomfortable with during the interview. Your responses will be coded and recorded anonymously.

Brief Description of the thesis:

This research aims to assess the effectiveness of results-based regulations (RBR) in fostering innovation and social learning in Saskatchewan. RBR is a regulatory model that outlines expected outcomes and allow organizations to develop processes to achieving the outcomes when carrying out certain activities on regulated environmental resources. The RBR model was implemented by the Saskatchewan Ministry of Environment (The Ministry) in 2015. Before implementing RBR, the protection of environmental resources was administered through prescriptive regulations in the province. The prescriptive regulation is process-based and led to delayed approvals of environmental permits. This process wasted productive hours and resulted in a loss of revenue, among other impacts. To mitigate the limitations of the prescriptive regulation, the Ministry implemented the RBR.

Having implemented RBR in 2015, this study aims to answer the research question of what innovation and social learning has been fostered by the Ministry of Environment’s results-based regulations? To address the research question, I will review relevant studies that focus on regulatory reforms, theories of innovation and social learning. The literature review will aid in identifying any knowledge gap, and to build a theoretical framework that supports the empirical analysis. For the empirical analysis, I will collect primary data through online survey and semi-structured interviews with regulated industries that are legislated under EMPA and FRMA.

This research is relevant to the province because it will serve as a baseline for measuring future assessment of the effectiveness of the regulation. It may reveal best practices for other jurisdictions to emulate in regulating similar environmental activities. Also, feedback from stakeholders is increasingly becoming very relevant to informing more effective policy decisions because it enables policymakers to hear from those most affected by the regulations.

Purpose of the Interview:

Through the RBR initiatives, the Ministry developed the Saskatchewan Environmental Code (code). The code is designed to provide options on how to achieve the expected environmental outcomes. Thus, this research is important in the Saskatchewan context. The research seeks to engage organizations and qualified persons regarding their experience associated with RBR. The decision to evaluate the performance of RBR informs the objectives of this interview, which includes:

- To establish a baseline for measuring future assessment of code performance and client satisfaction.
- To contribute to the continuous improvement of the code and also inform the development of additional code chapters.
- To assess if RBR has led to innovation, and social learning, especially where a company decides to follow an alternative solution in achieving the regulatory outcome.
The open-ended interview questions are as follows:

1. What does your organization do, and which legislation applies to your organization?
   - The Environmental Management and Protection Act, 2010 (EMPA)
   - The Forest Resources Management Act (FRMA)
   - Both?
   1i: How long have you been working for this organization?
2. What kind of improvements have you seen as a result of RBR?
   2i. What does innovation mean to you?
   2ii. Can you tell me what innovation you see that has been fostered by the RBR?
3. Do you prefer the acceptable or alternative solutions? Yes/No
   3i. Have you used an alternative solution when carrying out environmental activities (Yes/no)?
   3ii. If yes to 3ii, would you be willing to share how you developed your alternative solutions with other companies?
4. Do you believe the Ministry communicates its code requirements effectively? Yes/No
   4i. If No/Yes, please explain.
   4ii If yes, what was the communication media.
   4iii Are you informed of code updates in a timely fashion?
5. How long does it take you to prepare the documents you submit for alternative solutions/acceptable solution; how long does it take you to do it before RBR was implemented?
   5i: How long does it take to get approval before RBR and after was implemented?
6. Have you attended any seminar(s) that discuss several ways of managing environmental resources?
   6i. Is any of the seminars related to the Saskatchewan Environmental Code/RBR?
7. Is there any economic benefit of the regulatory reform to your business?
   7i. Does the code save your organization money?
8. Do you feel the RBR model makes you more accountable than the prescriptive model?
9. What do you think about the use of a Qualified Person?
10. Are you a Qualified Person? How do you see your role as a qualified person and do you feel it improves environmental protection?
11. Qualified persons only: What does it mean to you to certify an alternative solution?
   11i. Is the 3-year license renewal adequate or be reviewed?
   12. Since RBR was implemented, have you made any suggestions for its improvement to the Ministry?
   12i. How was it communicated (through what media)?
13. Is there any other best practice(s) you could suggest for future code development?
   13i. How can you compare RBR with the regulations of other provinces and countries that regulate similar environmental activities? Any strength and weakness?
14. Do you believe that compliance with the code is being monitored by the Ministry with an appropriate frequency and level of detail? Please give examples.
   15. Have you had any non-compliant issue?
   15i. Do you think non-compliance issues are handled in a fair and timely manner?
16. What are some incentives the Ministry could explore to encourage compliance?
17. Does RBR foster Innovation?
   17i. If yes, are there any hinges that could prevent the innovation?
18. Does RBR foster social learning?
   18i. If yes, are there any hinges that could prevent social learning?
19. Please, do you have any other comment?
Appendix 3.5.

Testing the Reliability of the CSFs in Reporting the Research Findings

The research used a priori themes (CSF) and a global theme (environmental stewardship) to present the research findings in chapters four, five and six. Due to the emergence of environmental stewardship as a global theme, the framework synthesis was conducted again to retested for the reliability of all the themes. In this process, two additional articles that met some of the screening criteria were added (Appendix 3, Table 3.2).

All the articles selected for the framework synthesis were peer reviewed journal, except for one article - Steiman (2013), which was a management review. It was added because of its focus on practical examples of environmental stewardship. Following the strict inclusion criterion set by the researcher (see Appendix 2: section 2.1.4), the article did not stand a good chance of being included in the framework synthesis. However, leveraging on (Finfgeld-Connett, 2003), it was included to avoid publication bias and to match academic writing with the perceptions of firms.

Appendix 3: Table 3.2 illustrates the density of coding for each CSF and environmental stewardship in the fourteen articles. The green colours represent articles with more than three CSFs; Blue represent

<table>
<thead>
<tr>
<th>s/n</th>
<th>Country of Study</th>
<th>SF</th>
<th>F</th>
<th>A</th>
<th>U</th>
<th>Si</th>
<th>Es</th>
<th>Six CSF</th>
<th>Five CSF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Axelsson et al. (2013)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td>√</td>
<td>Med</td>
<td>low</td>
</tr>
<tr>
<td>2</td>
<td>Coglianese &amp; Nash (2017)</td>
<td>×</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td>×</td>
<td>High</td>
<td>high</td>
</tr>
<tr>
<td>3</td>
<td>Cho et al. (2018)</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td>Med</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Hoberg, Malkinson &amp; Kozak (2016)</td>
<td>√</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td>Med</td>
</tr>
<tr>
<td>7</td>
<td>Hurlbert (2013)</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td>√</td>
<td>√</td>
<td>High</td>
<td>high</td>
</tr>
<tr>
<td>8</td>
<td>May (2003)</td>
<td>×</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td>high</td>
</tr>
<tr>
<td>9</td>
<td>Paraskevopoulou (2012)</td>
<td>√</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td>High</td>
<td>Med</td>
</tr>
<tr>
<td>11</td>
<td>Tan et al. (2017)</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td>high</td>
</tr>
<tr>
<td>13</td>
<td>Raty et al. (2016)</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td>Med</td>
<td>low</td>
</tr>
<tr>
<td>14</td>
<td>Steiman (2013)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Min</td>
<td></td>
</tr>
</tbody>
</table>

Number of Articles that explored each CSF: 10 5 3 6 5 12

Where S=Stringency; F= Flexibility; A=Affordability; U= Uncertainty; Si=Stakeholders’ Interaction; Es= Environmental Stewardship

31 Etzkowitz and Ranga (2013) recommends a continuous cross-interaction of regulators, firms and academia. This effort is not to dilute the rigor involved in developing academic writings but to enhance knowledge creation, which may enhance the transition to a knowledge society, and result in a mass of niche innovation.
articles with at least two CSFs and yellow represent articles with only one CSF. An additional colour coding was included to accommodate why Steiman (2013) was highlighted in orange colour due to its low CASP\textsuperscript{32} rating on research quality. Thus, following Houghton et al. (2016a), the fourteen selected articles where assessed thus: \( n = 14 \); Where \( n \) = number of selected articles: \( n = 8 \), indicating high amount of CSF in these articles, \( n = 5 \) medium, and \( n = 1 \) minimum amount of CSF in each article.

In this final synthesis there was no article under the ‘low’ criteria, because the inclusion of a new CSF increased the robustness of all the articles. Articles with positive effects on each CSF are marked with this symbol (\( \sqrt{\text{\scriptsize{\textbullet}}} \)), while articles with negative effects on each CSF are marked with (\( \times \)). Though Steiman (2013) rated minimum when assessed by the research rigour using CASP, but its effect on the final analysis was minimal and did not skew the overall synthesis to any direction. In general, the inclusion of environmental stewardship increased the robustness of the synthesis.

In summary, after conducting the screenings and quality appraisal. The inclusion of environmental stewardship increased the robustness of the synthesis because the frequency of CSF in some articles selected initially increased, which increased their significance on the overall synthesis. For instance, when the matrix coding for themes quality appraisal was repeated after including environmental stewardship in the search, the impact of the following articles increased from medium to high impact: Hoberg, Malkinson & Kozak (2016); Paraskevopoulou (2012); Ramanathan et al. (2017); Kitching, Hart & Wilson (2015), color coded in green. Also, Axelsson et al. (2013), and Raty et al. (2016) increased from low to medium impact, color coded in blue (see Appendix Table 3.1).

\textsuperscript{32} Critical Appraisal Skills Programme (CASP, 2006) was designed by the British Public Health Resource Unit. It outlines cogent questions that relate to the principles or assumptions that characterises qualitative research such as the clarity of a report, rigors undertaken in its methodology, the depth of the study’s conceptual framework and paradigmatic coherency (also see CASP, 2018; Campbell et al., 2011; Valderas et al., 2012; Jordan et al, 2016).
Appendix 3.6. Survey Questionnaire

Your feedback is important

Having implemented the Saskatchewan Environmental Code (code) in 2015, the ministry would like to hear from those who have been working with the code chapters or with the ministry on their development. This brief survey is a tool for ensuring your feedback contributes to an ongoing process of improvement and effective environmental management.

The survey of forty-eight questions is divided into three sections: 1) Ranking statements you may agree or disagree with; 2) Open-ended questions for detailed responses and questions regarding your involvement in developing the code chapters; 3) Targeted questions for qualified persons.

Section One

The following statements are grouped into five themes. Please check (√) each statement to indicate your views:
1= Strongly Disagree, 2=Disagree, 3=Agree, 4= Strongly Agree, N/A= Not Applicable

| REDUCTION IN REGULATORY RED TAPE (MEASURING UNCERTAINTY REDUCTION AND AFFORDABILITY) |
|---------------------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| 1 The acceptable solution process provides for simplified and timely approval. |
| 1a Prior to code, on average, how many days did it previously take to receive approval? # of days previously |
| 2 The code uses plain language and provides clear and direct information. |
| 3 The code reduces barriers and impediments. |
| 4 The code removes redundant and duplicative processes. |
| 5 The alternative solution process provides a flexible option for my organization. |
| 6 The code saves my organization money. |
| 7 During the code development process my organization’s feedback was considered. |
| 8 Additional comments: |

<table>
<thead>
<tr>
<th>EFFECTIVE COMMUNICATION : MEASURING UNCERTAINTY REDUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 Has the ministry communicated code requirements effectively?</td>
</tr>
<tr>
<td>10 I know where to provide feedback on the code.</td>
</tr>
<tr>
<td>11 My feedback is heard and responded to in a timely manner.</td>
</tr>
<tr>
<td>12 I am being informed regarding code updates in a timely fashion.</td>
</tr>
<tr>
<td>13 I believe that the ministry understands and engages with my organization.</td>
</tr>
<tr>
<td>14 I believe that the ministry is transparent and explains its decisions that affect my organization.</td>
</tr>
<tr>
<td>15 The code imposes unnecessary paperwork (if agree, please explain in additional comments).</td>
</tr>
<tr>
<td>16 Additional comments:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TRANSPARENCY, ACCOUNTABILITY AND ENVIRONMENTAL STEWARDSHIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 I have confidence in the use of qualified persons.</td>
</tr>
<tr>
<td>18 The use of qualified persons helps ensure regulatory compliance.</td>
</tr>
<tr>
<td>19 Qualified persons are held accountable.</td>
</tr>
<tr>
<td>20 My organization is held accountable to the code.</td>
</tr>
<tr>
<td>21 The acceptable solution provides fair and consistent requirements.</td>
</tr>
<tr>
<td>22 It is appropriate to be able to use my organization’s internal audit, processes and results to fulfil the requirements of the ministry’s environmental compliance audit.</td>
</tr>
<tr>
<td>23 Compliance with the code is being monitored by the ministry with an appropriate frequency and level of detail.</td>
</tr>
<tr>
<td>24 All information, data, test results, reports, returns and records, and responses submitted to the Minister should be public information, with exceptions.</td>
</tr>
</tbody>
</table>
Additional comments:

## CONTINUOUS IMPROVEMENT OF RESULTS-BASED REGULATION: MEASURING UNCERTAINTY REDUCTION AND FLEXIBILITY

- Information (regulations, standards, etc.) are updated in a timely manner.
- The ministry is responsive to industry needs.
- The ministry is responsive and flexible to changing science and technology.
- Has information management modernization in the ministry met the needs of the environmental code to promote efficiency?

## MONITORING, COMPLIANCE AND ENFORCEMENT: MEASURING REGULATORY STRINGENCY

- I understand the ministry’s compliance and enforcement policies and consequences of non-compliance.
- There are too many reporting requirements in the code.
- There are too many monitoring requirements in the code.
- There are too many record keeping requirements in the code.
- Non-compliance issues are handled in a fair and timely manner.

## Section Two

- What suggestions do you have to improve the code?
- Do you have any suggestions for future code development?
- If you have submitted an alternative solution, was it innovative? Please explain how it was innovative.
- What was your experience with how your alternative solution was reviewed?
- What are some incentives the ministry could explore to encourage compliance?

## Section Three: Questions for designated qualified persons

- Was the application and approval process timely? Yes No
- Was the information requested reasonable?
- Was the feedback adequate?
- Is a three-year expiry date reasonable?
- Should classes of qualified persons be expanded to include other professionals? If yes, which class and why?

## Additional comments:
## Appendix 4: Extracts of Survey Results from SPSS

### Table 4.1. Cross-tabulation: Item5 * Legislation

<table>
<thead>
<tr>
<th>Likert-item 5</th>
<th>Likert Options</th>
<th>Frequency</th>
<th>Legislation</th>
<th>EMPA</th>
<th>EMPA &amp; FRMA</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Agree</td>
<td>Count</td>
<td>5</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% within Legislation</td>
<td></td>
<td>15%</td>
<td>8%</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Agree</td>
<td>Count</td>
<td>18</td>
<td>1</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% within Legislation</td>
<td></td>
<td>55%</td>
<td>8%</td>
<td>42%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Disagree</td>
<td>Count</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% within Legislation</td>
<td></td>
<td>15%</td>
<td>42%</td>
<td>22%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td>Count</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% within Legislation</td>
<td></td>
<td>0%</td>
<td>33%</td>
<td>9%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not Applicable</td>
<td>Count</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% within Legislation</td>
<td></td>
<td>15%</td>
<td>8%</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>Count</td>
<td>33</td>
<td>12</td>
<td>45</td>
<td></td>
</tr>
</tbody>
</table>

*Approximate% % within Legislation 100% 100% 100%

*All percentages were rounded up approximately to their nearest whole numbers.

### Table 4.2 Chi-Square Test Result

<table>
<thead>
<tr>
<th>Value</th>
<th>Df</th>
<th>Asymptotic Significance (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>19.019</td>
<td>0.002</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>45</td>
<td></td>
</tr>
</tbody>
</table>

### Table 4.3. Cross-tabulation: Item6 * Legislation

<table>
<thead>
<tr>
<th>Likert-item 6</th>
<th>Likert Options</th>
<th>Frequency</th>
<th>Legislation</th>
<th>EMPA</th>
<th>EMPA &amp; FRMA</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Agree</td>
<td>Count</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% within Legislation</td>
<td></td>
<td>0%</td>
<td>8%</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Agree</td>
<td>Count</td>
<td>9</td>
<td>1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% within Legislation</td>
<td></td>
<td>27%</td>
<td>8%</td>
<td>22%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Disagree</td>
<td>Count</td>
<td>16</td>
<td>4</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% within Legislation</td>
<td></td>
<td>49%</td>
<td>33%</td>
<td>44%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td>Count</td>
<td>1</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% within Legislation</td>
<td></td>
<td>3%</td>
<td>42%</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not Applicable</td>
<td>Count</td>
<td>7</td>
<td>1</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% within Legislation</td>
<td></td>
<td>21%</td>
<td>8%</td>
<td>18%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>Count</td>
<td>33</td>
<td>12</td>
<td>45</td>
<td></td>
</tr>
</tbody>
</table>

*Approximate% % within Legislation 100.00% 100.00% 100.00%

*All percentages were rounded up approximately to their nearest whole numbers.
Table 4.4 Chi-Square Test Results

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>df</th>
<th>Asymptotic Significance (2-sided)</th>
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</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>15.298</td>
<td>4</td>
<td>0.004</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>45</td>
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<td></td>
</tr>
</tbody>
</table>

Appendix 4: Table 4.5. Cross-tabulation: Item 12 * Legislation

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<tr>
<th>Likert-item 12</th>
<th>Likert-options</th>
<th>Frequency</th>
<th>Legislation</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>EMPA</td>
<td>EMPA &amp; FRMA</td>
</tr>
<tr>
<td>I believe that</td>
<td>Strongly Agree</td>
<td>Count</td>
<td></td>
</tr>
<tr>
<td>the Ministry</td>
<td></td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>understands</td>
<td></td>
<td>% within</td>
<td></td>
</tr>
<tr>
<td>and engages</td>
<td></td>
<td>Legislation</td>
<td>12%</td>
</tr>
<tr>
<td>with my</td>
<td>Agree</td>
<td>Count</td>
<td></td>
</tr>
<tr>
<td>organization:</td>
<td></td>
<td>21</td>
<td>1</td>
</tr>
<tr>
<td>my</td>
<td></td>
<td>% within</td>
<td></td>
</tr>
<tr>
<td>organization:</td>
<td>Disagree</td>
<td>Count</td>
<td></td>
</tr>
<tr>
<td>Stakeholders</td>
<td></td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Interaction</td>
<td>Strongly Disagree</td>
<td>Count</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Not Applicable</td>
<td>Count</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>% within Legislation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>% within</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Legislation</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Count</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>% within</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Legislation</td>
<td>100.00%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>Count</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>33</td>
<td>12</td>
</tr>
</tbody>
</table>

Appendix 4: Table 4.6 Chi-Square Tests

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Df</th>
<th>Asymptotic Significance (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>21.937</td>
<td>4</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Creating Likert-Scale from Likert-items (Survey in Appendix 3.6)

<table>
<thead>
<tr>
<th>Likert Scale</th>
<th>Items</th>
<th>Individual Likert-items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Affordability = Mean(Item6, item18, item24)</td>
<td>6</td>
<td>The code saves my organization money</td>
</tr>
<tr>
<td>18</td>
<td>My organization is held accountable to the code</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>The Ministry is responsive to industry needs</td>
<td></td>
</tr>
<tr>
<td>2 Uncertainty Reduction = Mean(item1, item2, item3, item4, item9, item10, item11, item13, item14, item19, item23, item26, item27, item32, item33, item34, item35)</td>
<td>1</td>
<td>The acceptable solution process provides for simplified and timely approval</td>
</tr>
<tr>
<td>2</td>
<td>The code uses plain language and provides clear and direct information</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>The code reduces barriers and impediments</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>The code removes redundant and duplicative processes</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Has the Ministry communicated code requirements effectively?</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>I know where to provide feedback on the code</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>My feedback is heard and responded to in a timely manner</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>I am being informed regarding code updates in a timely fashion</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>The code imposes unnecessary paperwork.</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>The acceptable solution provides fair and consistent requirements</td>
<td></td>
</tr>
</tbody>
</table>
In information (regulations, standards, etc.) are updated in a timely manner.

26 Information management modernization in the Ministry promotes efficiency.

27 I understand the Ministry’s compliance and enforcement policies and consequences of non-compliance.

28 Are you familiar with the objectives of the code?

29 Was the application and approval process timely?

30 Was the information requested reasonable?

31 Was the feedback adequate?

32 The alternative solution process provides a flexible option for my organization.

33 The Ministry is responsive and flexible to changing science and technology.

34 During the code development process my organization’s feedback was considered.

35 Has the Ministry communicated code requirements effectively?

36 I believe that the Ministry understands and engages with my organization.

37 All information, data, test results, reports, returns and records, and responses submitted to the Minister should be public information, with exceptions.

Appendix 4: Table 4.8.1 Suggested Best Practice

<table>
<thead>
<tr>
<th>Research Themes - the CSF</th>
<th>Best Practice from the respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexibility</td>
<td>(a)  Be less prescriptive and open to the idea that there are different ways to achieve the results desired</td>
</tr>
<tr>
<td></td>
<td>(b)  More acceptable solutions will be excellent</td>
</tr>
<tr>
<td></td>
<td>(c)  The portal needs to be more user-friendly</td>
</tr>
<tr>
<td></td>
<td>(d)  Easier web accessibility</td>
</tr>
<tr>
<td></td>
<td>(e)  More clear and direct information is required regarding Pathway/receptor elimination, including the long-term consequences of Pathway elimination (development restrictions and legal instruments)</td>
</tr>
<tr>
<td></td>
<td>(f)  Clearly defined remediation standard for discharges below ‘table 1 quantities in the code’</td>
</tr>
<tr>
<td></td>
<td>(g)  Repetitive sections should be removed with the option to click on them, similar to the way the glossary of terms is handled</td>
</tr>
<tr>
<td></td>
<td>(h)  Create a hard copy of the SEQS endpoints like Alberta has and keep it for a year, then update it once a year</td>
</tr>
<tr>
<td></td>
<td>(i)  Continue updates to major regulations. Continue with supporting documents such</td>
</tr>
</tbody>
</table>
as chapters and guidance documents for specific topics/subject matter

(j) Improved guideline consistency across Canada

(k) The code should require a pass/fail system based on 85% correct work

Enhanced stakeholders’ interaction

(l) Provide workshops for people to attend to learn more about the code.

(m) Increased sector consultations during development

(n) Additional discussion regarding property sale and the implications of CAPs which impact future development of properties. I am seeing CAPs prepared for property sellers which severely restrict future development. These can be misunderstood by financing institutions and purchasers.

(o) Continuous training: “Fix discharge and discovery (table 1 of Chapter 1) and provide training to the staff who have to work with it so they can help”

(p) The model from the original code writing was appropriate, with participation from all stakeholders

Stringency

(q) Do away with survey requirements for sample locations in certain risk assessment supported submissions

(r) Consideration of specific requirements for sites that have undergone environmental assessment processes

(s) The list of acceptable qualified persons does not include chemists except by special exception. Working with the chemists within the province to include them as options for qualified persons would be a good step

(t) QPs should be involved in the annual reports to improve the quality of annual reports that the Ministry receives

(u) The Ministry should increase its vigilance on small scale operators enforcing the regulations

New Code Chapters

(1) Linear development code chapter

(2) Develop and implement the landfill chapter

(3) Hazardous materials and waste code development needs to be a priority

(4) Add more land uses to the criteria suite, specifically to address mixed-use type of properties

(5) Develop a water and waste-water code for some types of expansions/improvements

(6) Salt criteria for Saskatchewan soils

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**Appendix 5: Extracts of Transcript Results**

**Appendix 5: Table 5.1: Assigning Responses to Themes – Positive Responses**

<table>
<thead>
<tr>
<th>Interview Guide</th>
<th>Transcripts Responses</th>
<th>Subthemes</th>
<th>Themes (CSF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. What kind of improvement have you seen as a result of RBR?</td>
<td>1. It helps clarify the requirements. 2. It provides more guidance to the proponent on how to get through the system. 3. It can be done online</td>
<td>Continuous Improvement</td>
<td>Flexibility</td>
</tr>
<tr>
<td>3. Do you prefer acceptable or alternative solution?</td>
<td>1. I prefer Alternative Solutions</td>
<td>Continuous Improvement</td>
<td>Flexibility</td>
</tr>
<tr>
<td>3iii. If you have used alternative solutions, would you be willing to share how you developed your alternative solutions with other companies?</td>
<td>1. We have given a talk on it in a conference. 2. We have presented our approaches to SEIMA. Risk assessment is not proprietary. It’s something that the education should be accessible for anyone to do.</td>
<td>formal network</td>
<td>Stakeholders’ Interaction</td>
</tr>
<tr>
<td>4. Do you believe the Ministry communicates its code requirements effectively?</td>
<td>1. Whenever we have questions, they are good at returning calls and emails. 2. They have done a couple of information sections.</td>
<td>Effective communication</td>
<td>Uncertainty Reduction</td>
</tr>
<tr>
<td>4iii. Are you informed of code updates in a timely fashion?</td>
<td>1. We get emails once something is changed. 2. No recent update on the current code, however, in the Saskatchewan Mining Association, the Environmental Forum in Saskatoon, the Ministry could speak.</td>
<td>Effective communication</td>
<td>Uncertainty Reduction</td>
</tr>
<tr>
<td>6. Have you attended any seminar(s) that discuss several ways of managing environmental resources?</td>
<td>1. SEIMA. 2. South East Saskatchewan Air Zone Association. Association of North America. 3. Association of Saskatchewan Forestry Professionals. 4. Canadian Steel Association.</td>
<td>Formal network</td>
<td>Stakeholders’ Interaction</td>
</tr>
</tbody>
</table>
6. Is any of the seminars related to the Saskatchewan Environmental Code/RBR?

1. We participate in many environmental associations. A lot of these are implemented to discuss certain issues such as species at risk in grasslands. 2. We talk about how we comply with several variety of legislations. Code chapters are discussed.

7. Is there any economic benefit of the regulatory reform to your business?

1. Less time and effect. Quick turnaround time for permitting. 2. There is economic benefit because companies don’t feel threatened by the ambiguity of the regulation. 3. Because you can choose alternative ways of doing thing, it can save you money.

7i. Does the code save your organization money?

1. It’s been a more consistent approach and shorten the time it takes. 2. There is economic benefit because companies don’t feel threatened by the ambiguity of the regulation. 3. Because you can choose alternative ways of doing thing, it can save you money.

Appendix 5: Table 5.2 Transforming Data to Themes – Negative Responses

<table>
<thead>
<tr>
<th>Question</th>
<th>Interview Transcripts Examples</th>
<th>Subthemes</th>
<th>Themes (CSF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. What kind of improvement have you seen as a result of RBR?</td>
<td>No improvement</td>
<td>Flexibility-Limit Continuous Improvement</td>
<td>Flexibility</td>
</tr>
<tr>
<td>3iii. If you have used alternative solutions, would you be willing to share how you developed your alternative solutions with other companies?</td>
<td>No. It’s our competitive advantage.</td>
<td>Stakeholders interaction-negative</td>
<td>Stakeholders’ Interaction</td>
</tr>
<tr>
<td>4iii. Are you informed of code updates in a timely fashion?</td>
<td>I didn’t seem to get regular updates about what is happening. The consultants tell us of the code, we don’t get it directly.</td>
<td>Uncertainty Increased</td>
<td>Uncertainty</td>
</tr>
<tr>
<td>6. Have you attended any seminar(s) that discuss several ways of managing environmental resources?</td>
<td>No, I have never been to any. At the time of implementing RBR, I was not in the role.</td>
<td>Stakeholders interaction-negative effect</td>
<td>Stakeholders’ Interaction</td>
</tr>
<tr>
<td>6i. Is any of the seminars related to the Saskatchewan Environmental Code/RBR?</td>
<td>I never have gone to events put up by the Ministry discussing the upcoming issues.</td>
<td>Stakeholders interaction-negative effect</td>
<td>Stakeholders’ Interaction</td>
</tr>
<tr>
<td>7. Is there any economic benefit of the regulatory reform to your business?</td>
<td>Not at this time. As consultants it does not save us money but can save our clients’ money</td>
<td>Affordability-high compliance cost</td>
<td>Affordability</td>
</tr>
<tr>
<td>7i. Does the code save your organization money?</td>
<td>Not at this time. 3. It does not save consultants’ money but can save our clients’ money</td>
<td>Affordability-high compliance cost</td>
<td>Affordability</td>
</tr>
</tbody>
</table>

Appendix 5: Table 5.3 Percentage of Cumulative Frequency (PCF) per Legislation

<table>
<thead>
<tr>
<th>Affordability</th>
<th>EMPA</th>
<th>FRMA</th>
<th>EMPA &amp; FRMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Responses</td>
<td>11</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>Positive Perception</td>
<td>73%</td>
<td>100%</td>
<td>57%</td>
</tr>
<tr>
<td>Negative Perception</td>
<td>27%</td>
<td>0</td>
<td>43%</td>
</tr>
</tbody>
</table>

Appendix 5: Table 5.4 Uncertainty Reduction

<table>
<thead>
<tr>
<th>Category</th>
<th>EMPA</th>
<th>FRMA</th>
<th>EMPA &amp; FRMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responses</td>
<td>18</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>Positive Perception</td>
<td>72%</td>
<td>100%</td>
<td>85%</td>
</tr>
<tr>
<td>Negative Perception</td>
<td>28%</td>
<td>0%</td>
<td>15%</td>
</tr>
</tbody>
</table>

Appendix 5: Table 5.5 Flexible Regulatory Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>EMPA</th>
<th>FRMA</th>
<th>EMPA &amp; FRMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Responses</td>
<td>35</td>
<td>11</td>
<td>34</td>
</tr>
<tr>
<td>Positive Perception</td>
<td>63%</td>
<td>91%</td>
<td>71%</td>
</tr>
<tr>
<td>Negative Perception</td>
<td>37%</td>
<td>9%</td>
<td>32%</td>
</tr>
</tbody>
</table>
### Appendix 5: Table 5.6: Stakeholders’ Interaction

<table>
<thead>
<tr>
<th>Category</th>
<th>EMPA</th>
<th>FRMA</th>
<th>FRMA &amp; EMPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Responses</td>
<td>35</td>
<td>9</td>
<td>24</td>
</tr>
<tr>
<td>Positive Perception</td>
<td>79%</td>
<td>56%</td>
<td>96%</td>
</tr>
<tr>
<td>Negative Perception</td>
<td>21%</td>
<td>44%</td>
<td>4%</td>
</tr>
</tbody>
</table>

### Appendix 5: Table 5.7. Theme Frequency Table: Responses on the Perception of Qualified Persons

<table>
<thead>
<tr>
<th>(a) Item</th>
<th>(b) Questions from Interview Guide</th>
<th>(c) Dominant subtheme</th>
<th>(d) EMPA</th>
<th>(e) FRMA</th>
<th>(f) Both</th>
<th>(g) All Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total=11</td>
<td>Total=3</td>
<td>Total=8</td>
<td>Cumulative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>What do you think about the use of a Qualified Person?</td>
<td>Stringency-positive</td>
<td>9 0 1 0 6 0 16 0 16 6 22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10i</td>
<td>How do you see your role as a qualified person (QP) and do you feel it improves environmental protection?</td>
<td>Stringency-positive</td>
<td>3 0 2 0 4 0 9 0 9 0 9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Qualified persons only: What does it mean to you to certify an alternative solution?</td>
<td>Stringency-positive</td>
<td>2 0 2 0 2 0 6 0 6 3 9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11i</td>
<td>Is the 3-year license renewal adequate or be reviewed?</td>
<td>Stringency-positive</td>
<td>3 0 0 0 2 0 5 0 5 4 9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total number of responses (items: 9,10i,11,11i)</td>
<td></td>
<td></td>
<td>17 0 5 0 14 0 36 0 36 13 49</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cumulative percentage of ‘P &amp; N’ for each legislation from columns d, e &amp; f</td>
<td></td>
<td></td>
<td>100% 0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Keys: P=Positive Perception; N=Negative Perception; C=Classified responses; Unc=Unclassified response.

### Appendix 5: Table 5.8 Suggested Best Practice (Item 13)

<table>
<thead>
<tr>
<th>Organizing Themes (also the CSF)</th>
<th>Best Practice Contextualized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexibility</td>
<td>(a) Additional code chapters</td>
</tr>
<tr>
<td></td>
<td>(b) Regular review of the code</td>
</tr>
<tr>
<td></td>
<td>(c) Unify the government processes regarding environmental regulations</td>
</tr>
<tr>
<td>Reduction of uncertainties in regulatory requirements</td>
<td>(d) Improved online services and proving appropriate guidelines</td>
</tr>
<tr>
<td></td>
<td>(e) Improved Timelines for Approval</td>
</tr>
<tr>
<td>Enhanced stakeholders’ interaction</td>
<td>(f) Increase in stakeholders’ interactions to discuss compliance issues</td>
</tr>
<tr>
<td></td>
<td>(g) Continuous training (knowledge sharing)</td>
</tr>
<tr>
<td></td>
<td>(h) Increase trust</td>
</tr>
<tr>
<td>Stringency</td>
<td>(i) Strengthen stringent measures</td>
</tr>
</tbody>
</table>

Appendix 5: Table 5.8 presents four themes that were deduced from ‘item 13.’ They provided relevant information that may inform the development of additional code chapters as follows:
i. **Flexibility:** best practices suggested under the flexibility theme include the provision of additional code chapters, regular review of the code and unifying some regulatory processes. Participants suggested a regular review of the current code chapters and inclusion of additional environmental activities in the code such as the Hazard Materials and Waste Dangerous Goods; the installation of Linear Developments (i.e. Power lines, fiber optic lines, roads etc.); Wildfire Act; Wildlife, and Ground water monitoring. Also, some participants suggested that the Ministry should reach out for input from experts on what new code chapters should be developed (P1, P2, P3, P5).

Another significant suggestion was the need to unify the government processes regarding environmental regulations. ‘P10’ explained that documents of environmental activities such as *upstream oil and gas stream in Saskatchewan* should align with the code, though they are currently managed by two Ministries - the Saskatchewan Ministry of Environment and Saskatchewan Ministry of Energy and Resources.

ii. **Reduction of Uncertainties in Regulatory Requirements:** improving approval timelines, online services and provision of appropriate guidelines were suggested to mitigate the uncertainties around RBR. Regarding the online services, participants who experienced some difficulty when uploading large files on the Ministry’s portal suggested an expansion of the capacity for file upload. Also, there was a general consensus to improve the Saskatchewan Environmental Quality Guideline (SEQG). Other suggestions guidance documents regarding Environmental Protection Plan (EPP) for industrial facility, and guidance on the administrative control on ground disturbance policy and By-Law changes. Participants explained that the current administrative control regarding ground distribution is a bit vague, *using a phrase like ‘implement them appropriately,’ is hard to decipher the context of appropriate implementation* (p12). In addition, participants look forward to a faster response time in approving alternative solutions as delays are accompanied with loss of business opportunities consequences.

iii. **Enhanced Stakeholders’ Interaction:** a significant number of the participants look forward to improved stakeholders’ interaction. Also, the issue of trust was highlighted by few participants. Improved stakeholders’ interaction may involve the Ministry and stakeholders getting together to deliberate about compliance issues. The interaction happened already in the mining sector, but it hasn’t happened in the code sessions; these talks will enable us devise strategies in managing the forest inventory problem. The Ministry should embark on this project and do it together with all the various chapters. We want to hear how other industry sectors are managing their emissions, we don’t have that kind of dialogue (P8). Another participant suggested that QPs should get together to deliberate on issues that arise and changes to practices (P13). Also, social trust was identified as a binding factor that may enhance stakeholders’ interaction (see Pretty and Ward, 2001).

(iv) **Strengthen stringent measures:** increased measures for the quality of works approved was suggested. Also, a suggestion was made that a QP for tier 3 has to be a risk assessor to cover a corrective action plan (P13).

### Appendix 5.1: Incentives to encourage Compliance

(a) **Financial benefits:** there are financial burden to remediate sites; an incentive will be the ability to implement more innovative solutions. There is a certain level of cost that goes with it, requiring some funding or tax credit on it; some way to level the capital expenditure by the client for both alternative and acceptable solutions (P12)

(b) **Awards and recognitions:** participants suggested the issuance of awards and public recognition at zero cost - public ranking for environmental performance, recognizing good environmental protection; it does have some commercial value. For example, our major customers ask about how compliant we are to environmental protection, the amounts of greenhouse gases emissions, and environmental, health and safety performance. Clients have interest in such reports (P1, P4, P13, P21).
(c) **Timely Feedback:** if we know that when we deal with the Ministry, we will get response in a timely manner, that will help in our compliance. Delayed response tends to deter one from doing things out of the box. They basically need to increase their staff (P16)

(d) **Increase stakeholders’ interaction:** enable forums where companies meet to interact on specific chapter issues and share ideas on associated risks, mitigation and compliance methods (P8).

(e) **Increased education and communication:** increase in the education and communication, where they bring their experts to communicate the legal requirements. Explaining what they are looking for, and communicate the benefits of the review process (P2, P6, P11).

(f) **Strengthen stringent requirements:** they should be better at rejecting poor quality works (P14)
## Appendix 6.1. Comparing Findings of Similar Studies

<table>
<thead>
<tr>
<th>Authors/Year/Type of Report/Country of study</th>
<th>Study Focus</th>
<th>Methods</th>
<th>CSF identified</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Weiss and Anisimova (2018). *</td>
<td>They provided an empirical insight into the Porter hypothesis (PH) and its dynamic nature. Swedish environmental regulation of polluting industries provides an interesting case because it has been praised, due to containing elements of ‘well-designed’ regulations, for being conducive to accomplishing the ‘win-win’ situation of mutual environmental and economic benefits.</td>
<td>1. Quantitative Analysis through a secondary data. They conducted an econometric test of the PH proposition, using Swedish pulp and paper plants as empirical application. The PH posits that well-designed environmental regulations induce eco-innovations at polluting firms that improve both their environmental and business performance via ‘innovation offsets’.</td>
<td>1. Flexibility 2. Stringency 3. Reduction of uncertainty</td>
<td>The empirical results indicate that flexible and dynamic command-and-control regulation and economic incentive instruments have induced innovation offsets through improved energy efficiency</td>
</tr>
<tr>
<td>Ramanathan, He, Black, Ghobadian, Gallear (2017). *</td>
<td>See Appendix 2, Table 2.2: The authors examined the relationships between environmental regulations, firms’ innovation and private sustainability benefits. They unraveled how a firm’s environmental actions of improving its private benefits of sustainability could be influenced by its relationship with the government who enacts regulations to maximize public sustainability.</td>
<td>See Appendix 2, Table 2.2: Semi-Structured Interview Using nine case studies of the UK and Chinese firms, the authors interviewed fourteen participants - six with UK firms and eight with Chinese firms. The in-depth interviews with the selected companies were conducted between September 2009 and July 2014 (p. 82).</td>
<td>See Appendix 2, Table 2.2: (1) Stringency. (2) Flexibility. (3) Environmental stewardship (Global theme in RBR thesis)</td>
<td>See Section 1.1. The result of their study showed that firms who adopted a more dynamic approach in responding to environmental regulations innovatively, and who were proactive in managing their environmental performance, were generally better able to reap the private benefits of sustainability (p. 89).</td>
</tr>
<tr>
<td>Hoberg, Malkinson &amp; Kozak (2016). *</td>
<td>See Appendix 2, Table 2.2: The authors examined the response of regulated entities to results-based regulation (RBR) introduced in British Columbia, Canada. They analyzed the operational plans produced through the first round of implementing the new regulatory framework to determine if there was some form of innovation and interviewed key foresters.</td>
<td>See Appendix 2, Table 2.2: (1) Document Review (2) Online Survey (3) Semi-structured Interview The authors reviewed the first 65 Forest Stewardship Plans (FSPs) approved by government as of March 15, 2007. Afterwards, a web-based survey was sent to the foresters who developed each of the 65 FSPs, to elicit the rationale behind their choice of practices and willingness to innovate. Subsequently, four FSPs were selected as case studies for in-depth interview through phone in 2011, after the initial data review.</td>
<td>See Appendix 2, Table 2.2: 1. Stringency. 2. Flexibility. 3. Environmental Stewardship (Global theme in RBR thesis)</td>
<td>They found that RBR did not foster Innovation (See Section 5.4.1.2) They found that the foresters in BC complained of increased compliance costs due to the requirement to employ and pay professionals (ibid p.5).</td>
</tr>
<tr>
<td>Authors/Year/Type of Report/Country of study</td>
<td>Study Focus</td>
<td>Methods</td>
<td>CSF identified</td>
<td>Findings</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------</td>
<td>---------</td>
<td>----------------</td>
<td>----------</td>
</tr>
<tr>
<td>Hurlbert (2013) Journal / Canada</td>
<td>See Appendix 2, Table 2.2: The author explored how policymakers and stakeholders perceived policy framing and adaptation to climate change, social learning and stakeholders’ participation regarding two successful Agri-environmental programmes in Saskatchewan, Canada.</td>
<td>See Appendix 2, Table 2.2: Semi-Structured but open-ended interview</td>
<td>See Appendix 2, Table 2.2: 1. Stakeholders interaction. 2. Uncertainty reduction. 3. Affordability. 4. Environmental Stewardship (Global theme in RBR thesis)</td>
<td>Process innovation was found (See Section 1.2) Stakeholders interaction served as a causal factor for social learning to occur after the implementation of a government program (Canada-Saskatchewan Farm Stewardship Program (CSFSP)). In turn, social learning led to improved environmental practices for the farmers to develop a group plan for source water protection. The creation of the group plans improved learning and adaptive behaviours amongst the farmers because it increased the producers’ trust in the system, increased accessibility to government funding, and allowed a more robust program that encouraged collaborative learning between the network of producers and the government.</td>
</tr>
<tr>
<td>Paraskevopoulou (2012). Journal / Spain</td>
<td>See Appendix 2, Table 2.2: In this study, Evita Paraskevopoulou explored the influence that non-technological regulations have on innovation and their potentials as inputs for innovation policy. She demonstrated that regulations can contribute to the achievement of targets set by innovation policy and that innovation policy measures can facilitate the compensation of negative regulatory implications for innovation.</td>
<td>See Appendix 2, Table 2.2: Semi-Structured Interview 26 industry representatives and policy makers, NGOs and industrial associations were identified, and 35 interviews were conducted. The difference number was because some interviewees held dual roles as managers in the company and members of the board of associations.</td>
<td>See Appendix 2, Table 2.2: 1. Stringency. 2. Uncertainty. 3. Stakeholders interaction 4. Environmental stewardship (Global theme in RBR thesis)</td>
<td>1. Section 6.2.1: Paraskevopoulou found that Henkel[^33], a German chemical industry experienced increased business competitiveness by complying with environmental regulations (Section 1.3). 2. See section 2.6.1.1: Potential for free-riding was found to limit stakeholders’ interaction when a new regulation that deals with the Registration, Evaluation, Authorization and Restriction of Chemical substances (REACH) was introduced.</td>
</tr>
</tbody>
</table>

[^33]: https://www.henkel.com/

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*Weiss and Anisimova (2018) was not included in the selected literature for a framework synthesis in Appendix 2, Table 2.2 because they used secondary data for their quantitative analysis. The framework synthesis captured literatures with primary data analysis. Notwithstanding, Weiss and Anisimova (2018) was consistent with the finding of the current study.*