



Regulatory Efficiency Indicators for Clean Technology Deployment

An Exploratory Study – Final Report

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SUBMITTED TO:

Stefanie Bowles
Senior Project Leader
Clean Technology and Clean Growth Branch
Innovation, Science and Economic Development Canada
stefanie.bowles@canada.ca

PREPARED BY:

Stratos Inc.
1404-1 Nicholas Street
Ottawa, Ontario
K1N 7B7
Tel: 613 241 1001
Fax: 613 241 4758
www.stratos-sts.com

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1 Introduction

1.1 CONTEXT

As populations in developing countries enter the ‘consumer class’, adopting consumption habits that previously had been restricted to people living in Europe, North America and Japan, there will be even greater pressures placed on the ecosystems that sustain life on the planet.¹ This has catalyzed growing interest in the notion of ‘decoupling’², or ‘clean growth’³ – reducing the environmental footprint associated with economic growth. Both concepts have taken on greater significance in the context of the threat posed by climate change, and the global commitment to shift to a low carbon economy (i.e. delinking economic growth from carbon pollution).

Accelerating the development and adoption of clean technologies (cleantech) is one of the central pillars of any ‘decoupling’ or clean growth strategy, with cleantech defined as:

- “Any good or service designed with the primary purpose of contributing to remediating or preventing any type of environmental damage; and
- Any good or service that is less polluting or more resource-efficient than equivalent normal products which furnish a similar utility. Their primary use, however, is not one of environmental protection.” (Statistics Canada, 2017)

Cleantech also presents an opportunity for those companies that either generate solutions to global environmental challenges (i.e. clean technology providers) or reduce the environmental footprint of their operations (i.e. clean technology adopters). Establishing a robust cleantech sector, however (i.e. supporting the emergence and growth of companies that are technology providers) is no easy task. The cleantech industry faces a number of distinct barriers inhibiting its development and growth, including access to capital.

Recognizing this, Canada’s 2017 federal budget announced over \$2 billion to support the development and adoption of cleantech in Canada.⁴ Yet, capital alone is not sufficient. To identify barriers to developing a competitive and inclusive cleantech industry, in 2018, Canada’s federal department of Innovation, Science and Economic Development (ISED) established the Clean Tech Economic Strategy Table (CTEST, or ‘the Table’) as one of six economic strategy tables.⁵ A key recommendation arising from the Table was the need for Canada to “reset [its] regulatory regime so that it enables the [domestic] adoption of new clean technologies.”⁶ **The Table specifically highlighted the role of regulations in facilitating cleantech adoption.**

¹ Worldwatch Institute. *The State of Consumption Today*. Accessed March 1, 2019 from <http://www.worldwatch.org/node/810>.

² Organization for Economic Cooperation and Development. (2001). *Indicators to Measure Decoupling of Environmental Pressure from Economic Growth – Executive Summary*. Accessed March 2, 2019 from <http://www.oecd.org/environment/indicators-modelling-outlooks/1933638.pdf>.

³ Minister Catherine McKenna. December 22, 2017. *Federal Actions for a Clean Growth Economy – Introduction*. Accessed March 2, 2019 from <https://www.canada.ca/en/services/environment/weather/climatechange/climate-action/federal-actions-clean-growth-economy/introduction.html>.

⁴ Government of Canada. February 27, 2019. *Canada’s clean technology advantage*. Accessed from <https://www.ic.gc.ca/eic/site/099.nsf/eng/home>.

⁵ Government of Canada. September 25, 2018. *Report from Canada’s Economic Strategy Tables: Seizing Opportunities for Growth*. Accessed March 2, 2019 from <https://www.ic.gc.ca/eic/site/098.nsf/eng/00027.html>.

⁶ Government of Canada. September 25, 2018. *Report from Canada’s Economic Strategy Tables: Clean Technology*. Accessed March 2, 2019 from <https://www.ic.gc.ca/eic/site/098.nsf/eng/00023.html>.

Regulatory reform (i.e. improving the efficiency and effectiveness of regulatory regimes) is a dauntingly complex task. Jurisdictions around the world have put in place a number of regulatory reform initiatives, as well as efforts to measure their success. Notwithstanding all this work, experts continue to struggle with how to measure regulatory efficiency at a country level (i.e. measuring the economy as a whole), let alone with respect to the adoption of cleantech within specific sub-sectors. Accordingly, following the conclusion of the Table’s mandate, ISED asked Stratos to undertake exploratory research examining the efficiency with which regulatory regimes support the adoption of cleantech.

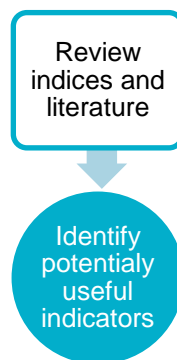
1.2 STUDY PURPOSE

The purpose of this project was to review several indices of regulatory efficiency and effectiveness in order to identify whether they contained any indicators that could be used to track the efficiency with which Canada’s regulatory function(s) enable the deployment of clean technologies. Given the paucity of work that has been done on regulatory efficiency (as opposed to regulatory effectiveness), ISED agreed that this would be an exploratory research project.

1.3 METHODOLOGY

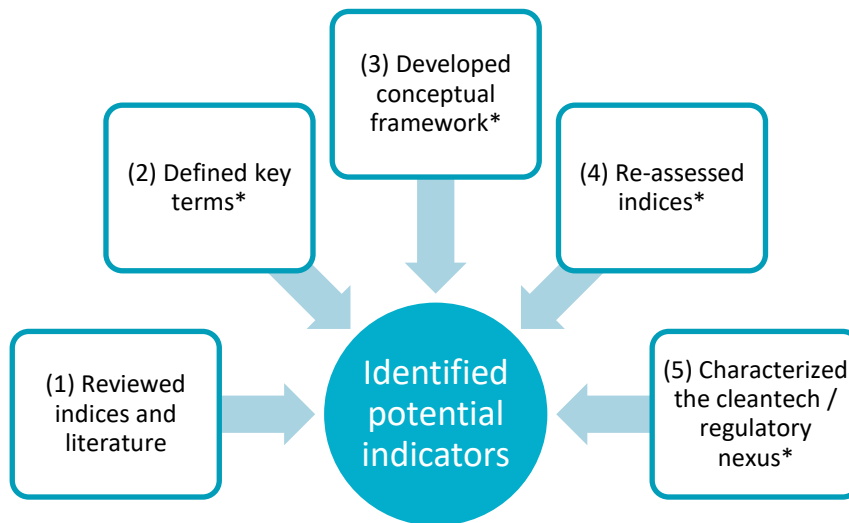
The methodology proposed at the outset of the contract (see Figure 1) was to review a series of regulatory indices and literature, as provided by ISED (see Appendix A) and identify indicators that might be helpful with respect to tracking the efficiency with which regulatory regimes in Canada were enabling the deployment of clean technologies.

Figure 1: Initial project methodology



Following the initial review, the Stratos team expanded the scope of the project slightly (see Figure 2, with additional tasks tagged with an asterisk). This included examining the nexus between regulatory regimes and cleantech deployment to assess why so few indicators were relevant, to inform potential future work in this area.

Figure 2: Revised project methodology



2 Findings

The indices and literature generated relatively few indicators of potential relevance, as they:

- Primarily measured regulatory effectiveness, as opposed to regulatory efficiency
- Lacked a common framework with which to define/conceptualize regulatory efficiency
- Often focused on regulatory design features as opposed to indicators

Each of these is discussed further below.

2.1 REGULATORY EFFECTIVENESS VS. EFFICIENCY

Stratos found that the documents and indices that were reviewed often referred to the concept of regulatory effectiveness, which can be understood as:

The quality of the work and level of performance of a regulatory body [including]... striving for continuous improvements.⁷

Across the various indices, however, the notion of ‘performance’ or “effectiveness” appeared to encompass two kinds of outcomes:⁸

- **Substantive, or technocratic, outcomes** that relate to whether the regulator is achieving its purpose (e.g. safety, environmental protection, decisions on major projects, validation of technology performance claims, etc.); and

⁷ International Atomic Energy Agency. 1999. *Assessment of regulatory effectiveness*. Accessed April 1, 2019 from https://www-pub.iaea.org/MTCD/publications/PDF/pdrp_004_prn.pdf

⁸ Adapted from Coglianese, Cary. 2012. *Measuring regulatory performance: evaluating the impact of regulation and regulatory policy*. Accessed April 5, 2019 from https://www.oecd.org/regreform/regulatory-policy/1_coglianese%20web.pdf. Page 7.

- **Procedural outcomes**, including both *administrative outcomes* (more commonly associated with efficiency) and *democratic outcomes* (associated with public participation and confidence).

Indices often failed to distinguish between these different outcomes.

2.2 REGULATORY EFFICIENCY: A CONCEPTUAL MODEL

For the purposes of clarity, Stratos recommends scoping the term ‘effectiveness’ to mean whether or not the regulator achieves the substantive outcomes for which it was established. In other words, regulatory effectiveness relates to measuring whether regulators “effectuate some improvement in the conditions of the world... [such that] the conditions in the world with the regulation are better than what they would have been without the regulation.”⁹

Regulatory efficiency, by contrast, is defined in this paper as encompassing the two types of procedural outcomes identified by Coglianesi: administrative and democratic. Building on this, Stratos adapted a definition of regulatory efficiency put forward by the State Parliament of Victoria (Australia) in 1997:

Regulatory efficiency reduces the compliance burden on business and regulators without compromising effectiveness, i.e. ensuring that key regulatory objectives continue to be met, and regulatory standards upheld, with the level of integrity and transparency expected by the public.

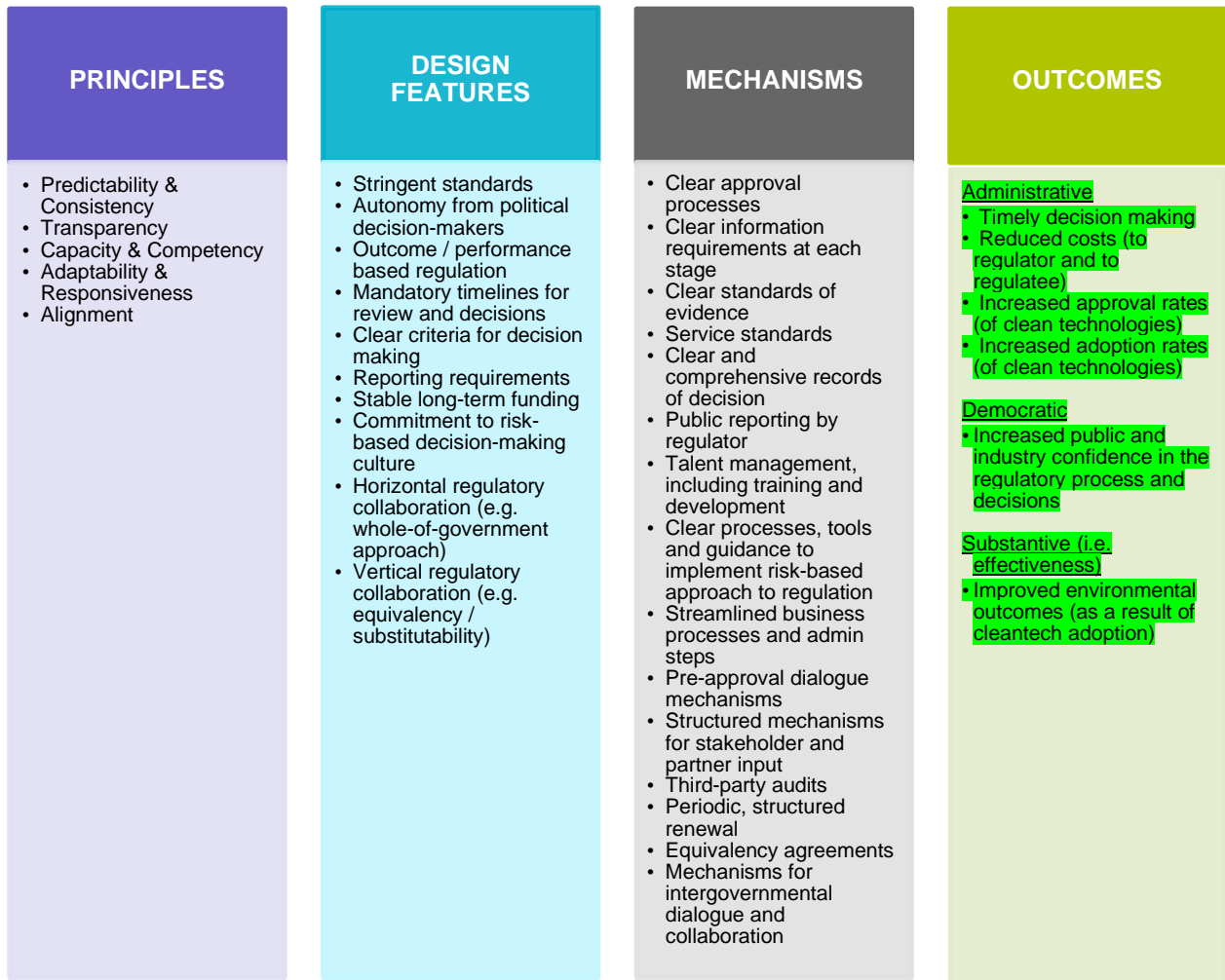
There are clear linkages between the concepts of effectiveness and efficiency – for example, a regulatory regime with well-trained, competent regulators is likely to be both more efficient and more effective. Nonetheless, effectiveness is not necessarily a proxy for regulatory efficiency. While two regulatory bodies with the same mandate might be equally effective at achieving desired policy outcomes, one regulatory might take more time, require more resources and impose higher compliance costs on industry.

With this definition in mind, Stratos developed a conceptual framework for regulatory efficiency with the following four components, reflecting both administrative and democratic values (see Figure 3):

- **Principles:** These shape the design and implementation of regulatory regimes.
- **Design features:** These elements provide the enabling architecture for a specific regulatory regime. It is within this enabling architecture that a given regulatory body or agency will undertake activities that enable it to perform its regulatory functions. Design features are usually within the jurisdiction of the governments and their policy departments that are ultimately accountable for most regulatory regimes.
- **Mechanisms:** These are the concrete actions, approaches, tactics and tools of regulatory agencies and bodies (i.e. those that are within their control and sphere of influence).
- **Outcomes:** The end results of efficient regulatory regimes.

⁹ Ibid., page 8.

Figure 3: Conceptual framework for regulatory efficiency



2.3 INDICATORS OF REGULATORY EFFICIENCY

When reviewing the indices through the lens of the conceptual framework outlined above (see Table 1 and Appendix B) Stratos identified two categories of indicators that could be useful for measuring the efficiency with which regulatory systems in Canada facilitate the deployment of clean technology. The first category included indicators of the **compliance burden faced** by companies (i.e. measuring an **'administrative' outcome**, as outlined in the model). The second category included indicators of **transparency** and **building public confidence** (i.e. measuring the extent to which regulatory systems adhered to a 'principle', as outlined in the model, supporting a **'democratic' outcome**)

2.3.1 Compliance burden

The compliance burden of a regulatory regime refers to the time and cost of the process from the perspective of an industry participant entering into the regime seeking some sort of approval, as manifested in a license, permit or other form of 'authorization' document.

Processes

Many of the indices contained criteria measuring administrative processes. These can directly affect the timeliness and cost of a regulatory process. Specific criteria that may be relevant for the cleantech regulatory ecosystem (with the indicator in the bracket) include:

- Administrative procedures (total number)
- Time cost of a regulatory process and/or to achieve a regulatory decision (total time spent, time spent/unit of time)
- Financial cost of a regulatory process (total cost, or relative cost, i.e. as a % of another financial metric such as profit, revenue or annual budget)
- Cost savings arising from regulatory reform initiatives (total savings per regulator, per industry sector, per company)

Policies and programs

Policy and program indicators measured the presence or absence of specific instruments that directly or indirectly affected the length of time or costliness associated with participating in the regulatory process, including the presence or absence of policies mandating:

- Regulatory impact assessments: These help policy makers:
 - Choose the most effective / efficient policy instruments through which to achieve public policy goals
 - Examine the potential costs and benefits of proposed regulation (including costs of reading and understanding regulations, implementing them and reporting on them), as well as the distribution of those costs and benefits
 - Consider non-regulatory alternatives
- Caps on government rules, such as:
 - Targets on red tape control (e.g. "one-for-one" rule)
 - Targets on red tape reduction (e.g. reduce by target % within target time frame)
- The presence or absence of commitments to regulatory modernization, such as:
 - Government investments in "e-government" initiatives, to automate or digitize administrative processes
 - Reviews of business processes to streamline the administration of regulatory regimes, simplifying the number and type of steps in the regime
 - The creation of 'one-stop shops' to simplify navigation of the regulatory system
- Adoption of the 'silence is consent' rule, wherein regulatory applicants are deemed to have been approved if they have not heard from a regulator within the agreed-upon time period

2.3.2 Transparency

Procedural fairness, i.e. the presence or absence of rules mandating that:

- Regulations be published or communicated to the public prior to entry into force
- Proposed regulations be subject to a public comment procedure
- The regulatory decision-making process be clear, including via publicly disclosing the criteria by which decisions are made, records of decision, etc.

While increased transparency was highlighted as a key driver of regulatory effectiveness, its impact on efficiency is less clear. In most instances, transparency requirements increase the costs of regulatory compliance in the short run, for individual companies. In the long-run, however, some argue that increased transparency builds public confidence in the regulatory system, leading to potential future reductions in the time and cost of compliance from an industry-wide perspective. In other words, while increased transparency might reduce the regulatory efficiency with which any one company secures regulatory approvals, it is likely to contribute to greater regulatory efficiency for all companies, over time. As Coglianesse notes, “it is possible that better process outcomes can contribute to better substantive outcomes, and vice versa.”¹⁰

Table 1: Findings from review of indicators

TABLE 1		RELEVANCE OF REVIEWED DOCUMENTS	
SOURCE	Potential Efficiency Indicators	Relevance to Cleantech Regulatory Efficiency	
<p>World Bank Ease of Doing Business</p> <p><i>Doing Business</i> presents quantitative indicators on business regulation and the protection of property rights that can be compared across 190 economies, and over time.</p> <p>The 11 indicator sets capture the effectiveness and quality of business regulation.</p>	<p>Administrative indicators are a consistent theme across the World Bank indicator sets, measuring factors such as:</p> <ul style="list-style-type: none"> • Procedures (number) • Time (days, hours per year, or years) • Cost (as a % of a component, e.g. profit, level of investment) • Payment (number per year) 	<p>PARTIAL</p> <ul style="list-style-type: none"> • Addresses administrative efficiency factors • Not directly related to innovation • Not clean tech specific (neither provider nor adopter) 	
<p>World Economic Forum Global Competitiveness Burden of Government Regulation</p> <p>There are 98 indicators in the index, derived from a combination of data from international organizations as well as from the World Economic Forum’s Executive Opinion Survey.</p> <p>The indicators are organized into 12 pillars, which are further grouped into four categories:</p> <ul style="list-style-type: none"> • Enabling environment • Human capital • Markets • Innovation ecosystem 	<p>Potentially relevant indicators were identified within 3 of the 12 pillars.</p> <p>Institutions:</p> <ul style="list-style-type: none"> • Burden of government regulation • Budget transparency • Future orientation of government • Intellectual property protection <p>Product markets:</p> <ul style="list-style-type: none"> • Efficiency of the clearance process <p>Innovation capability:</p> <ul style="list-style-type: none"> • Buyer sophistication 	<p>PARTIAL</p> <ul style="list-style-type: none"> • Indicators are perception-based (e.g. perception of the “burden” of regulations) • Indicators reflect a mix of policy (e.g. extent of subsidies) and process (e.g. efficiency of clearance) • Innovation indicator is very abstract • Not clean tech specific (neither provider nor adopter) 	

¹⁰ *Measuring regulatory performance*, page 37.

TABLE 1	RELEVANCE OF REVIEWED DOCUMENTS	
SOURCE	Potential Efficiency Indicators	Relevance to Cleantech Regulatory Efficiency
<p>Red Tape Report</p> <p>The report evaluates governments across Canada to ensure they are accountable for the regulatory burden they impose on individuals and businesses.</p> <p>Governments are assigned letters ranging from A to F.</p> <p>Three categories are examined:</p> <ul style="list-style-type: none"> • Strong political leadership • Comprehensive public measure • Clear cap on government rules 	<ul style="list-style-type: none"> • Strong political leadership • Comprehensive public measure • Clear cap on government rules <ul style="list-style-type: none"> ○ Targets on red tape control (e.g. “one-for-one” rule) ○ Targets on red tape reduction (e.g. reduce by 20% in 3 years) 	<p>PARTIAL</p> <ul style="list-style-type: none"> • Administrative efficiency indicators within the “Cap on government rules” category • Not directly related to innovation • Not clean tech specific (neither provider nor adopter)
<p>OECD Indicators of Product Market Regulation</p> <p>Competitive product market environments that allow new firms to challenge incumbents, efficient firms to grow, and inefficient ones to exit, can help boost economic growth and living standards.</p> <p>These indicator sets measure:</p> <ul style="list-style-type: none"> • Economy-wide regulation • Sector regulation • Regulatory impact • Internet regulation • Regulatory management practice • Competition law and policy 	<p>Relevant material was found in three areas related to:</p> <ul style="list-style-type: none"> • Complexity of regulatory procedures • Administrative burdens on start-ups • Regulatory protection of incumbents <p>Two interesting policy/program indicators were listed here, particularly the presence or absence of:</p> <ul style="list-style-type: none"> • one stop shops for licences and permits • the ‘silence is consent’ rule for issuing licences (licenses are issued automatically if the competent licensing office has not acted by the end of the statutory response period) 	<p>PARTIAL</p> <ul style="list-style-type: none"> • Covers both policy (regulatory protection of incumbents) and process (complexity, burden) • Focused on enabling a competitive environment, which fosters innovation • Has a clear emphasis on “start-ups”, which is of relevance to cleantech providers

TABLE 1	RELEVANCE OF REVIEWED DOCUMENTS	
SOURCE	Potential Efficiency Indicators	Relevance to Cleantech Regulatory Efficiency
<p>OECD Services Trade Restrictiveness Index</p> <p>These composite indices measure trade barriers in 22 sectors, to benchmark and allow policy makers to assess reform options. Indices measure the impact of policy on:</p> <ul style="list-style-type: none"> • Restrictions on foreign entry • Restrictions on the movement of people • Other discriminatory measures • Barriers to competition • Regulatory transparency and administrative requirements 	<p>The Index addresses the need for regulatory transparency, including whether:</p> <ul style="list-style-type: none"> • License were granted in a transparent manner • Regulations are published or communicated to the public prior to entry into force • There is a public comment procedure 	<p>LIMITED</p> <ul style="list-style-type: none"> • Indicators of relevance are primarily focused on transparency • Not directly related to innovation • Not clean tech specific (neither provider nor adopter)
<p>OECD Indicators of Regulatory Policy and Governance</p> <p>The purpose of these indicators is to present information on regulatory policy practices to allow countries to easily compare their progress in different areas of regulatory policy over time. It also provides insights into the organization and institutional settings to design, enforce and revise regulations.</p>	<ul style="list-style-type: none"> • Administrative simplification and burden reduction • Transparency and access to information • Public consultation practices • Need to consider alternatives to regulation • Compliance and enforcement issues 	<p>PARTIAL</p> <ul style="list-style-type: none"> • Addresses administrative / procedural indicators • Addresses post-approval lifecycle (compliance/enforcement) but at high level • Not directly related to innovation • Not clean-tech specific
<p>Alberta Energy Regulator (AER) Annual Report 2015/16</p> <p>One focus of regulator performance reported is “efficient” with the goal being to transform Alberta’s energy regulatory system and improve efficiency. AER is aiming to create a regime that is:</p> <p>“efficient, minimizing duplication, with highly efficient processes, and only intervening to the level necessary”</p>	<p>Efficiency attributes:</p> <ul style="list-style-type: none"> • Regulatory process efficiencies • Regulatory requirements • Efficiency of AER application decisions <p>Indicators:</p> <ul style="list-style-type: none"> • Public confidence levels (% of stakeholders surveyed) • Annual savings to industry as a result of changes made (one example: \$200 million from one change; \$400 million in cost savings from efficiency initiatives in 2015) 	<p>RELEVANT</p> <ul style="list-style-type: none"> • Direct efficiency goal and outcome • Outcome indicator – cost savings (to industry) • Also has a public confidence indicator • Not related to innovation • Relevant to cleantech adopters

2.4 THE CLEANTECH REGULATORY LANDSCAPE

There was little information, in the literature reviewed, on what regulatory efficiency might mean specifically in the context of cleantech deployment, aside from anecdotal examples of regulatory design practices that may help facilitate clean technology deployment (e.g. regulatory sandboxes).

Given the lack of information on regulatory efficiency more broadly, and the paucity of information on regulatory efficiency in the context of cleantech deployment, Stratos did some light research on the regulatory approval pathways of two Canadian jurisdictions (Quebec and Saskatchewan) for one cleantech sub-sector (water). This research helped Stratos characterize the cleantech regulatory regime in a manner that may prove useful for future research in this area.

2.4.1 A fragmented landscape

The regulatory landscape for clean technology deployment is fragmented and complex, A

- **Technology providers** are seeking the necessary approvals required to enable their technologies to be available in the market and thus to enable organizations to use their technology. They are also looking for stringent standards in environmental regulations that can help stimulate demand for their goods and services.
- **Technology adopters** are seeking the necessary approvals to deploy a specific new technology that will significantly impact a health, safety or environmental outcome (e.g. when the new technology affects a major business activity, such as the processing of mine tailings). They are looking for efficient regulatory processes that allow them to adopt new technologies, meet or exceed regulatory/stakeholder/Indigenous expectations and secure legal permits and licenses to operate.

2.4.2 Case example: Clean water technologies

With this additional conceptual clarity, Stratos analyzed the regulatory approval pathways associated with clean water technologies in order to more clearly understand and characterize the role of regulations in facilitating/hindering cleantech deployment (see Table 2). What became clear is there are some common challenges for clean tech adopters as well as clean tech providers that reduce the efficiency of the regulatory process, including:

- Duplicative regulatory approval processes¹¹, due either to a lack of harmonization between:
 - 1 Various levels of government (i.e. requiring separate approval processes for the exact same adoption situation) or
 - 2 Jurisdictions (i.e. requiring new approval processes regardless of whether a technology has been approved and deployed in another jurisdiction with similarly robust approval processes).
- Limited capacity on the part of regulators (either in terms of human resources, financial resources or expertise/competency), creating delays or uncertainties (e.g. through risk aversion) in the processing of cleantech applications.

Table 2: Approval process for tech providers and adopters

¹¹ Providers, however, also face some unique challenges related to duplication, such as when they are required to seek the same types of regulatory approvals when marketing to new industry sectors, notwithstanding having secured approvals for the use of identical technology in other industries prior.

TABLE 2		APPROVALS: TECH PROVIDERS		APPROVALS: TECH ADOPTERS	
WATER		Regulator	Regulatee	Regulator	Regulatee
<i>Provincial</i>	The Province of Saskatchewan does not certify technologies. It provides guidance to consumers on the role of standard setting bodies in certifying performance claims. ¹²	Technology providers wishing to sell products in Canada can have performance claims certified via a recognized standard-setting body	Water Security Agency (through a permit process ¹³)	Municipalities such as Unity, SK ¹⁴ which is piloting the Memfree wastewater treatment technology ¹⁵	
<i>Provincial</i>	BNQ ¹⁶ manages water technology verification committees on behalf of two QC Ministries. ¹⁷ These committees verify the performance of water treatment technologies before they can be deployed. ¹⁸	Technology providers, such as Pall, which produces the Microza sans coag water filtration system. ¹⁹	Depending on the purpose of the technology (e.g. drinking water vs. treatment of sewage), various pieces of provincial legislation and related regulations apply (e.g. for technologies used to deliver clean drinking water, deploying entities would need to be compliant with the Drinking Water Regulation established under the Environment Quality Act. It is not clear if approval is required prior to the technology being deployed, or if the regulation sets a standard for compliance that the technology would be expected to meet.	Municipalities. “Under the regulation, drinking water service managers are required to analyze the water they distribute, inform the government of the analysis results on a regular basis, report all cases of contamination and take the steps required to comply with regulatory standards” ²⁰	

Notwithstanding these similarities, however, what also became clear is that the challenges of cleantech adopters are more similar to those faced by any technology adoption entity. Technology

¹² <http://www.saskh2o.ca/PDF-WaterCommittee/CertificationWaterTreatmentDevices%20.pdf>

¹³ <https://www.wsask.ca/Global/Permits%20and%20Approvals/Apply%20for%20a%20Permit%20or%20License/EPB%20200-Application%20for%20Permit%20for%20Construction%20of%20Waterworks%20or%20Sewage%20Works.pdf>

¹⁴ <https://www.newsoptimist.ca/news/local-news/pilot-project-wastewater-treatment-system-now-operational-1.9731255>

¹⁵ <https://www.tecvalco.com/memfree-wastewater-treatment-system/>

¹⁶ <https://www.bnq.qc.ca/en/other-services/water-treatment-technology-validation.html>

¹⁷ The Design Guide for Drinking Water Production Facilities (Guide de conception des installations de production d'eau potable) provides a description of water treatment technologies and design criteria deemed suitable for meeting the requirements of the *Regulation respecting the quality of drinking water* (RQDW). A Drinking Water Treatment Technologies Committee has been established for instances where a technology or its application is considered to be new in order to validate performance tests and determine if the level of development of the technology or application complies with the RQDW. The coordination of the committee's activities is overseen by the Bureau de normalisation du Québec (BNQ).

¹⁸ <http://www.environnement.gouv.qc.ca/eau/potable/guide/procedure-analyse-comite-en.pdf>

¹⁹ http://www.environnement.gouv.qc.ca/eau/potable/guide/Pall_sanscoag.pdf

²⁰ <http://www.environnement.gouv.qc.ca/eau/consultation-en/themes3.htm>

adopters must demonstrate that the adoption of a given technology will comply with pre-existing regulations related to the environment or work-place health and safety.

The challenges of **clean technology providers**, by contrast, are more similar to those faced by other industries that are trying to get products approved for the marketplace, such as chemicals, food and beverages, biotechnology and pharmaceuticals. This has important implications for future work.

3 Next Steps / Future Work

Not surprisingly, the document review did not generate a list of indicators that could be easily applied to the measurement of regulatory efficiency in the context of cleantech adoption. That being said, this exploratory project uncovered some intriguing ground that could potentially lead both to a novel characterization of the regulatory functions being studied and new ways to measure their efficiency at deploying clean technologies.

3.1 'PRODUCT-TO-MARKET' REGULATORY REGIMES

As a result of the efforts to characterize the intersection of cleantech with regulatory regimes in Canada, it became clear that cleantech providers experience a 'product-to-market' regulatory pathway (e.g. similar to that of a pharmaceutical company) as opposed to a 'project-approval' cycle (e.g. an environmental assessment of a major project in the natural resources sector). As a result, additional insights into regulatory efficiency might be gleaned from:

- Further examination of the regulatory pathways taken to market by specific **cleantech sub-sectors** (e.g. water) to build on the insights derived from the cursory research undertaken for this project.
- Case studies on the regulatory regimes of other **'product-to-market'** industries (e.g. chemicals, biotechnology, food, health products, pharmaceuticals) to identify potential regulatory efficiency indicators.

This could involve a review of product regulatory indicators employed by federal regulators such as Health Canada, Environment and Climate Change Canada, Canadian Food Inspection Agency, etc. It could also involve some country case studies looking at the regulators for similar types of industries in Australia, United Kingdom, United States, and European Union.

3.2 A LIFE-CYCLE PERSPECTIVE

Just as technologies move through a life cycle (i.e. from research and development through demonstration to deployment) so too is there is a regulatory life-cycle. It might be useful to look at deployment of technologies through the lenses of this **regulatory life-cycle**, to see if other ways of measuring efficiency emerge. There are five components to the regulatory life-cycle, including:

Problem Definition

During the problem definition stage, regulators assess the public risks they are trying to protect against, or the public benefit outcomes they are trying to achieve. It is important for firms to understand and have participated with the regulators in understanding the kinds of societal risks their products can pose and the need for regulations to mitigate them. For example, have cleantech providers/adopters thought holistically and systematically about the risks posed by their technologies,

and about the unique kinds of oversight that may be needed to enable their products to be introduced into the market?

Regulatory Design (i.e. ‘instrument choice’)

Regulations are not always the right mechanism through which to achieve the public interest. Sometimes incentives, naming/shaming or education campaigns will be more effective. Even if regulations are selected as the most appropriate tool, additional discussion is required to ascertain whether prescriptive or performance-based regulations are more suitable. For example, a new water purifier technology may be best regulated through a performance based regulatory system – so long as the technology can demonstrate that it is achieving the desired environmental performance, as per the regulation or legislation, the regulatory regime should have little concern about the manner in which compliance is generated (unless the technology involves novel materials that might in and of themselves generate environmental or social risks, thus making them subject to additional scrutiny).

Implementation

Implementation stage issues are usually related to adequate time, competent people and sufficient financial resources to implement the regulatory regime in question, without which efficiency delays are inevitable.

Compliance and enforcement

The fourth stage of the regulatory life-cycle relates to enforcement and compliance, including any penalties imposed for non-compliance. From a technology provider/adopter perspective, this might include oversight of manufacturing facilities (i.e. where the products are being made), performance compliance verification at the retail level (i.e. prior to products being allowed to be sold) or performance compliance at the customer level (i.e. where products are being used).

This is one of the areas in which industry often focuses the most, as it is easy to see how an implementation process could be made more efficient in order to reduce the compliance burden associated with the regulatory regime. For example, if a technology provider/adopter is asked to demonstrate its ability to meet a certain performance standard, it can be extremely frustrating to have the standard shift over time, leading both to delays and increased costs as the company is forced to continually demonstrate its ability to meet a moving target.

At this stage, it is important to have clear guidelines associated with information requests being made of industry, and clear, consistent and stable standards for assessing performance.

Evaluation and Continuous Improvement

The final stage of the regulatory cycle is related to evaluation, learning and continuous improvement. This would ideally involve adequate consultation with companies moving through their regulatory regimes.

It may be useful to focus on the experiences of technology providers as they move through the regulatory life cycle for deployment-stage technologies. For example: sometimes a firm is frustrated that they are proposing to commercialize a product that doesn't fit the regulatory system Canada has in place. In this instance the problem may be a regulatory design problem where the oversight in place doesn't fit the product proposed and the unique issues / problems / risks / solutions it presents to society.

In other instances the design of the regulation isn't the problem - instead it is the inspection regime for safety that may seem particularly onerous when compared to the tests administered by other national jurisdictions with similarly designed regulations (i.e. there may be an implementation problem where Canadian regulators are too risk averse and unpredictable in their demands for evidence that the product will be safe).

Sometimes a firm may be frustrated that product reviewers seem unfamiliar with the technology and haven't got the competence to assess the risks it poses accurately. They may lack adequate guidance for standards of evidence that would help pave the way for cost effective furnishing of the kind of evidence needed to secure product approval and successful commercialization.

Finally, the issue may not relate to any particular stage of the cycle, but rather arises from the "out of date nature" of the entire regime because there have been no recent reviews/evaluations of the regulatory system at each stage of the lifecycle to adjust to the evolving nature of the industry and the societal issues to be safeguarded.

A project in this area would look more closely at regulatory efficiency measures and indicators that correspond with each of these stages of a potential firm's points of contact with the regulatory system.

3.3 REGIME DESIGN

Many of the documents that were reviewed contained excellent ideas on how to *design* efficient regulatory regimes (as opposed to *measuring* their efficiency). It may be useful to have Stratos pull out interesting ideas related to regime design that were flagged in these various documents, as a 'toolkit' of best practices to which ISED could refer when engaging with regulatory regimes across Canada. Regulatory design discussion also enable a second look at whether regulatory instruments are in fact the best option to achieve public policy goals.

As the Government of Canada notes, "Choosing an instrument or, more importantly, the appropriate mix of instruments, involves selecting the tools that are most likely to achieve the public policy objective pursued on a sustained basis and at an acceptable cost."²¹ This may involve exploring the feasibility/desirability of market mechanisms, such as incentives, or the use of behavioural psychology to inform programs that shift behaviours, e.g. 'nudge theory'.²²

²¹ Government of Canada. 2007. *Assessing, Selecting, and Implementing Instruments for Government Action*. Accessed April 8, 2019 from <https://www.canada.ca/en/treasury-board-secretariat/services/federal-regulatory-management/guidelines-tools/assessing-selecting-implementing-instruments-government-action.html>.

²² <https://www.behavioraleconomics.com/resources/mini-encyclopedia-of-be/nudge/>

Appendix A: Indices and Documents Reviewed

Stratos scanned each of the following indices, as requested by ISED, to understand what indicators, if any, could be construed as measuring regulatory efficiency:

- World Bank Doing Business Index
- World Economic Forum Global Competitiveness Burden of Government Regulation
- Canadian Federation of Independent Business Red Tape Report Card
- OECD Product Market Regulations Index
- OECD Services Trade Restrictiveness Index

In addition, Stratos reviewed the following documents related to regulatory modernization to inform the development of a framework for regulatory efficiency and to characterize the intersection between clean tech deployment and regulatory regimes:

Provided by ISED

- Horizon Advisors: Regulations and Clean Technology A Review of Best Practices in Select Jurisdictions
- Deloitte:
 - Technologies and Tactics for Tomorrow's Regulator
 - Future of Regulations
 - Principles of Regulating Emerging Technologies
 - Compliance Without Tears
- ISED:
 - Economic Strategy Tables (EST) Final Report (chapeau piece)
 - Clean Tech Chapter in EST Final Report

Identified by Stratos

- Cary Coglianese, University of Pennsylvania: Listening, Learning, and Leading: A Framework for Regulatory Excellence (2015)
- Jennifer Nash, Harvard Kennedy School and Daniel Walters, University of Pennsylvania: Public Engagement and Transparency in Regulation: A Field Guide to Regulatory Excellence (2015)
- OECD Recommendation of the Council on Regulatory Policy and Governance (2012)
- Innovation and the State: Finance, Regulation and Justice – Dr Cristie Ford UBC (2018)

Other supplemental sources reviewed by Stratos

- OECD Indicators of Regulatory Policy and Governance (2015)
- Alberta Energy Regulator Annual Report 2015/16

Appendix B: Detailed Findings From Indices

Source	Potential Efficiency Indicators
<p>World Bank Doing Business</p> <p>Doing Business presents quantitative indicators on business regulation and the protection of property rights that can be compared across 190 economies—from Afghanistan to Zimbabwe—and over time. The 11 Doing Business indicator sets capture the effectiveness and quality of business regulation. New Zealand ranks 1st, United States 8th, UK 9th and Canada 22nd.</p> <p>The Doing Business indicators are based mostly on reading laws and regulations. ~13,000 Subject matter experts fill out questionnaires and references to the relevant laws, regulations and fee schedules. This is then checked by the Doing Business Team for accuracy</p>	<p>Administrative indicators are a consistent theme across the World Bank indicator sets:</p> <ul style="list-style-type: none"> • Procedures (number) • Time (days, hours per year or years) • Cost (as a % of a component e.g. income per capita or profit) • Payment (number per year)
<p>World Economic Forum Global Competitiveness Burden of Government Regulation</p> <p>There are 98 indicators in the index derived from (a) responses by executives to survey questions or (b) reputable sources such as the OECD, World Bank, IMF, etc.</p> <p>These indicators are organized into 12 pillars: (1) institutions, (2) infrastructure, (3) ICT adoption, (4) macroeconomic stability, (5) health, (6) skills, (7) product market, (8) labour market, (9) financial system, (10) market size, (11) business dynamism and (12) innovation capability.</p> <p>From these 12 pillars, they are grouped into four categories:</p> <ul style="list-style-type: none"> • Enabling environment (pillars 1-4) • human capital (pillars 5 & 6) • Markets (pillars 7-10) • Innovation ecosystem (pillars 11-12) 	<p>The potentially relevant indicators within the following pillars: institutions, product market, and innovation capability.</p> <p>Institutions indicators:</p> <ul style="list-style-type: none"> • Burden of government regulation (1-7) via survey question i.e., executives were asked to respond to questions such as “In your country, how burdensome is it for companies to comply with public administration’s requirements (e.g., permits, regulations, reporting)? • Budget transparency (0-100) • Future orientation of government regarding adapting to digital business models and extent to which the government responds effectively to change (e.g., technological, social and demographic, security and economic) • Intellectual property protection (1-7)

Source	Potential Efficiency Indicators
<p>The US is ranked in 1st place, UK in 8th, Canada in 12th.</p>	
<p>Canadian Federation of Independent Business Red Tape Report</p> <p>The report evaluates governments across Canada to ensure they are accountable for the regulatory burden they impose on individuals and businesses. Governments are assigned letters ranging from A to F.</p> <p>CFIB look for indications of red tape reduction in 3 categories. Indications can be found in political mandate letters or commitments, for example.</p> <p>Three categories are examined:</p> <ul style="list-style-type: none"> • Strong political leadership • Comprehensive public measure • Clear cap on government rules 	<p>Strong political leadership (i.e., indications that red tape is a high priority for the Premier and cabinet) including:</p> <ul style="list-style-type: none"> • Premier and Cabinet Ministers champion red tape reduction • Efforts across government to improve customer service and ensure that red tape burden is being reduced <p>Comprehensive public measure:</p> <ul style="list-style-type: none"> • There is a credible measure in place • The measure is publicly available and easy to find • The measure is publicly promoted • There is a measure of the total regulatory burden (a baseline) not just a measure of what is being added and subtracted • Legislation is in place requiring public reporting <p>Clear cap on government rules:</p> <ul style="list-style-type: none"> • Targets on red tape control (e.g. “one-for-one” rule) • Targets on red tape reduction (e.g. reduce by 20% in 3 years)
<p>OECD Indicators of Product Market Regulation</p> <p>Competitive product market environments that allow new firms to challenge incumbents, efficient firms to grow, and inefficient ones to exit.</p> <p>These indicator sets measure:</p> <ul style="list-style-type: none"> • Economy-wide regulation • Sector regulation • Regulatory impact • Internet regulation • Regulatory management practice • Competition law and policy 	<p>Economy-wide PMR is the most relevant and is constructed through a bottom up approach. There are 18 low level indicators, which are aggregated into 7 mid level indicators, which are then aggregated into three high-level indicators including:</p> <ul style="list-style-type: none"> • State control • Barriers to entrepreneurship • Barriers to trade and investment <p>A questionnaire containing over 700 questions was used to compute and evaluate the economy-wide PMR. Questions were either closed questions that could be answered by numerical values or answered by selecting a pre-defined set of answers e.g. yes or no.</p>

Source	Potential Efficiency Indicators
	<p>Indicators are aggregated into three levels, with the three high-level indicators including:</p> <ul style="list-style-type: none"> • State control • Barriers to entrepreneurship • Barriers to trade and investment <p>Relevant indicators that measures barriers to entrepreneurship include:</p> <ul style="list-style-type: none"> • Licences and permits systems: use of “one-stop-shops” and the “silence is consent” rule for issuing licenses and accepting notifications • Communication and simplification of rules and procedures: the government’s communication strategy and efforts to reduce and simplify the administrative burden of interacting with the government e.g., is there a program to reduce regulatory burden, does government reallocate powers and responsibilities between departments, etc. • Administrative burdens for corporations: administrative burdens on creating a public limited company e.g., number of mandatory procedures, number of public and private bodies to contact to register a company, etc. • Administrative burdens for sole proprietor firms: administrative burdens on creating an individual enterprise • to operations, etc.
<p>OECD Services Trade Restrictiveness Index</p> <p>These composite indices measure services trade barriers in 22 sectors across 45 countries, representing over 80% of global services trade.</p> <p>Its purpose is to benchmark countries and allow policy makers to assess reform options policymakers to assess options for reform.</p> <p>The STRIs are composite indices taking values between zero and one, zero representing an open market and one a market completely closed to foreign services providers. The STRIs contains a list of</p>	<p>Regulatory transparency and administrative requirements indicators:</p> <ul style="list-style-type: none"> • License were granted in a transparent manner • Regulations are published or communicated to the public prior to entry into force • There is a public comment procedure

Source	Potential Efficiency Indicators
<p>scoring criteria in which sectors are evaluated against</p> <p>Indices measures the impact of policy on:</p> <ul style="list-style-type: none"> • Restrictions on foreign entry • Restrictions on the movement of people • Other discriminatory measures • Barriers to competition • Regulatory transparency and administrative requirements 	
<p>OECD Indicators of Regulatory Policy and Governance</p> <p>The purpose of these indicators is to present information on regulatory policy practices to allow countries to easily compare their progress in different areas of regulatory policy over time. It also provides insights into the organization and institutional settings to design, enforce and revise regulations.</p> <p>A survey collected qualitative and quantitative data regarding the content of regulatory policies, as well as on the requirements and practices of countries. Answers were provided by delegates to the OECD Regulatory Policy Committee (RPC) and central government officials</p>	<p>The regulatory impact assessment (RIA) and stakeholder engagement is potentially applicable and note the importance of:</p> <ul style="list-style-type: none"> • Administrative simplification and burden reduction • Transparency and access to information • Public consultation practices, consideration of alternatives to regulation • Compliance and enforcement issues
<p>Alberta Energy Regulator (AER) Annual Report 2015/16</p> <p>One focus of regulator performance reported is “Efficient” with a goal to transform Alberta’s energy regulatory system to improve efficiency.</p> <p>The efficiency outcome sought is: the regulatory system is efficient, minimizing duplication, with highly efficient processes, and only intervening to the level necessary.</p>	<p>Efficiency attributes:</p> <ul style="list-style-type: none"> • Regulatory process efficiencies • Relevant regulatory requirements • Improve efficiency of AER application decisions <p>Indicators:</p> <ul style="list-style-type: none"> • Public confidence levels (% of stakeholders surveyed) • Cost savings to industry (\$200 million in annual savings as a result of changes made to a regulatory Directive) <p>Costs saved through efficiency initiatives (\$400 million in 2015).</p>