



when do climate policies work?

A Systematic Review of Experiences from Low-Carbon Technology Promotion and Water Management



Network for
Business Sustainability
Business. Thinking. Ahead.

Prepared by
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Robert Slater

Good policy helps
markets work for
both the economy
and society.

How can government
and industry create
efficient and effective
environmental policy?

when do climate policies work?

A Systematic Review of Experiences from Low-Carbon Technology Promotion and Water Management

Prepared by
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Dear Policy-Makers, Business Leaders and
Non-Governmental Organizations,

As economies have grown, so have the impacts of industry on the environment. This puts business in the position of having to understand both the impacts and the policy responses they generate. This challenge motivated the NBS Leadership Council to ask “What policies are most effective in achieving their desired environmental objectives?” as a way of understanding how policy is made and how business can play a role in the development of sound environmental policy.

This report represents the culmination of a year-long research study. The research team from Carleton University filtered through thousands of articles to summarize the best available evidence on how to build effective and efficient environmental policy.

You will find valuable insights throughout this report. In particular, we encourage you to read the policy-making decision tree, found in the executive briefing and on page 58 of this report. This tool will help you work through the policy development process, highlighting key success factors and red flags unique to the environmental policy sphere.

We hope this report will help you play a more constructive role in building successful policy — whether you’re a policy lead or a stakeholder in the policy process. Please share this research with colleagues and collaborators working in the challenging and critical area of environmental policy.

Sincerely,

The NBS Environmental Policy Committee and Advisors



Kelly Acton, Industry Canada (chair)



John Coyne, Unilever Canada Inc.



Luc Robitaille, Holcim (Canada) Inc.



David Runnalls, Sustainable Prosperity



Kernaghan Webb, Ryerson University



Alex Wood, Sustainable Prosperity

Dear Reader,

I am delighted to share with you this report on effective environmental policy. While global economic growth benefits society, it can also stress the natural environment. Sound government and industry policies can help protect the environment while stimulating the economy. This report systematically reviews the body of knowledge on climate-related policies to determine what policies work and how policy-makers can lay the groundwork for successful policies from Day One.

This report represents NBS's first foray into the world of public policy research. Businesses and government can, no doubt, cite instances of tension or mistrust in the public policy dialogue. This may stem, in part, from the perception that their interests diverge. I hope this report will help businesses and policy-makers identify specific ways they can engage constructively with one another to achieve common goals — the maintenance of the natural environment for future generations of society and business — through effective policy design, resource-efficient implementation, and flexible and adaptive processes.

This research was authored by a team based at Carleton University, including Dr. Graeme Auld, Bozica Burlica, Dr. Alexandra Mallett, Francis Nolan Poupart and Dr. Robert Slater. The team has benefited from the insights offered by their guidance committee, which included Kelly Acton (Industry Canada), Alex Wood (Sustainable Prosperity), John Coyne (Unilever Canada Inc.), Luc Robitaille (Holcim Inc.) David Runnalls (Sustainable Prosperity) and Kernaghan Webb (Ryerson University).

This systematic review is one of many that form the backbone of NBS. The topics are chosen by our Leadership Council, a group of multi-sector organizations leading in sustainability whose names you will find at the end of this report. This group meets annually to identify the topics most salient to their business. Developing effective and efficient environmental policy was one of the issues at the top of their list in 2011.

We are proud of our systematic reviews. Popularized in the field of medicine, they systematically and rigorously review the body of evidence from both academia and practice on a topic. The result is an authoritative account of the strategies and tactics of managing sustainably, as well as the gaps for further research.

I hope this report will add to our understanding of the determinants of “good” environmental policy and the role that we, as business leaders, researchers and government, can play in its development.

Sincerely,



Tima Bansal, PhD
Executive Director, Network for Business Sustainability
Professor, Richard Ivey School of Business

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synthesis and road map

The Systematic Review was undertaken with three objectives:

1. To understand the direct effects of policy instruments that target environmental problems and how these policies interact.
2. To understand how and whether characteristics of environmental problems influence the effectiveness of policy instruments.
3. To understand the possible trade-offs between cost-effectiveness, solving the environmental problems and government accountability.

introduction

Pressing environmental challenges face business leaders and policy-makers alike. As the challenges of climate change become more apparent, the need for careful assessment of what policies work in what circumstances and why is ever more important.

In conducting this study, commissioned by the Network for Business Sustainability, the authors sought to shed light on questions about the impacts, processes, cost considerations and accountability implications of different policy instruments. The motivation for this study arose from a preliminary assessment of the literature on environmental policy. That assessment identified two trends within the literature: first, that interest in new environmental policy instruments is increasing and second, that there are few reviews of the empirical evaluations done to date on the successes or failures of different implemented policies.

We undertook this systematic review to address these gaps and were guided by three objectives:

1. To understand the direct effects of policy instruments that target environmental problems and how these policies interact;
2. To understand how and whether characteristics of environmental problems influence the effectiveness of policy instruments; and
3. To understand the possible trade-offs between cost-effectiveness, solving the environmental problems and government accountability.

The first objective was motivated by policy scholars' growing interest in the role of policy bundles (Jordan, Wurzel, and Zito 2005; Durant et al. 2004; Braithwaite 2008). Hence, we focused specifically on understanding how governments can and do play a steering role through the use of a suite of different instruments, ranging from taxes and charges to negotiated agreements and labelling programs, and on determining what lessons might be available to better guide this steering role in the future. We sought to examine empirical cases in which new environmental policy instruments — which we broadly classify as hybrid instruments — have been used, because systematic assessments of their impact in practice are all but absent in the literature. By carefully assessing the roles of individual instruments, we sought to identify how and when bundles of policy initiatives, led by government and private actors, work effectively.

The second objective was a response to research that has stressed the need to match policy instruments to the character of policy problems (Keohane, Revesz, and Stavins 1998; Paehlke 2001). Many and diverse environmental problems exist. We have limited our attention to climate change, focusing on two aspects of this wide-ranging and complex policy problem: (1) finding ways to promote the adoption of low-carbon technologies and (2) managing ocean and fresh water ecosystems for climate-change mitigation and adaptation.¹ Focusing on these two aspects facilitated our examination of the fit of different policies with problems of natural resource management

and technology and/or pollution reduction, and allowed us to assess whether and how similar policies work for differently for different problems.

The third objective arose from research highlighting how different policy goals often operate at cross-purposes. Cost considerations may, for instance, limit how far a policy goes in ameliorating an environmental problem. Our category of hybrid instruments raises other questions about government accountability in instances where policy-makers delegate authority or have their authority superseded by private regulatory initiatives. Though what constitutes accountability has been the subject of much debate, many have contended that it is “the responsibility to answer, to explain and to justify specific actions (or inactions), in part by keeping records of important activities” (Behn 2001, p. 4). Our study has focused on accountability by government, in the role of public trustee and as government actors relate to other, non-

¹ We restrict our definition of “adaptation” to those policies that reduce climate-change effects on human social and economic systems. We will not look at policies for adapting biological systems, such as moving protected areas.

state actors, particularly from the private sector. Building upon these three objectives, we were guided by the following questions:

1. How effective are different policy instruments in achieving environmental objectives, particularly:
 - a) The promotion of low-carbon technologies (low-carbon technology, hereafter)
 - b) The management of ocean and fresh water ecosystems for climate-change mitigation and adaptation (water management, hereafter)?
2. How cost-effective are these instruments for governments, regulated parties and society?
3. What accountability implications do different instruments have for government?

SUMMARY OF FINDINGS AND HOW WE GOT THERE

We began our research with a conceptual framework, drawn from the literature, that helped us identify aspects of the policy interventions and their effects (see Figure 1). It comprised three components.

First, the framework identified two contextual factors: the agenda-setting process (i.e. how an issue gains the attention of an authority such that a policy action is considered) and the characteristics of the problem. We expected that both would shape the kinds of impacts policies would have when implemented in different settings.

Second, the framework focused on policy design. This component included four primary considerations — the basis of authority for the policy, the type of instrument, the actor targeted by the

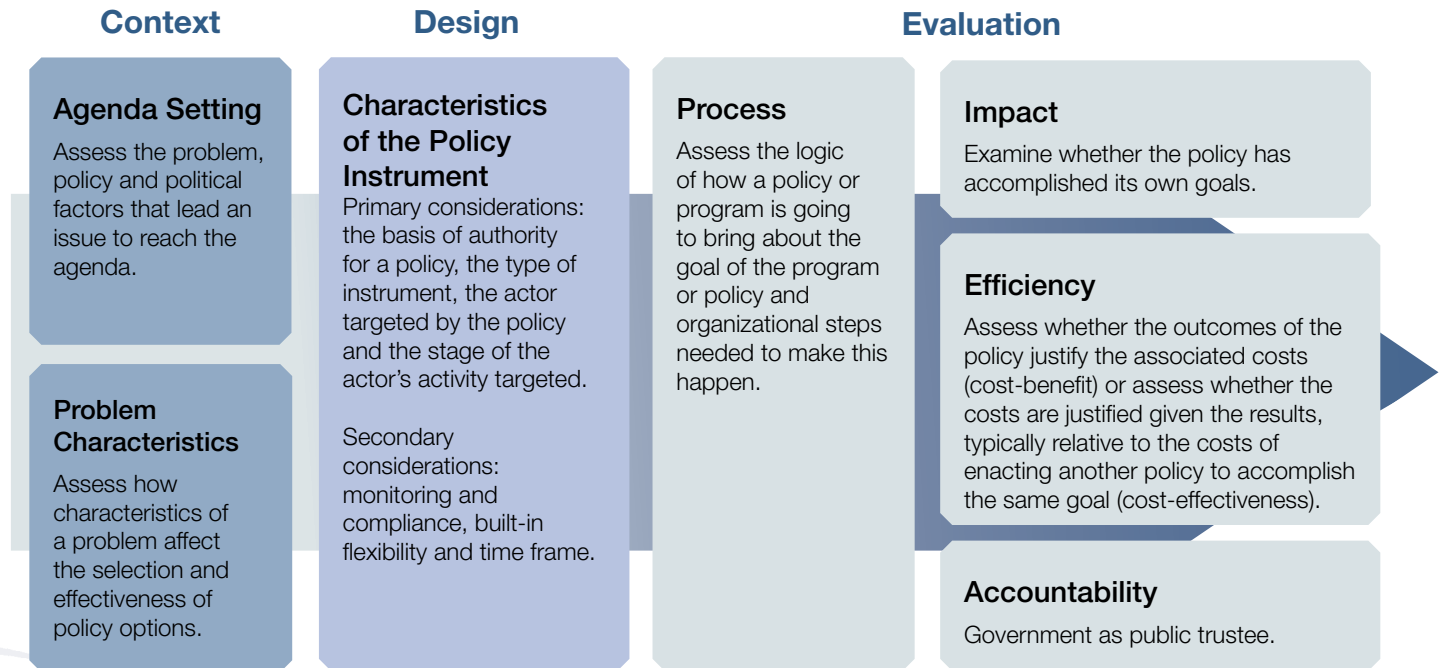
policy and the stage of the actor's activity targeted — and several secondary considerations — the policy's monitoring and compliance provisions, built-in flexibility and time frame.

Third, we considered three types of policy evaluation — *process*, *impact* and *efficiency* — and the implications different policy interventions had upon accountability. *Process evaluation* assesses the logic of how a policy or program is going to bring about the goal of the program or policy and the organizational steps needed to make this happen. *Impact evaluation* assesses whether the policy has accomplished its own goal as identified by the reviewed study. Rather than defining impact a priori, we assessed how researchers had quantified impacts, whether science-based, such as reductions in greenhouse gas (GHG) emissions or some other measure of environmental improvement, and also noted whether effects were direct or indirect and positive or negative. *Efficiency evaluation* assesses cost-benefit — whether the outcome of a policy justifies the associated costs — and cost-effectiveness — whether the costs are justified given the results, typically viewed in relation to the costs of enacting another policy to accomplish the same goal (Pal 2010).

Finally, we assessed *accountability*, understood as the government's role as a public trustee. Thus, overall evaluation results refer to the total number of evaluations, regardless of their type.

Figure 1

CONCEPTUAL FRAMEWORK GUIDING THE RESEARCH



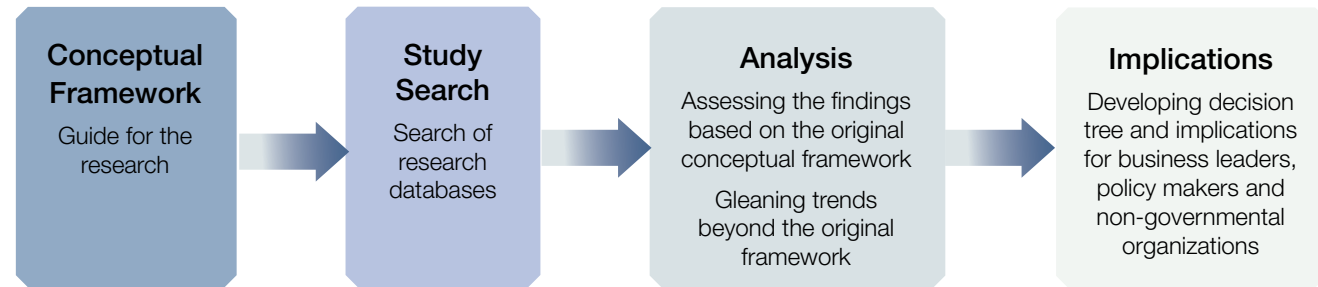
Using the conceptual framework, we conducted searches of academic peer-reviewed literature and other technical sources (e.g. government reports). The searches were tailored to identify studies on our two focal problems. Within these search results we then looked for studies with an empirical focus, defined as research examining primary data gathered directly from interviews, surveys, observation and sampling, or from the meta-analysis of other such primary-sourced studies, and focused on those studies reporting *ex post* evaluations of policies and/or programs. These

studies were examined for conclusions about the impact-, efficiency- and process-related outcomes of different policy interventions, as well as consequences for accountability. Having analyzed the empirical data, we moved on to consider their implications, developing a policy framework and decision tree to help government policy-makers, business leaders and non-governmental organizations understand the key factors to weigh when choosing among different instruments for specific objectives. Our analytic method is outlined in Figure 2.

Our literature searches covered 892 sources, of which we reviewed in depth the most rigorous and relevant 204 studies.

Figure 2

ANALYTIC PROCESS



Our literature searches covered 892 sources, of which we reviewed in depth the most rigorous and relevant 204 studies. Of these qualifying studies, more than three-quarters of them assessed low-carbon technology policies. The skew towards low-carbon technology studies meant we focused the majority of our analysis on this problem, but we used water-management policy as a counterpoint to increase the robustness of our analysis (Table 1).

What did we find? First, we discerned several patterns in the qualifying studies. The bulk of the analyzed policies detailed impact evaluations, which, while important, presented only a partial portrayal of the policy under scrutiny. Our analysis found that policy-makers were at risk of making several potential trade-offs. One such risk was that accountability might be traded off for efficiency, or vice versa, depending on a policy instrument's source of authority. For example, a voluntary program allowing participating firms to choose between various options for GHG abatement might reduce its costs, but in the process

negatively impact the program's accountability because poor monitoring and reporting of voluntary action make identifying responsibility more difficult. Another potential trade-off is between environmental effectiveness and cost-effectiveness, depending on the stage of activity that a policy regulates.

Second, looking at instrument characteristics, we found that expenditure instruments perform better than regulatory instruments in overall and impact evaluations. Built-in flexibility and longer time frames were two other factors that increased positive evaluations. Instruments with built-in flexibility were more likely to have positive overall, process and efficiency evaluation results. Policies with longer time frames garnered more positive efficiency and process evaluations. Evaluation results also co-varied depending on the target of the policy: government, firms, citizens or other actors. For both policy problems we studied, those policies that target governments have a lower rate of success than those that target firms, industry associations and citizens.

Table 1

ILLUSTRATIVE STUDIES FROM THE REVIEW

LOW-CARBON TECHNOLOGY

- Banerjee, A. and B. D. Solomon. 2003. Eco-labeling for Energy Efficiency and Sustainability: A Meta-evaluation of US Programs. *Energy Policy* 31 (2) (1): 109–23.
- Brouhle, K. and D. R. Harrington. 2010. GHG Registries: Participation and Performance under the Canadian Voluntary Climate Challenge Program. *Environmental & Resource Economics* 47 (4): 521–48.
- Bruvoll, A. and B. M. Larsen. 2004. Greenhouse Gas Emissions in Norway: Do Carbon Taxes Work? *Energy Policy* 32 (4–3): 493–505.
- Carley, S. 2009. State Renewable Energy Electricity Policies: An Empirical Evaluation of Effectiveness. *Energy Policy* 37 (8): 3071–81.
- Ekins, P. and B. Etheridge. 2006. The Environmental and Economic Impacts of the UK Climate Change Agreements. *Energy Policy* 34 (15): 2071–86.
- Henriksson, E. and P. Söderholm. 2009. The Cost-Effectiveness of Voluntary Energy Efficiency Programs. *Energy for Sustainable Development* 13 (4): 235–43.
- Johannsen, K. S. 2002. Combining Voluntary Agreements and Taxes — An Evaluation of the Danish Agreement Scheme on Energy Efficiency in Industry. *Journal of Cleaner Production* 10 (2): 129–41.
- Yin, H. and N. Powers. 2010. Do State Renewable Portfolio Standards Promote In-State Renewable Generation? *Energy Policy* 38 (2): 1140–9.

WATER-MANAGEMENT

- Pittock, J. and D. Connell. 2011. Australia Demonstrates the Planet's Future: Water and Climate in the Murray-Darling Basin. *International Journal of Water Resources Development* 26 (4): 561–78.
- Van Der Brugge, R. and R. De Graaf. 2010. Linking Water Policy Innovation and Urban Renewal: The Case of Rotterdam, the Netherlands. *Water Policy* 12 (3): 381–400.

Finally, many studies have stressed the need to understand how bundles of policies could work together synergistically. They might examine, for instance, how revenues for carbon taxes could be fed back into funds for research and development on low-carbon technologies such that the combined effects would be greater than any achievable by an individual policy. Or, they might explore what kind of rules government should impose when using expenditure

instruments so as to lever these funds for greater results. More research is needed, particularly on water-management policies; across the board, the studies we reviewed stressed the great importance that the effects of climate change will have on water.

From our findings, we have isolated several key points that have both general application and specific relevance for government, businesses and non-governmental organizations.

Our **general application** takeaways are:

- *Look long-term*: The nature of current environmental challenges demands continued and sustained attention by all parties, with a long-term view in mind.
- *Focus on opportunities*: Decision-makers can unlock more creativity by focusing on solutions outside the bounds of legislative authorities entrenched in the status quo.
- *Avoid “one size fits all” policy*: The choice of specific instruments depends upon the nature of the issue and the parties involved.
- *Use policy bundles to make the most progress*: Combinations of legislation-based (regulation, expenditure and information provision) and hybrid policy initiatives, when synergistic, can provide the most effective and efficient conditions for progress.
- *Monitor performance for better results*: Policies that incorporate mandatory reporting requirements perform best.
- *Communicate frequently and effectively*: Open communications and information transfer between all parties provide an essential foundation throughout the lifecycle of an issue and play a critical role in agenda setting.

Our takeaways for **government** include:

- *Fulfill your public role*: Government’s status as public trustee gives it a unique and paramount role in leading and facilitating environmental policy action.

- *Engage all players*: There are great benefits from engaging the private sector and other interests while managing carefully the perception or reality of regulatory capture.
- *Stay the course*: Action on environmental policy requires a long-term commitment and vision.

Our takeaways for **business** are:

- *Focus on efficient and effective engagement*: Businesses have a stake in every stage of an issue life cycle, and can constructively engage with policy-makers by bringing technical expertise to decision-making processes.
- *Choose to lead or to follow*: Leading firms can benefit from getting ahead of the regulatory curve, but following also may be viable if the stakes for an individual company do not justify the investment necessary to lead.

Our takeaway for **non-governmental organizations**:

- *Leverage your voice and positioning*: Non-governmental organizations, while limited in resources, can have high credibility with the public and are often the source of novel and challenging solutions. Moreover, they can and do play active roles in advocating for, designing and implementing effective environmental policies.

HOW TO NAVIGATE THIS REPORT

The remainder of this report is structured in four parts. First, following this brief introduction, the Synthesis and Roadmap section ends by providing a descriptive overview of the studies we reviewed. We use this section as a background for the rest of the report. It includes definitions of the key terms used in classifying and assessing the studies (these terms can also be found in a glossary at the end of the report) and provides descriptive statistics sketching the overall patterns that emerge from the 204 studies reviewed. For the reader wanting a quick snapshot of the studies, this section is a useful place to start.

The next section presents our analysis. We identify differences in the evaluation outcomes for the two focal problems discussed in the qualifying studies. In addition, we examined how policy characteristics and evaluation outcomes co-vary. Examples from specific studies are used to illustrate the general patterns. From these trends and examples, we identify the contextual factors, design issues and trade-offs affecting low-carbon technology and water-management policies. This part of the report will be important for the reader wanting more details from the studies we examined.

Following the analysis section are the implications of this study's findings for decision-makers and future research. We outline a model policy framework which comprises three components: the context of an issue, cross-cutting policy functions and the issue's life cycle. We operationalize the framework through a decision tree, which we apply to our two focal policy problems. The discussion of each problem draws upon the reviewed studies and their findings about specific policy instruments. However, the

decision tree includes questions that ensure decision-makers will be careful to recognize and account for the interactions between policies. This is the section for the reader keen to immediately understand the practical implications of the review.

The last section outlines the search and coding protocol we used to identify the qualifying studies. The information it contains should answer any questions a reader has about the steps we took in garnering the results outlined in the body of the report. This section also includes a glossary of key terms and an instrument-by-instrument assessment of the design considerations of selected policies, which affected whether they worked well or not. This part of the report ends with the list of references cited throughout.

Map of the Literature

Our review examined 204 studies that met two primary criteria. First, the studies assessed policies addressing low-carbon technologies or water management in the context of climate change. Second, they presented *ex post* evaluations of the policy impacts in practice, which means they evaluated effects during or after a policy's implementation. A few studies presented *ex ante* evaluations. These studies were included to provide additional coverage of the water-management problem. Many studies evaluate more than one policy. For instance, a number of studies examined the UK Climate Change Levy and Climate Change Agreements (Agnolucci 2009; Ekins and Etheridge 2006). In these cases, we assessed each policy separately. Hence, the number of policies discussed in the report exceeds the total number of studies.

This section describes the literature to provide a background for the analysis presented in the analysis section. Following a discussion of the character of the studies, we outline features of the problems, policies and evaluations that have been assessed in our review. (Please see Research Methods for more information on the research approach.)

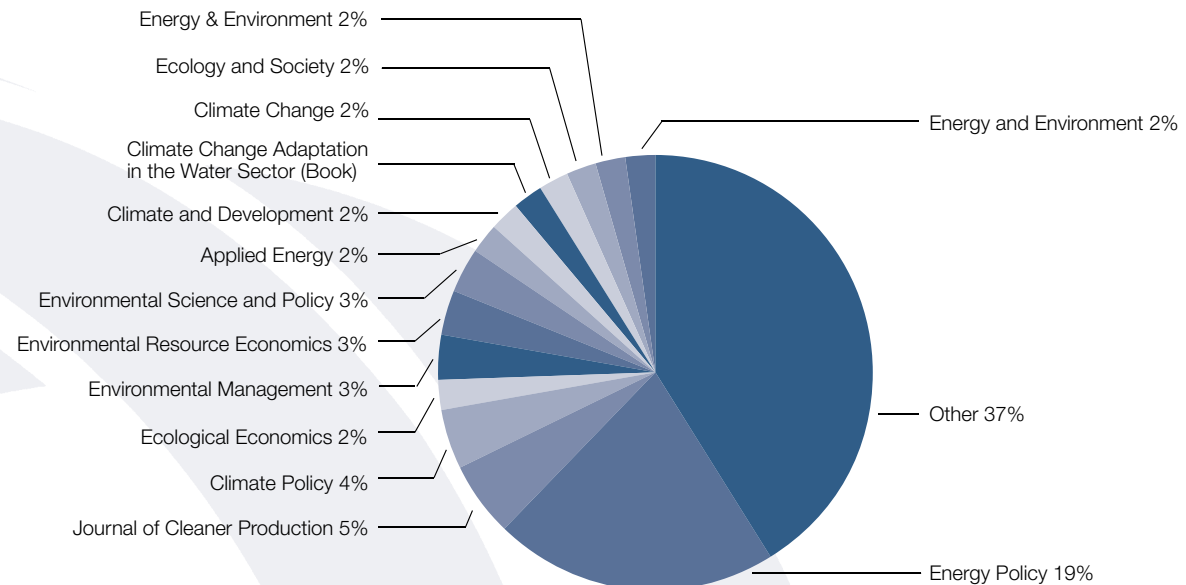
THE STUDIES

Of the 204 studies reviewed, 113 were academic, peer-reviewed publications, 90 were grey literature and one was a technical or trade publication. As noted above, studies which were not peer reviewed were classified

as grey literature, which encompasses government reports, working papers and additional sources not subject to academic peer review. The academic peer-reviewed studies come from more than 50 journals, a quantity that suggests broad interest in climate change across a range of academic disciplines. However, *Energy Policy* dominates in its contribution, providing a total of 33 studies. The next most significant journals include the *Journal of Cleaner Production* (six studies) and *Climate Policy* (five studies), *Ecological Economics*, *Environmental Management*, *Environmental Resource Economics* and *Environmental Science and Policy* each had three studies (Figure 3).

Figure 3

ACADEMIC, PEER-REVIEWED STUDIES BY SOURCE



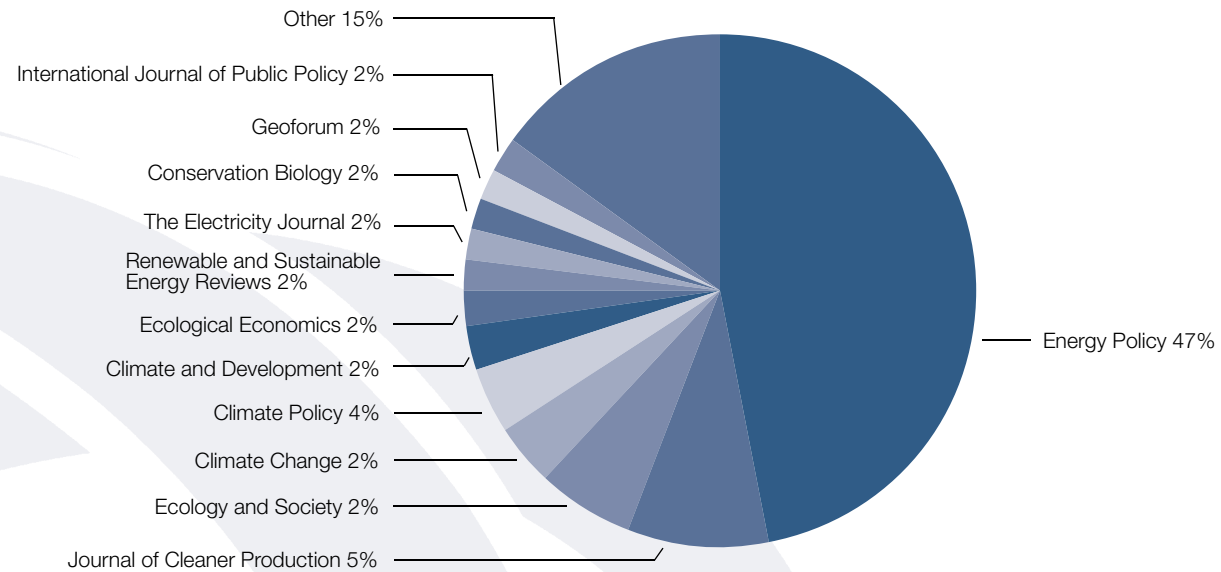
The number of Google Scholar citations provides a proxy for the importance of individual studies.² A large number of citations indicate that a study is in some way influencing ongoing research and/or policy discussions. Studies from *Energy Policy* dominate the number of citations received on Google Scholar. These studies have been cited a total of 858 times, representing nearly 50 percent of all the citations to the journal studies we examined (Figure 4). Almost half of these citations are for articles published in 2006. The nine studies published in *Energy Policy* that year account for 371 citations, or 78 percent of the 471 citations to all the academic and grey

literatures studies from 2006. Despite this dominance, compared to the number of studies per journal, citations are more evenly spread: 30 percent of the academic studies have been cited 20 or more times, and 43 percent have 10 or more citations. The grey literature receives fewer citations: eight percent have been cited 10 or more times; 41 percent have been cited at least once.

Over time, citation numbers have grown substantially. There is also a general growth in the number of studies (Figure 5). To date, studies from 2006 are the most cited. The general increasing trend in

Figure 4

GOOGLE SCHOLAR CITATIONS BY JOURNAL



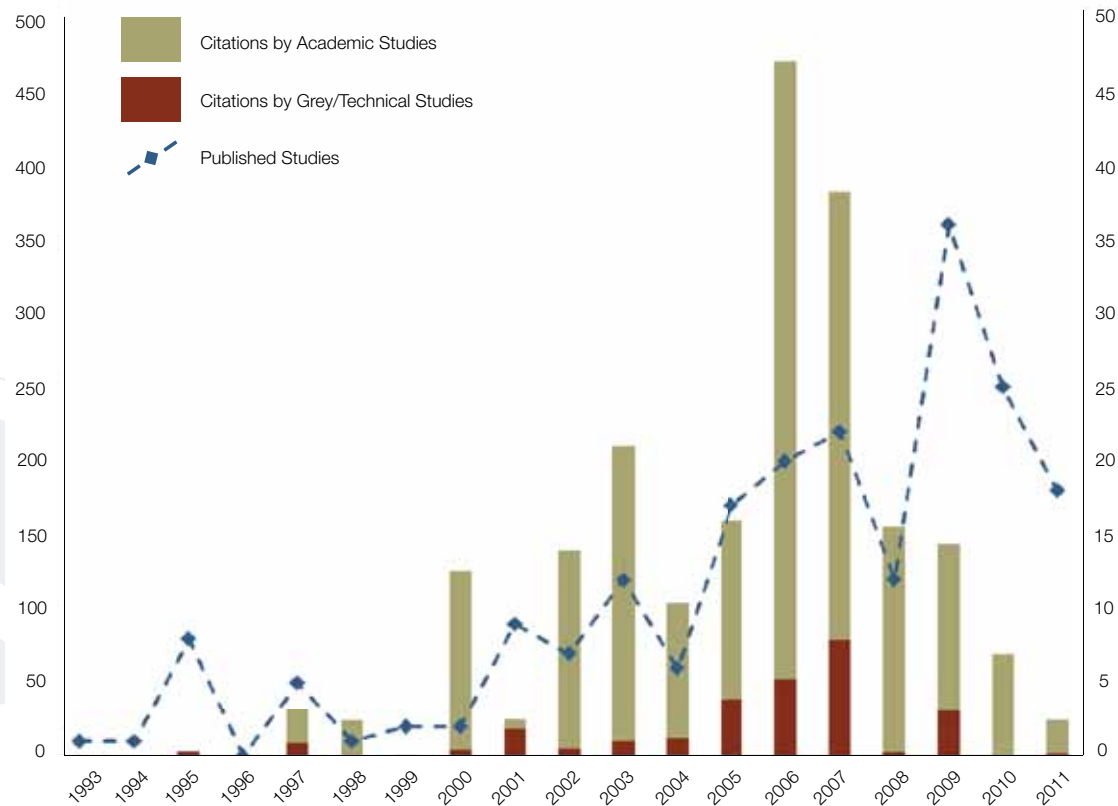
² We have used Google Scholar instead of Scopus or Web of Science to enable comparisons between the grey literature and the academic studies.

studies implies that studies from 2008 to 2011 are likely to receive further citations in the coming years, as there is frequently a lag between when a study is published and when it is referenced by further research. The focus and research methods of the studies are diverse. We coded 136 case studies, 52 program

reviews and 33 meta-analyses (Table 2). The case studies included the widest range of research; they could be comparative or focus on just one unit, which could be a policy initiative, a program, a problem, a technology or an organization. Program reviews were more specific, assessing a government

Figure 5

GOOGLE SCHOLAR CITATIONS BY YEAR AND NUMBER OF STUDIES



Note: Time trend in the number of studies (blue line) and Google Scholar citations by academic (green bar) and grey or technical literature (red bar) by the year studies were published. The number of citations is captured on the left vertical axis; the number of studies is captured on the right vertical axis.

Table 2

TYPES OF RESEARCH AND FOCUS OF THE STUDIES' ANALYSES

CHARACTERISTICS	TYPE OF RESEARCH				
	Program Review	Case Study	Meta Analysis	Ex Ante	Total
Number of Studies	52	136	33	5	226
FOCUS OF ANALYSIS					
Other	1				
Instrument	40	88	23	1	152
Problem	5	30	7	2	44
Sector	3	6	1	2	12
Technology	3	12	2		17
Sub-total	52	136	37	5	225
FORM OF ANALYSIS					
Qualitative	30	104	27	2	163
Quantitative	25	39	13	2	79
Sub-total	55	148	40	4	242

Note: Numbers add up to more than total studies as certain studies fell in more than one category.

or inter-governmental program after or during its implementation. Meta-analyses compiled information from a number of studies to assess the overall conclusions of a body of work. For all three categories, the most typical focus of analysis was a policy instrument. For instance, there were several studies that examined carbon taxes in different countries (Andersen 2004) or renewable portfolio standards (RPS) in the United States (Wiser, Porter and Grace 2005; Wiser, Barbose and Holt 2011). Problem-based analyses were the next most prevalent. A number of the water-

management studies, for example, examined how climate change was expected to alter the frequency and severity of drought and flood events in certain watersheds (Kranz, Menniken and Hinkel 2010). Technology and sector-level analyses were the least prevalent in our review.

Across the types of studies, both qualitative and quantitative analyses were used. While a total of 41 studies used both quantitative and qualitative analysis, qualitative analysis dominated overall. More than 75 percent of the case studies (104 studies) used

qualitative analysis. About 75 percent of the studies were also comparative, looking at more than one geographic unit. There is a more even spread among the studies of the time span they analyzed: 30 percent of the studies covered a time span of less than five years; 34 percent covered between five and 10 years; and 28 percent covered more than 10 years.

CONTEXT

Climate change as a complex problem

Climate change, although discussed frequently as a single problem, is really a collection of problems. At a basic level, slowing or stopping the emissions of greenhouse gases (i.e. mitigation) presents different challenges than those involved in changing human activities to adjust to the environmental, cultural and economic consequences of climate change (i.e. adaptation). Our review provides insights into both these policy areas. It also provides decision-makers with information on how certain characteristics of problems have been addressed by other decision-makers working in different contexts.

Of the 204 articles we coded, 165 related to policies for low-carbon technology. The remaining 39 articles focused on policies addressing water management. The types of problems these two policy areas address are diverse. Low-carbon technology policies focus on energy efficiency and/or renewable energies. Some of these policies intend to reduce emissions but others pay attention to competitiveness, industrial development or other objectives. Water-management policies also tackle different kinds of problems — from water allocation to efficient use by

households, industrial users or farmers, and from water basin and/or coastal zone planning to address sea-level rise to weather events, such as drought, floods and intense storms.

With respect to geographic area, most of the studies for both problems focus on the European Union or one of its member countries. Climate change has been front and centre for European governments, industry and non-governmental organizations for many years. For instance, Germany launched its first Feed-in-Tariff (FiT) in 1991 (Wüstenhagen and Bilharz 2006) and Norway, Sweden, Finland and Denmark all enacted carbon taxes in the 1990s (Andersen 2004; Persson and Gudbjerg 2005). In addition, EU members, and particularly the Netherlands, have served as policy leaders with initiatives on water management (Roth and Winnubst 2009; Hulea, Ebert and Strobel 2009; Hendriks and Buntsma 2009).

Agenda Setting

Context plays a pivotal role in determining the kinds of policy instruments governments adopt. There may be many problems experts, citizens, firms, the international community and other stakeholders consider important, yet only some of these make it onto the government's agenda.

We surveyed the selected studies for mentions of factors that help explain why a given policy reached the agenda. Agenda setting was mentioned in 112 policies. Among these, 70 noted a particular characteristic of the problem that helped raise the issue's salience. The most frequently cited factor was some kind of international process (28 policies). For

instance, many of the studies addressing low-carbon technology noted the importance of the Kyoto Protocol as a spur to policy action on GHG emissions for those countries assigned specific emission reduction targets (Betz and Sato 2006). The second most cited factor was a focusing event (20 policies). For example, after Chernobyl, concerns in Germany about the safety of nuclear energy were attributed with helping keep renewable energy on the German political agenda (Walz 2007; Wüstenhagen and Bilharz 2006). Studies cited the presence of an indicator raising an issue's salience 13 times and the action of a feedback mechanism, such as a policy with a built-in review process, nine times. For instance, reaction by industry to the United Kingdom (UK) Climate Change Levy (CCL) served as a feedback mechanism that helped bring about the negotiations of the UK Climate Agreements. As a result, the Agreements gave eligible energy-intensive sectors the possibility of an 80 percent reduction in the tax burden of the CCL in exchange for sector targets for energy use or carbon emissions (Martin and Wagner 2009).

Characteristics of politics were mentioned as factors facilitating the movement of an issue onto the government's agenda a total of 31 times. Favourable public opinion was the most frequently cited factor (nine policies), followed by unfavourable public opinion (seven policies). In Germany, for example, a number of studies noted the importance of ongoing public support as a factor that ensured renewable energy policies were maintained since the oil crisis in 1973 (Wüstenhagen and Bilharz 2006), a situation that was not replicated in the US (Walz 2007). Favourable and unfavourable party platforms were the next most cited factors (five and three policies, respectively.)

Finally, specific characteristics of the policies were cited in 49 of the instruments analyzed, with the presence of champions for a given policy being the dominant factor (18 policies). In the Dutch city of Rotterdam, for example, an international architectural event — the 2nd International Architecture Biennale Rotterdam — served as both a focusing event and a champion for a new approach to water management in the city. It facilitated a visioning project that went beyond the individual mandates of participating government agencies, municipalities and water boards to develop a way to address urban design and climate adaptation concurrently through new approaches to water retention (Van Der Brugge and De Graaf 2010). Other studies noted as important the policy's fit with existing practices (nine policies indicated a good fit was important, three indicated that a lack of fit had been important) and social appeal (11 policies said high appeal was important, three policies indicated low appeal was important).

POLICY AND POLICY INSTRUMENTS

Policy provides an overall guide. It can involve action or inaction and necessitates determining the appropriate means necessary to accomplish certain ends. These ends may be social, economic or environmental outcomes desired by society. Sometimes, however, policies serve a symbolic rather than an instrumental purpose, so they function as ends in and of themselves (Prince 2010).

Policy-makers have an array of specific policy instruments available to them. Figure 6 presents a conceptual framework we developed to classify the key facets of the policies detailed in the qualifying studies.

These facets comprise the basis of authority, the types of instruments, the regulatory targets and the stages of activity targeted. Our analysis also collected information on additional attributes of the policies and agenda-setting processes covered by the studies. The latter are particularly important because an issue's status on the agenda is critically related to the action taken.

Authority

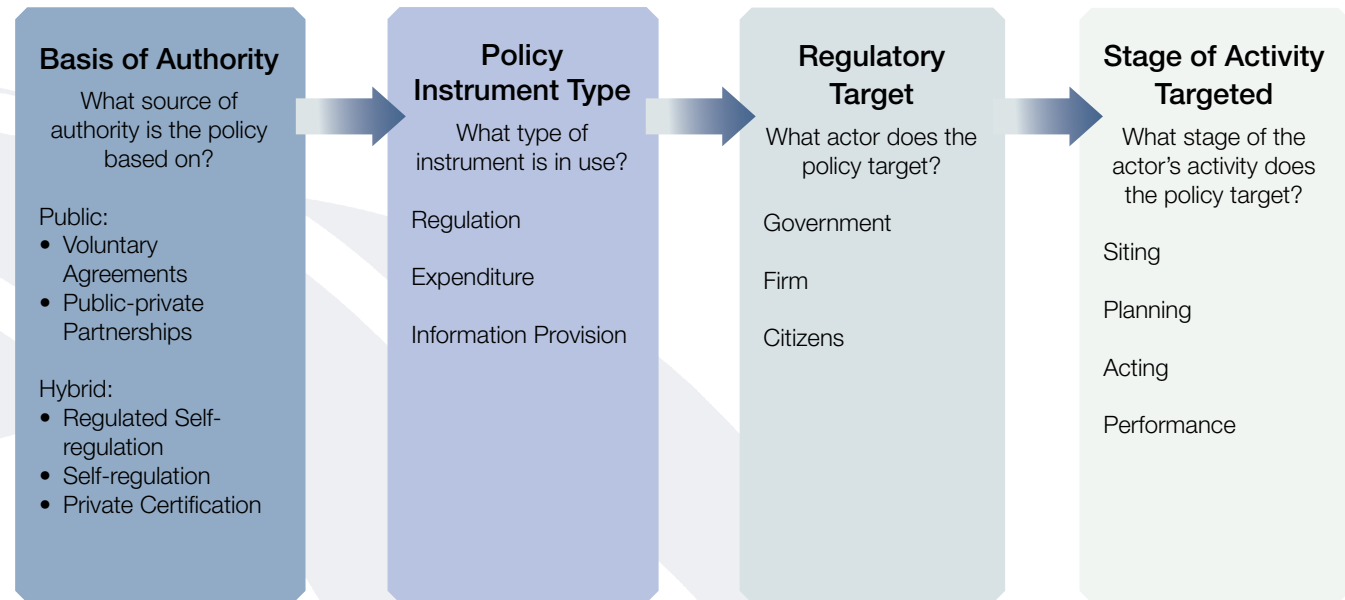
Our review began by categorizing instruments based on whether they were public or hybrid instruments (Figure

6). The hybrid category is varied, ranging from explicit partnerships among government, industry and other stakeholders (e.g. NGOs) to entirely private initiatives of individual companies or multi-stakeholder processes, where governments are either excluded or just one interest competing with others for policy influence (Cashore 2002).

Of the policies examined, 263 were classified as grounded in government authority; another 100 were classified as hybrids. The hybrids varied in form. There are 48 voluntary agreements in the assessed studies, making this the most prevalent type. Examples

Figure 6

CONCEPTUAL FRAMEWORK FOR THE CLASSIFICATION OF POLICIES COVERED IN THE QUALIFYING STUDIES



include the voluntary agreements between industry and governments in the UK and Denmark that set sector and/or company energy efficiency targets (Martin and Wagner 2009; Andersen 2004; Lipp 2007). Public-private partnerships comprised 22 of the hybrid instruments. One example is a river restoration partnership between the World Wildlife Fund and countries along the river Danube (Hulea, Ebert and Strobel 2009). Self-regulation and regulated self-regulation were the next most prevalent, with 13 and six instruments represented in the studies, respectively. Examples included the role of self-regulation in reef tourism operations in Australia (Biggs 2011) and the “Declaration of German Industry on Global Warming Prevention” announced in 1996 by 18 German industrial associations, which provided commitments to reaching a target of reducing emissions to 20 percent below a 1990 baseline (Ramesohl and Kristof 2001). Private certification programs were only captured four times. One example is Australia’s Greenhouse Friendly product labelling program (Taplin 2004).

Another implication of the shift noted above is the potentially increasing role of other forms of authority to induce behavioural change. Forms of hybrid governance, such as regulated self-regulation, may still rely on the threat that government might step in to regulate in the future; other forms of these instruments employ social and market forms of coercion to motivate action. The reviewed studies discussed 242 policies. The majority of these policies depended on government sanction as the source of authority. Forty-four of the 242 relied on the threat of government sanction. Only 14 policies discussed in the reviewed research drew on pressure from the market or pressure from a peer group as a means to encourage compliance.

Instrument type, targeted actor and stage of activity

For public and hybrid instruments, we categorized policies according to whether they were regulatory, expenditure or information provision instruments. Government regulations are “legal obligations based in legislation that prohibit certain types of behavior or that require the explicit permission of the government to engage in specified activities” (Winfield 2009, p. 47). They typically include some penalty (e.g. fines) if violated. When any of the hybrid instruments included regulations, the penalties would be different; they might involve, as noted above, the threat of government intervention in the future or the loss of market access, market share or a good reputation in the public’s eye as a consequence of, for instance, a naming and shaming campaign (Spar and La Mure 2003).

Expenditure policies involve control of finances. They are also often referred to as incentives, implying a positive reward, but they can be disincentives (e.g. user charges). They have been proposed as a means to create systemic-level change (such as addressing climate change) and include taxes, subsidies and charges.

Informational policies seek to change behaviour through the skillful deployment and control of information (Prince 2010). They include public outreach and education campaigns and information disclosure, such as Canada’s National Pollutant Release Inventory, created in 1992 (Winfield 2009; Hood 1984).

About half of the analyzed policies were some form of regulation (187 policies): 140 were government policies and 47 were hybrids. A total of 106 policies, roughly 30 percent, were regulation; 88 of these were government policies and 18 were hybrids. Informational

policies were less prevalent. We classified 64 policies as some form of information provision, with more than half of these, 35 policies, as some form of hybrid. This was the first instance where hybrid policies were more numerous than those of government.

We also analyzed the policies based on their target actor (e.g. citizen, firm or government) and target stage of activity. The stages of activity included siting, planning, acting and performance (Table 3).

Siting refers to policies that encourage or require the target to alter where and how they develop a new operation. For example, for a utility that owns electricity generation facilities, this could be an expenditure incentive, such as a subsidy given to the

utility to generate electricity from lower carbon sources like wind and solar energy thus changing the location where electricity was generated. It could also mean new transmission lines in a particular location over another, ensuring certain communities were better serviced or avoiding lines going through sensitive ecosystems.

Planning refers to policies that encourage or require the target to change how and when it undertakes activities such as accident or mitigation planning. For a utility, this could be a regulation, such as a requirement that the operation have a plan in place to minimize the environmental impacts of the periodic removal of vegetation underneath transmission lines, or

Table 3

DEFINITIONS OF STAGES OF ACTIVITY

STAGE	DESCRIPTION
Siting	Policies that encourage or require the target to alter where and how they develop a new operation <i>Example: Subsidy for an electric utility to generate power from wind and solar energy, thus changing the location where electricity is generated.</i>
Planning	Policies that encourage or require the target to change how and when it undertakes certain planning activities such as accident or mitigation plans. <i>Example: A regulation for a utility requiring planning to manage variability in the electricity supply of renewable energy sources to prevent brownouts during peak loads.</i>
Acting	Policies that encourage or require the target to undertake specific activities in its operation. <i>Example: A regulation requiring a utility to invest in increasing its own production of a particular kind of renewable energy.</i>
Performance	Policies that encourage or require the target to achieve particular outcomes <i>Example: A regulation requiring a utility to produce a certain amount, but not type, of renewable energy.</i>

to manage variability in the supply of electricity through renewable energy sources so that brownouts during peak loads could be prevented.

Acting refers to policies that encourage or require the target to undertake specific activities in its operation. For a utility, an example could be a regulation requiring fences around all transmission lines to prevent wildlife from interfering with the wires or a requirement that the utility invest in increasing its own production of a particular kind of renewable energy. The key idea is that the policy would influence the target's actual activities. (These policies are often referred to as technology standards because they require the target use a particular technology.)

Performance policies refer to those that encourage or require the target to achieve particular outcomes. For a utility, an example would be a renewable portfolio standard, requiring it to offer a certain percentage of its electricity generated from a set of renewable sources. If the requirement specified one type of renewable source or required that the utility produce this electricity itself, then the policy would be considered an acting standard instead. The key point of a performance policy is that the target has some discretion in how it achieves the policy's objective.

Firms were the most frequent targets of policy. A total of 187 policies targeted firms: 87 of these focused on performance; 74, on acting; 15, on siting; and 11, on planning. Citizens were the next most frequent targets. We analyzed 55 policies directed at citizens; among these, 31 focused on how citizens act, 12 focused on aspects of planning, nine dealt with performance and three with siting. Other targets included *government* (26 policies) and *industry*

or *professional associations* (26 policies). On the whole, performance policies were the most prevalent, accounting for 129 policies (38 percent); acting policies were a close second, with 125 policies (37 percent).

EVALUATION

Evaluation is essential to good policy-making. It tells us what does and does not work and why, thus providing the information and insights we need to achieve continuous improvement in performance. Our analysis captured information on *ex post* evaluations of the impacts of different policy instruments. It also assessed the accountability consequences of policy choices.

We looked at the individual and summed results for three types of evaluation — impact, process and efficiency (Pal 2010) — and accountability implications (Table 4). Impact evaluations examine whether the policy has accomplished its own goals. Across all the studies, there were 287 impact evaluations. Of these, 178 impact evaluations measured success against a program's and/or policy's own goals — for instance, whether the target of a renewable portfolio standard was met. Another 84 impact evaluations looked at alternative goals. For instance, some studies looked at how well feed-in-tariffs, tax credits and other instruments do at inducing innovation (Vollebergh 2010). A smaller set of 12 evaluations examined positive or negative side effects caused by a policy or program and a remaining 13 evaluated the impacts overall.

Process evaluations assess the logic of how a policy or program is going to bring about the goal of the program or policy and the organizational steps

Table 4

TYPES OF POLICY EVALUATION

EVALUATION	NUMBER OF EVALUATIONS	DESCRIPTION
Impact	287	Examines whether the policy has accomplished its own goals <i>Example: Assessing whether a renewable portfolio standard program accomplished its targets.</i>
Process	176	Assesses the logic of how a policy or program is going to bring about the goal of the program or policy and the organizational steps needed to make this happen <i>Example: Examining how features of a program, such as flexibility mechanism, affect implementation.</i>
Efficiency	85	Assesses whether the outcomes of a policy justify the associated costs (i.e. cost-benefit); assesses whether the costs are justified given the results, typically relative to the costs of enacting another policy to accomplish the same goal (i.e. cost-effectiveness) <i>Example: Assessing whether benefits from flood protection, such as reduced insurance payouts, are larger than the costs of new water-management infrastructure (cost-benefit).</i>

Note: Definitions drawn from Pal (2010).

needed to make this happen. There is a design and implementation component to process evaluations (Pal 2010). Either design or implementation or both can contribute to — or take away from — the success of a policy. Across the studies, 176 process evaluations discussed some procedural component of the policy and/or program. Of these, 31 process evaluations focused on the program theory; in other words, the logic of how the program was going to bring about the desired outcomes. There were few studies looking at program theory relating to water management in the context of climate change because of the limited

experience with implementation to date (Iglesias et al. 2011). Another 153 process evaluations (some which also focused on program theory) assessed implementation issues. For instance, the Dutch voluntary energy efficiency agreements are considered an important flexibility mechanism that has facilitated the implementation of the country's climate change policies as a whole (Andersen 2004).

The third type of evaluation is efficiency evaluation. It comes in two forms. Cost-benefit analyses assess whether the outcomes of a policy justify the associated costs. Cost-effectiveness evaluations look

at whether the costs are justified given the results and are typically done in comparative terms; the cost of one policy is assessed relative to the cost of another policy producing the same results. A total of 85 efficiency evaluations were reviewed. Of these, 14 were cost-benefit analyses; another 74 provided cost-effectiveness analysis.

For all of the above evaluation considerations, we made qualitative assessments of the overall conclusions of each policy discussed in the included studies: positive, mixed and negative. Positive results captured instances when a study found that a policy led to success on one of the above-defined forms of evaluation. Results were considered negative when outcomes fell short of the original policy goals or those defined by the researcher. Finally, mixed results captured instances where the study noted things that had gone well as well as things that were problems. (More details on this qualitative approach are provided in Research Methods.)

The final component of our assessment focused on the studies' conclusions about the accountability implications of different policies. We analyzed situations where studies indicated there were problems or benefits associated with the transparency of a policy's processes and inclusion of stakeholders, and whether these factors influenced the legitimacy of a policy and/or program. Though there were fewer studies that made points relevant to accountability, we did find 42 instances where studies provided insights for these issues.

CONCLUSIONS

This first part of the report reviewed our objectives and provided a descriptive map of the qualifying studies, thus laying the foundation for the analysis contained in the following section.

analysis

Past studies suggest expenditure instruments work better than regulatory instruments and policies with built-in flexibility have better evaluations.

Introduction

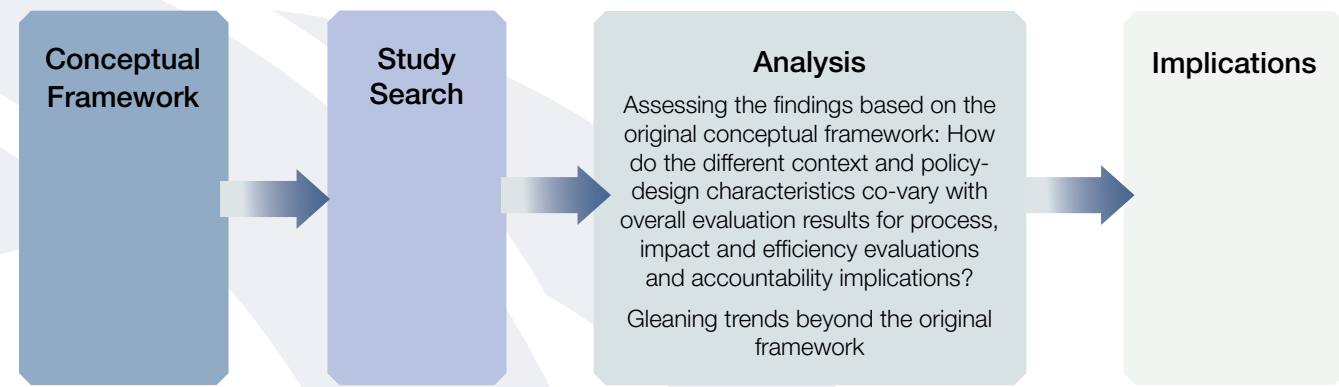
Building from the descriptive map of the literature in Synthesis and Road Map, this section details the relationships that emerge from analyzing the reviewed studies. The logic of the analysis is presented in Figure 7. Each study has been categorized in our data set according to the characteristics of the policies it examined and the results of those examinations. (See the last section for a discussion of our search and coding methods). Using the data set, we compared how the proportions of positive, mixed and negative evaluations, as defined in the first section, co-vary with policy-design characteristics and the contextual factors, specifically problem attributes and agenda setting. Examples from specific studies are used to shed light on what is behind the general patterns. From these trends and illustrative examples we are able

to identify the contextual factors, design issues and trade-offs affecting low-carbon technology and water-management policies.

Our analysis points to some key findings, which we summarized in the previous section and describe in further detail at the close of this section. We note the dominance of impact evaluations in the assessed studies and a number of trade-offs between the results of different evaluation approaches. For instance, accountability and efficiency were in tension for some of the hybrid instruments we assessed, as were environmental effectiveness and cost-effectiveness, depending on the stage of activity a policy targeted. Instrument characteristics — particularly built-in flexibility and longer time frames — were associated with increased positive evaluations. With instruments with built-in flexibility, positive overall, process and efficiency evaluation results were more likely. Policies

Figure 7

LOGIC OF THE ANALYSIS MOVING FROM THE CONCEPTUAL FRAMEWORK TO FINDINGS



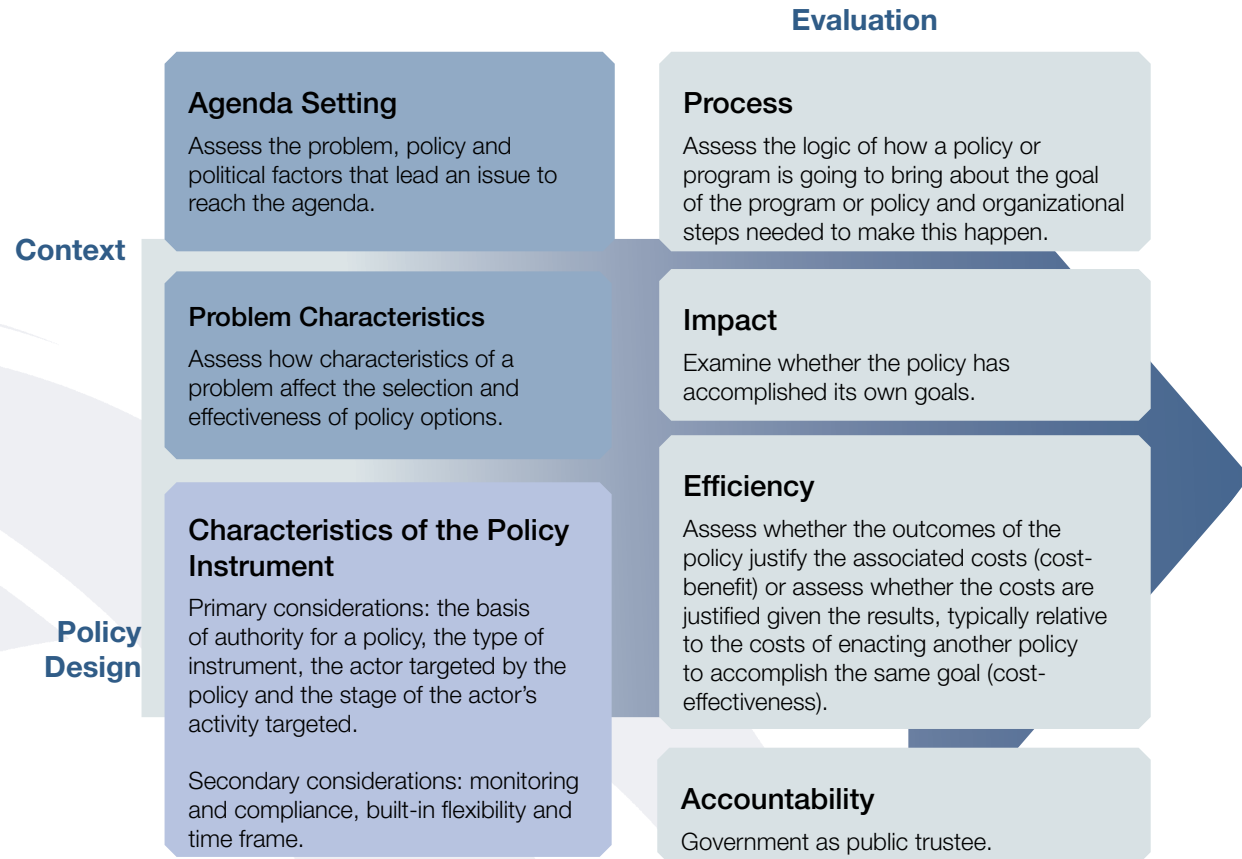
with longer time frames garnered more positive efficiency and process evaluations. Again, we pick up these and other key findings on page 49.

The remainder of this section of the report proceeds in two steps. First, we review our analysis, which is structured to follow our initial conceptual

framework. Second, we draw out key findings and note some important considerations the reader should note when interpreting the results. The next section of the report discusses the implications of the findings for decision-makers.

Figure 8

SCHEMATIC VIEW OF OUR APPROACH TO ASSESSING HOW CONTEXT (AGENDA SETTING AND PROBLEM CHARACTERISTICS) AND POLICY-DESIGN CHARACTERISTICS CO-VARIED WITH OUR EVALUATION CRITERIA (PROCESS, IMPACT, EFFICIENCY, ACCOUNTABILITY AND OVERALL EVALUATIONS)



Empirical Analysis

The structure of our analysis is shown in Figure 8. We began by looking at our two contextual factors — agenda setting and problem characteristics — to determine how they related to our different evaluation criteria. Second, we assessed the main and secondary considerations for the characteristics of the policy instruments assessed. The information provided results from cross-tab queries we performed using the Access database containing all the qualifying studies.

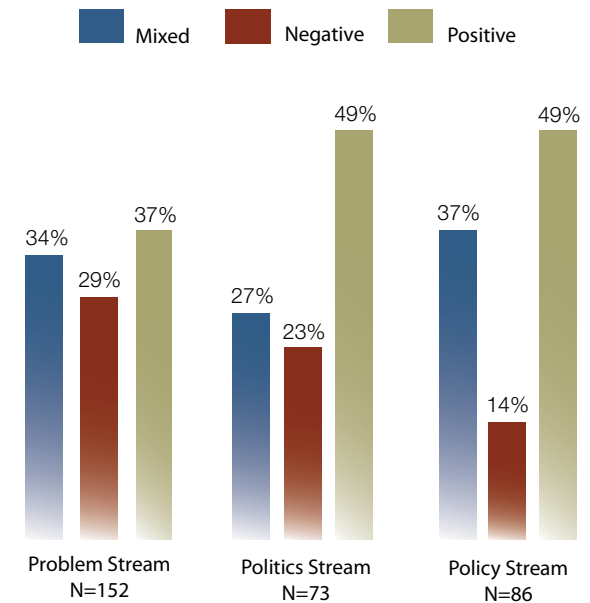
HOW DOES CONTEXT AFFECT EVALUATION OUTCOMES?

Agenda Setting

We noted in the previous section that characteristics of the problem were the most frequently cited agenda-setting process for the reviewed policies. Figure 9 shows that problem characteristics, in spite of being the most cited characteristics, were not associated with as many positive evaluations as characteristics of politics or policies that helped lift an issue onto the agenda. For the politics stream, favourable public opinion was, according to the studies, the most important contributor to positive evaluations of the policies that were then enacted. This was the case with Germany's renewable energy policies, for instance (Walz 2007). The presence of champions played the most notable role in bringing about positive evaluations in the case of characteristics of policies, with the social

Figure 9

OVERALL EVALUATION RESULTS FOR DIFFERENT AGENDA-SETTING PROCESSES



Note: There are more total references to agenda-setting processes than to policies, as sometimes more than one characteristic of the problem, politics, or policy streams were noted by a study.

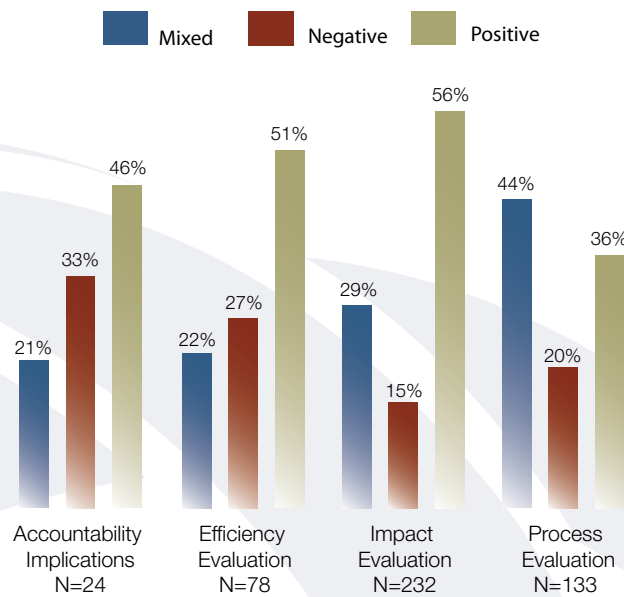
Graph percentages may not sum to 100 due to rounding.

appeal of a policy as the second most significant factor. Though caution is needed in drawing broad conclusions from these patterns, they do suggest problem characteristics, such as focusing events, may be important in bringing an issue onto the agenda; however, social acceptability and public support appear to be key in enabling the success of policy initiatives.

implications, since the positive impact and efficiency results could mean there are fewer accountability concerns associated with the policies we coded. While the above numbers demonstrate that climate change policies are working to a certain extent, they also show there are many instances where policies are not considered to be effective. To unpack these findings, we also scrutinized studies that focused on the policy process. Here, we can see that the evaluations of low-carbon technology were more

Figure 10

PROPORTION OF RESULTS FOR PROBLEM AND EVALUATION TYPE – LOW CARBON TECHNOLOGY (LCT)

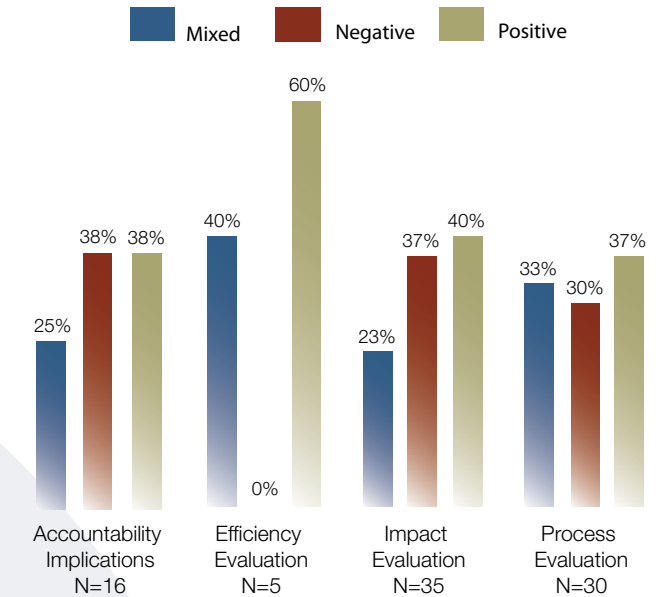


Problem Characteristics

The broader patterns for the evaluations of policies for low-carbon technology and water management are provided in Figures 10 and 11. For low-carbon policies, the least common evaluation tool taken into account was accountability implications (24 of 467 policies or approximately five percent). When broken down further, assessing those which were positive, negative or mixed, the highest proportion of positive evaluation results

Figure 11

PROPORTION OF RESULTS FOR PROBLEM AND EVALUATION TYPE – WATER MANAGEMENT



³ Renewable Portfolio Standards set targets for “electricity suppliers (or, alternatively, electricity generators or consumers) to source a certain quantity (in percentage, megawatt-hour, or megawatt terms) of renewable energy” (Wiser et al 2007, p. 9).

were for impact (more than 56 percent) and efficiency evaluations (more than 51 percent). These high results may explain why so few studies have focused on accountability mixed. For instance, a number of studies examining the effectiveness of renewable portfolio standards (RPS) in the United States identified design problems that limited success, such as standards with limited ambition (e.g. in Connecticut the RPS applied to only five percent of electricity load), a too-encompassing definition of renewable energy (e.g. Maine) or vague criteria for eligibility (e.g. Pennsylvania) (Wiser, Porter and Grace 2005; Wiser, Barbose and Holt 2011; Sawin 2004).³

The wide scope of policies aiming to promote low-carbon technologies — such that, for example, they attempted to address all electric utilities in a given country — appeared to be an obstacle to effectiveness. The broader the scope of a policy, the more contextual considerations a policy-maker needed to account for to ensure policy goals are achieved. For instance, several studies indicated that an effective carbon tax needed to consider, among other things, the tax base and rate, effects on competitiveness and differential responses across industry sectors. These studies underscored the high information requirements of certain policy designs (Sumner, Bird and Dobos 2011; Andersen 2004; Zhang and Baranzini 2004; Baranzini, Goldemberg and Speck 2000).

For water-management policies, the results for impact and process evaluations suggested that while evaluations were slightly more positive, the difference was very small. The smaller sample size, moreover, made it hard to judge the significance of this difference.

Still, these mixed results may be a consequence of the complex contextual factors that influence how water management takes place and hence warrant decision-makers' attention. For example, local approaches to governing and managing water can lead to very different results. In certain instances, local water basin or coastal zone management approaches can empower and engage local stakeholders and create jobs, such as the mangrove tree planting operations put in place in coastal Vietnam to reduce coastal erosion (Abeygunawardena et al. 2003). By contrast, local approaches can be dominated by powerful interests, which can thwart efforts to change. One study on farmers' groups in Australia's Murray-Darwin basin noted how the farmers were inhibiting transformative approaches to addressing water allocation in this drought-prone area (Pittock and Connell 2011).

The fit of climate change adaptation policies with existing water-management activities was another factor that shaped implementation and hence was captured by our analysis of process evaluation. A few studies noted that the integration of climate change modelling into water-management practices was easier when it required little change from current practices. The adaptation activities of the Netherlands, for instance, have been aided by a long history of democratically run water boards (Hendriks and Buntsma 2009). By contrast, other studies noted the challenge of changing narrow approaches to management — for example, those following policies focused only on technical aspects of water allocation — and that such approaches are at odds with the integrated management approaches required to tackle

the complex social, political, cultural and environmental dimensions of adaptation to climate change (Roncoli et al. 2009; Pittock and Connell 2011).

We suspect the limited number of efficiency evaluations for water-management policies has to do with the challenge of monetizing the current and future value of water-adaptation policies. Cost-effectiveness is often measured using specific metrics (e.g. avoided emissions of CO₂ equivalent or kWh of energy saved). With water, there are certain costs that are easier to account for — lost revenues from farming activities or industrial processes — and there are others that are difficult to measure — such as the impacts of lower stream flow rates for fish, other aquatic species or biodiversity in general (Pittock and Connell 2011; Mawdsley, O'Malley and Ojima 2009).⁴ Finally, there is a time dimension. Many of the harms that adaptation policies seek to remedy are in the future, but the costs — such as a farmer losing access to water for irrigation — are in the present. This creates both methodological challenges for policy analysts seeking to understand costs and benefits, and political difficulties because interests in the *status quo* may resist efforts to transform water management approaches (Pittock and Connell 2011).

HOW DO POLICY CHARACTERISTICS AFFECT EVALUATION OUTCOMES?

Building from the assessment of our contextual factors, below we assess policy characteristics to probe deeper into the relationships between problem and policy characteristics. We also consider the implications for accountability and process, impact and efficiency evaluations.

⁴ See Konidari and Mavrakis 2007 for discussion of this challenge.

Source of authority

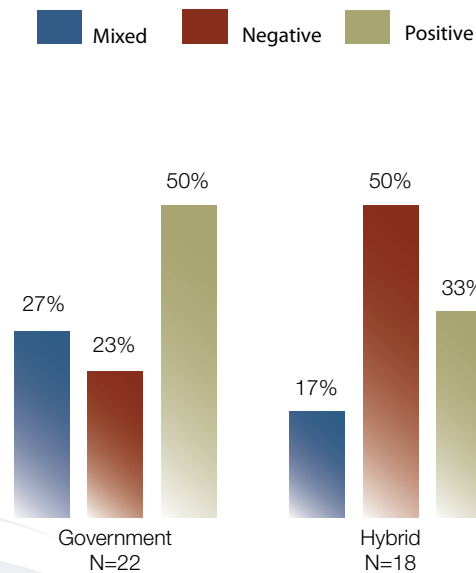
When data on all evaluations were aggregated, we found instruments with hybrid sources of authority were no more likely to have a positive overall evaluation result (45 percent) than were instruments with a governmental source of authority (48 percent). Moreover, policy instruments with hybrid and governmental sources of authority did not significantly differ in terms of results for impact or process evaluations. However, in the case of accountability and efficiency evaluations, a trade-off appeared. A higher proportion of positive efficiency evaluations and negative accountability implications existed for hybrid sources of authority, and a higher proportion of positive accountability implications and a lower proportion of positive efficiency evaluations existed for instruments with a governmental source of authority (Figure 12).

The trade-off between efficiency and accountability in the aggregate data is most recurrent in certain voluntary (or negotiated) agreements. Several evaluations concluded that while voluntary agreements might score positively on efficiency grounds due to their avoidance of mandates, fines, costly compliance testing, government oversight and potential lawsuits, these same factors could limit accountability (Lutsey and Sperling 2007). For example, the 1995 *Declaration of German Industry on Global Warming Prevention* (Krarup and Ramesohl 2002) — an initiative with no procedures for checking non-compliance and where branch associations merely delivered annual progress reports without legal power to enforce firm-level action — might have reduced costs, but it also made it difficult to identify responsibility for actions and account for how much progress the initiative was actually responsible

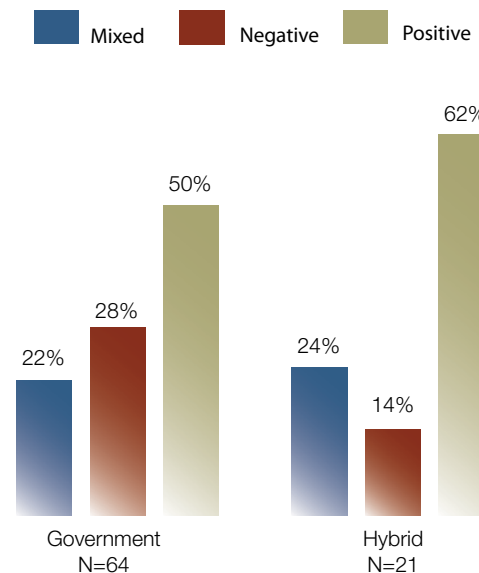
Figure 12

PROPORTION OF CODED POLICIES BY SOURCE OF AUTHORITY (GOVERNMENT OR HYBRID) AND RESULTS FOR (A) ACCOUNTABILITY IMPLICATIONS AND (B) EFFICIENCY EVALUATIONS

(A) ACCOUNTABILITY IMPLICATIONS



(B) EFFICIENCY EVALUATIONS



for (Ramesohl and Kristof 2001). This pattern repeated itself in the evaluation of a series of EU voluntary agreements enacted in the 1990s, which included the 1992 *Dutch Long-Term Agreements*, the 1996 Danish voluntary programs on energy management, the 1998 Italian *Energy and Environment Pact* and the 1995 French voluntary agreements, part of the French *National Programme for the Prevention of Climate Change* (Crocchi 2003; Chidiak 2002). In all of these cases, performance reporting was conducted by the company itself and no business-as-usual

estimates were made prior to any agreements. This, it is argued, resulted in poor accountability evaluations because it became harder to answer a fundamental question posed by Koehler (2007): “Did the minimal environmental improvement arise because the participants fail the institution or did the institution fail the participants?”

We also analyzed the policies according to the kind of authority backing them. In the Introduction (Authority), we explained how hybrid instruments, such as regulated self-regulation, might rely on the threat

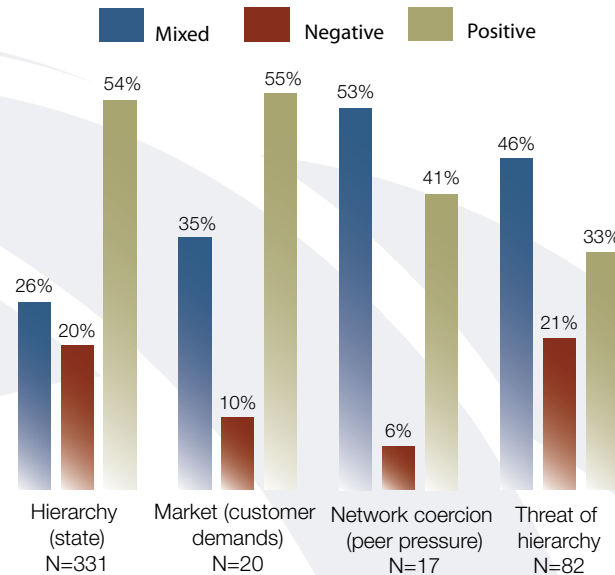
of future government regulation; other forms of these instruments employed social and market forms of coercion to motivate action. For both problems, state authority dominated (Figure 13). In the case of water management, government served as the source of authority in over 86 percent of the coded instruments. Those low-carbon technology policies backed by government authority performed relatively well on our overall evaluation measure. Just 20 percent of these policies received negative evaluations. Just 21 percent of policies that rely on the threat of government action to motivate compliance also received negative evaluations. However, only 33 percent of these policies

received positive evaluations, and 46 percent were coded as mixed. The number of policies relying on the threat of government action was far smaller than those with government backing, meaning these differences must be interpreted with caution. This also applies to the final two categories. Both policies derived incentives from customer demand and pressure from peers (e.g. member companies in an industry association regulating each other) and had very few negative evaluations. The theme of innovative ways of developing, managing and implementing policies is a feature teased out further in the following section of this report, where we examine voluntary agreements in more detail.

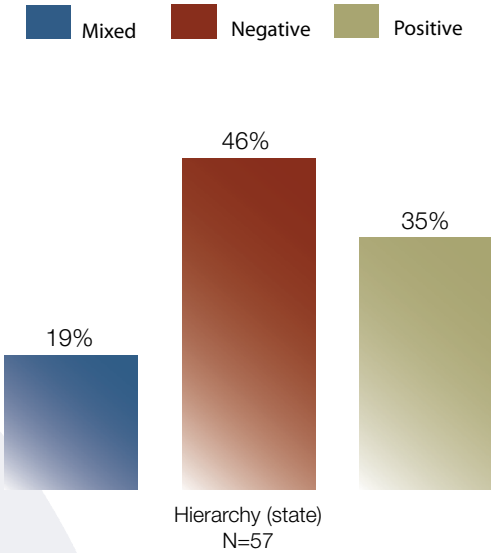
Figure 13

OVERALL EVALUATION RESULTS FOR (A) LOW-CARBON TECHNOLOGY AND (B) WATER MANAGEMENT BY FORM OF AUTHORITY BACKING POLICY

(A) LOW-CARBON TECHNOLOGY



(B) WATER MANAGEMENT



Regulatory Target

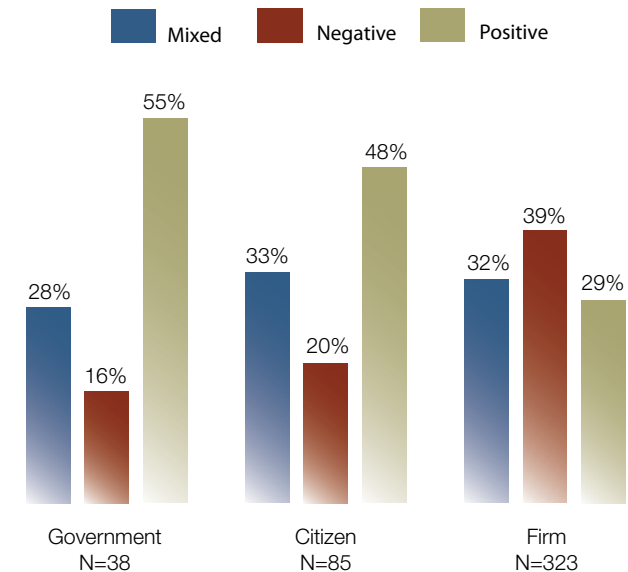
Policies target many different actors in the hopes of bringing about change. More than 60 percent of the coded studies targeted firms (see page 25). Of these evaluations, only 29 percent were positive; 39 percent were negative and 32 percent were mixed (Figure 14). When governments or citizens were the targets of policies, the results were generally more positive.

A slightly different pattern emerged when we compared the two problems. Water management policies that targeted government received nearly 20 percentage points fewer positive evaluations than low-carbon technology policies that targeted governments (23 percent vs 42 percent; see Figure 15).

A number of water policies involved multi-stakeholder partners, which complicated the management structure. The California Department of Water Resources (DWR), for instance, is responsible for updating the Californian Water Plan every five years and has recognized the impacts of climate change as critically important to ongoing planning updates. The DWR's work is overseen by an advisory panel comprised of more than 70 stakeholders (Purkey et al. 2007). Some factors that contribute to the policy challenges within this context include the multitude of competing and overlapping jurisdictions, a lack of coordination between these various players and a lack of trust or interest. For example, in a case study from Mexico, in the late 1990s, quasi-private municipal authorities were delegated to provide information about mitigating flood risk (an outcome used as a proxy for climate change): this policy was evaluated negatively because these governments had no

Figure 14

OVERALL EVALUATION RESULTS BY REGULATORY TARGET

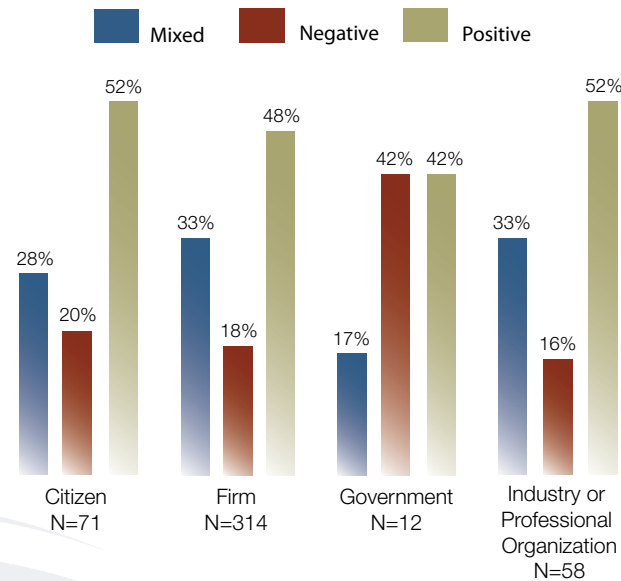


institutional memory and were disinterested in the local stakeholders' knowledge. The local population in turn mistrusted and ignored these bodies (Eakin et al. 2011). In addition, the studies highlighted the fact that governments (whether within the same jurisdiction or not) often pursued contradictory policies. In Australia, for instance, government policies discouraged farmers from growing in drought-prone regions by denying financial compensation. However, in practice, lobbying

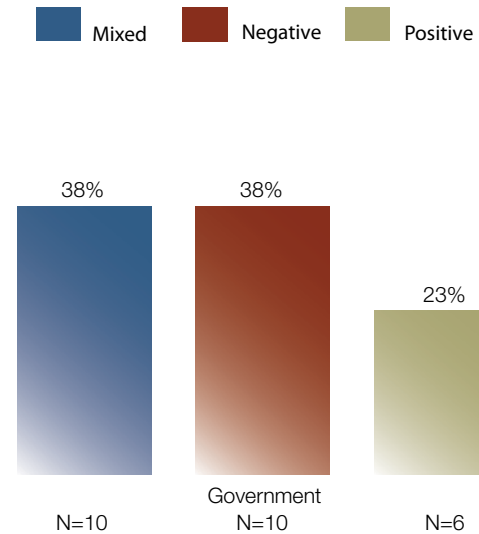
Figure 15

EVALUATION RESULTS (IMPACT, PROCESS AND EFFICIENCY) BY REGULATORY TARGET FOR (A) LOW-CARBON TECHNOLOGY AND (B) WATER MANAGEMENT POLICIES

(A) LOW-CARBON TECHNOLOGY



(B) WATER MANAGEMENT POLICIES



by farmers in these regions allowed them to continue receiving financial support (Pittock and Connell 2011). Higher complexity did not necessarily equal a more negative outcome. In fact, a number of studies suggested that making stakeholders integral, engaged members of the policy process could help lead to its success (Purkey et al. 2007).

This dynamic was repeated on a larger scale in the low-carbon technology studies, where policy effectiveness was more prevalent in cases where the target included citizens, firms and industry associations. There are several possible explanations for this

pattern. First, some scholars suggest that climate-change mitigation policies that targeted firms/industry associations were more successful precisely because firms/industry associations were more actively involved in the policy development, selection and implementation process (Price et al. 2005; Jiménez 2007). Views are mixed as to whether or not this is a good thing. In certain instances researchers found evidence that engaging industry makes policies most relevant and viable to businesses and thus effective, while in other instances engaging industry early on increases their ability to shape and dictate policies that suit their

interests, which do not generally equate to those being the most appropriate actions from a societal perspective (Price et al. 2005; Anderson and Di Maria 2011; Bailey 2008; Bohlin 1998; Welch and Schreurs 2005).

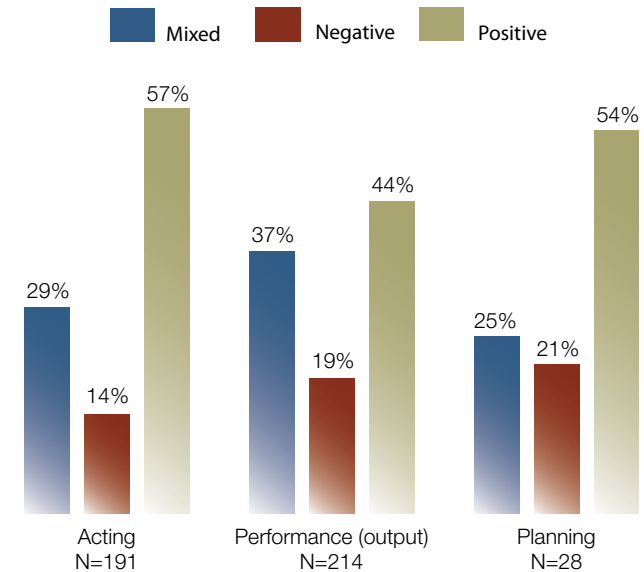
Low-carbon technology policies that targeted governments had an equal proportion of negative and positive evaluations. This is interesting because one might assume that policies targeting governments would be more likely to succeed. Governments, unlike businesses, are meant to operate in the public interest and, hence, as targets of policy, it is reasonable to expect that government officials, agencies or departments would be particularly motivated to comply to ensure a policy's success. This finding suggests that careful scrutiny should be given to those policies that highlight the role the public sector can play in spurring action by the private sector, through public research and development, government procurement or leading by example (Sam Rashkin et al. 2008). Furthermore, this evidence indicates that decision-makers involved in making policy targeting the private sector must strike a fine balance: they must be very careful to ensure that policies are relevant and applicable to practices “in the trenches” and at the same time not succumb to political pressures to appease stakeholders, which could affect the environmental integrity of the policy.

Stage of activity regulated

An examination of trends based on the stage of activity the policies targeted (Figure 16) shows that while acting, performance and planning had all been successful, policies targeting performance appeared less effective.

Figure 16

IMPACT EVALUATION RESULTS FOR LOW-CARBON TECHNOLOGY POLICIES BY THE STAGE OF ACTIVITY TARGETED BY THE POLICY



Trade-offs were ostensibly behind this pattern. Policies targeting a firm's acting processes received more positive impact evaluations and more negative efficiency evaluations compared to policies targeting a firm's performance processes. In contrast, policies targeting a firm's performance processes received more negative impact evaluations and more positive efficiency evaluations compared to policies targeting a firm's acting processes. These results suggested a trade-off between environmental effectiveness and

cost-effectiveness, depending on the stage of activity regulated.

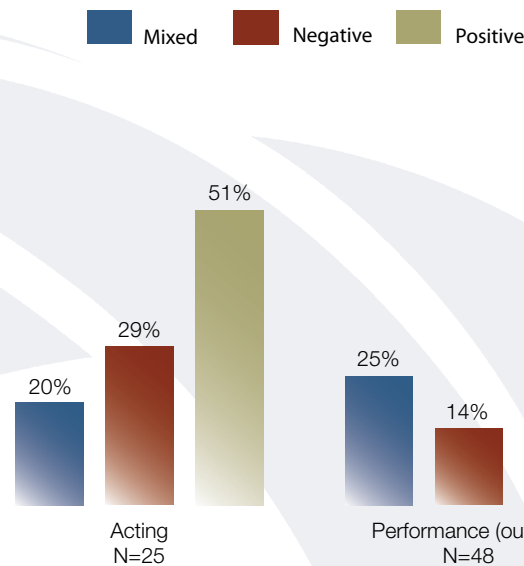
The comparison of technology and performance standards illustrates a possible explanation for this trade-off (Figure 17). Technology standards targeting the acting stage — for instance, a requirement that a company install a filter on an exhaust system to remove a particular pollutant — might offer more certain impacts because there was a direct connection between regulatory requirements and environmental outcomes. However, losses in cost-effectiveness could arise when regulators who were not well informed, applied technology standards uniformly

to a variety of firms, thus raising the costs for reaching a given level of environmental effectiveness (Gupta et al. 2007). Performance standards could reduce technology standards' cost problems by providing more flexibility, affording firms discretion in deciding how to meet an environmental target. Instead of installing an expensive technology, for instance, they might substitute other inputs for those that had been the pollutant or alter some other facet of the process or production system to achieve the performance target. However, this flexibility could also reduce the certainty that a given environmental outcome would be achieved because there would be uncertainty about whether the firm

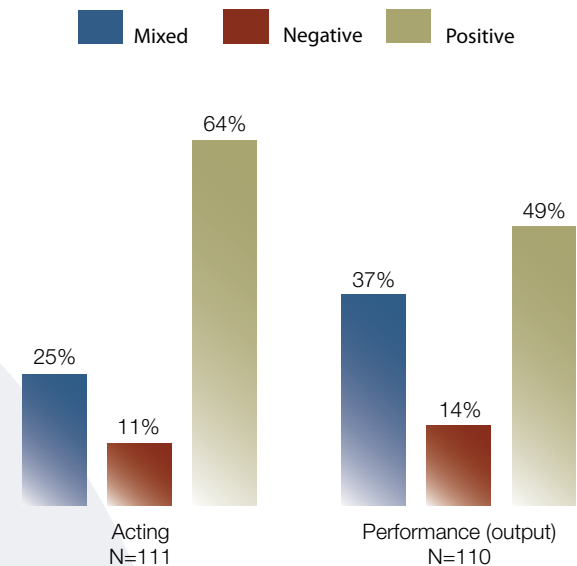
Figure 17

RESULTS FOR (A) EFFICIENCY AND (B) IMPACT EVALUATION RESULTS FOR ACTING AND PERFORMANCE STAGES

(A) EFFICIENCY EVALUATION



(B) IMPACT EVALUATION



would undertake the activities necessary to meet the performance objectives (Gupta et al. 2007).

Type of Instruments

Few clear trends emerged when we compared regulatory, expenditure and information instruments. One important feature within the figures below is that all three of the policy buckets had generally been found successful in terms of policy effectiveness overall and in the impact evaluations. On the whole, the literature's evaluated expenditure instruments were more likely

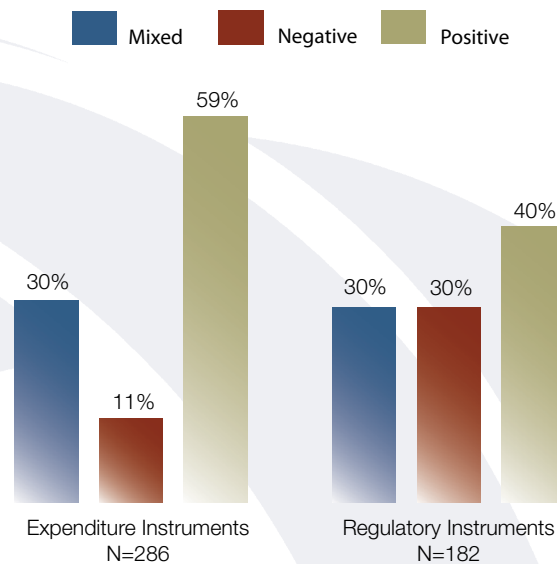
than the regulatory instruments to have received overall positive evaluation results (51 percent over 40 percent), as illustrated by Figure 18(a). When we turned to specific types of evaluations, expenditure and regulatory policies displayed similar results for accountability, process and efficiency evaluations. Differences among the instruments appeared, however, in the impact evaluations, where expenditure policies were slightly more likely to obtain positive evaluations. This can be observed in Figure 18(b).

How do we interpret these findings for stage of activity and policy "buckets"? We must be careful

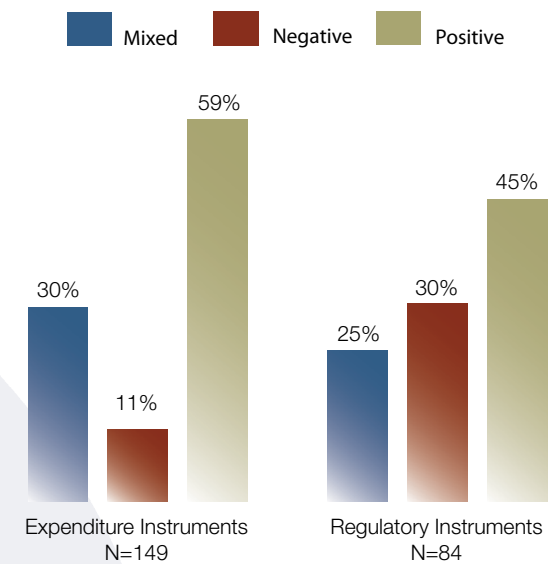
Figure 18

RESULTS FOR (A) ALL EVALUATIONS (IMPACT, PROCESS AND EFFICIENCY) AND (B) IMPACT EVALUATIONS FOR EXPENDITURE AND REGULATORY INSTRUMENTS

(A) ALL EVALUATIONS (IMPACT, PROCESS AND EFFICIENCY)



(B) IMPACT EVALUATIONS BY "POLICY BUCKETS"



as the category of expenditure instruments includes a wide variety of policies, from carbon taxes and emission trading schemes to subsidy incentives for adopting technology. However, the basic intuition, using the example of regulatory standards (whether technology or performance), is that standards focused on the acting stage — such as Best Available Control Technology (BACT) requirements set out in the US Clean Air Act — did not provide firms with the incentives to search for better approaches to reducing pollution (Gupta et al. 2007). Indeed, “if a government mandates a certain technology, there is no economic incentive for firms to develop more effective technologies,” (Gupta et al. 2007). In comparison, expenditure instruments gave firms greater flexibility to choose the cheapest climate policy-compliance measures, which might or might not include the uptake of low-carbon technology (Henriksson and Söderholm 2009).

The two best-known examples to illustrate the flexibility of expenditure policies are carbon taxes and cap-and-trade systems. In the latter, a cap puts a limit on the quantity of emissions allowed, thus creating a price for emission permits, and in the former, a tax puts a price on carbon to motivate firms to reduce emissions. In practice, however, as Sumner, Bird and Dobos note, “a carbon tax could be designed that functions in many ways as a carbon cap-and-trade policy and vice versa,” as these determined prices would allow firms to choose the cheapest options to reduce emissions, whether they involved low-carbon technologies or not (2011).

Permitting organizations to undertake the cheapest way to reduce GHG emissions was not necessarily the most effective policy when we considered side effects for other key economic and

social goals (e.g. reduced air pollution, increasing industry competitiveness, poverty reduction, community development, etc.). In this vein, incentive-based approaches could not be considered superior to regulation in all situations. With cap-and-trade systems, decision-makers had to determine rules that could create “transparent, liquid and efficient markets for tradable environmental instruments that allow efficient price discovery and risk management by participants,” (MacGill, Outhred and Nolles 2006). Because abstract markets were not constrained by the physical realities of many commodity markets, design rules might markedly affect commercial outcomes for participants (Toke 2007). In fact, some studies suggested that the complex nature of these instruments — the detailed administrative and technical requirements of creating an emissions trading scheme, for instance — was a serious shortcoming. Hence, it is important to recognize that the flexibility of incentive-based instruments can come with complex administrative challenges for governments. A final aspect we considered with respect to bucket type is the importance of undertaking a comprehensive approach to an issue, one that encompasses various types of policy buckets — a theme explored further in the following section of our report.

Flexibility

Built-in flexibility came in two forms. For low-carbon technology, the majority of studies interpreted built-in flexibility as a design that allowed different approaches to the same goal. For example, some policies gave firms the discretion to determine how best to achieve an emissions reduction target (e.g. to choose between

installing energy-efficient technologies and purchasing carbon offset credits). With water management policies, built-in flexibility meant accounting for changing circumstances (due to policy learning or outside events, for instance) through adaptive measures written into the policy or program from the start.

Policies with built-in flexibility were substantially more likely to have positive overall evaluation results than policies with no such provisions. Specifically, we saw no trend emerge in policies *without* built-in flexibility: each category of evaluation (positive, mixed and negative) garnered approximately one-third of the

evaluations. However, for flexible instruments, overall evaluations jumped to 53 percent positive, mixed and negative evaluations dropped to 27 percent and 20 percent, respectively (out of 280 coded policies). Moreover, concerning specific types of evaluations, policies *with* built-in flexibility performed substantially better in efficiency and process evaluations (Figure 19).

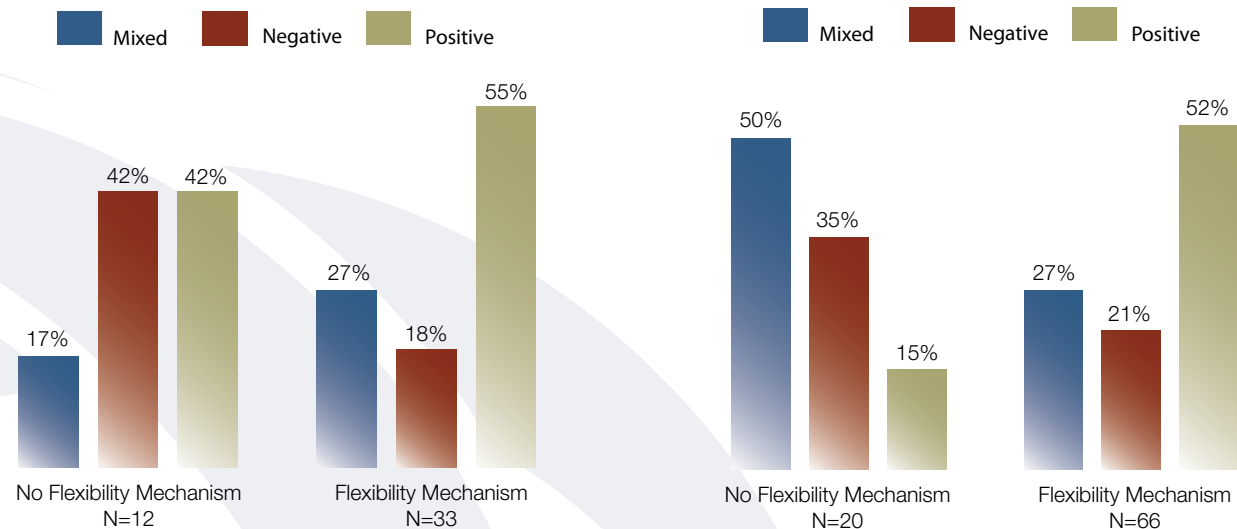
This finding fit with the theoretical argument that more flexible measures have the capacity to maximize the impact of a policy while they minimize the costs of achieving a specific target. Policies with built-in flexibility reduced the marginal abatement costs induced

Figure 19

PROPORTION OF RESULTS FOR (A) EFFICIENCY AND (B) PROCESS EVALUATIONS, BY PRESENCE OF FLEXIBILITY MECHANISMS

(A) EFFICIENCY EVALUATIONS

(B) PROCESS EVALUATIONS



by regulation by allowing regulated actors to adopt a range of compliance options, so that they could achieve reductions in a time frame in line with their capacities (Gupta et al. 2007; Elliott 2003). Emissions trading schemes that allowed for banking provisions and offset credits and could potentially stimulate innovation in unregulated sectors, such as the EU Emissions Trading Scheme (ETS), were better evaluated than those limiting these possibilities, such as the Regional Greenhouse Gas Initiative (Kneteman 2010). Similarly, Tradable White Certificate Schemes (or Energy Efficiency Resource Standards), which set energy savings targets for utilities but included flexibility through a market-based trading scheme incorporating banking, were overwhelmingly positively evaluated (Bodineau 2009; Mundaca and Neij 2009; Nadel 2006).

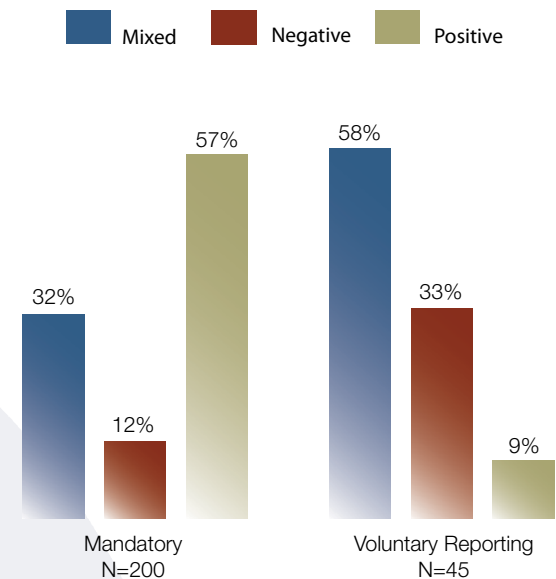
Nevertheless, these differences in proportions should be interpreted with care; flexibility mechanisms were no guarantor of success. Indeed, policies that offered too broad a range of options for abatement and that were subject to measurement, verification and additionality difficulties could lead parties looking to minimize the costs of meeting environmental obligations to search for loopholes (MacGill, Outhred and Nolles 2006). For example, renewable portfolio standards in various US states that allowed state-based utilities to purchase out-of-state renewable energy to meet their obligations — but did not set a floor on their own renewable capacity — led to the utilities’ purchase of existing renewable energy sources, thus defeating these policies’ objective of additional abatement (Wiser, Porter and Grace 2005; Delmas and Montes-Sancho 2011; Carley 2009).

Monitoring

Striking trends appeared for those policies with information on monitoring. As shown in Figure 20, the literature’s evaluations were clearly bent toward mixed or negative results when it came to voluntary reporting procedures, whereas much stronger positive results were identified for mandatory reporting. Results pointed in the same direction for efficiency and accountability implications; however, due to a much smaller sample size, these results were not quite as robust. Nevertheless, it is worth noting that the two studies evaluating the costs of voluntary reporting procedures noted negative results, as did five out of the seven

Figure 20

PROPORTIONS FOR RESULTS OF OVERALL EVALUATIONS, BY PRESENCE OF MONITORING



studies evaluating the accountability implications of such voluntary procedures.

These results were relatively straightforward to interpret. It seems unsurprising that when the compliance of firms (often the regulatory target in voluntary agreements) was voluntarily reported there would be poor incentives for performance if effecting emission reductions were costly. For example, one study found the environmental effectiveness of the 1995 *Declaration of German Industry on Global Warming Prevention* (Elliott 2003) was severely hampered by the insufficient quality of the information reported by the sectors it covered (Ramesohl and Kristof 2001). Moreover, another study concluded that the price collapse of the carbon market in the first phase of the EU ETS from 2005 to 2007 was due to a combination of the optimistic growth forecasts and the voluntary nature of firm level data used to construct historical emissions. EU ETS participants learned that reporting inflated data for historical emissions led to more generous future allocations (Anderson and Di Maria 2011).

Time

Although no clear patterns emerged when aggregating for all types of evaluations, controlling for types of assessments revealed that as policies' defined time frame increased, the policies' likelihood of being positively evaluated for efficiency or process also increased. (Figure 21: for the purposes of illustration, time frames have been grouped as either fewer than or more than five years.)

This result fit with the theory that regulated actors' responses to a policy would vary depending on the expectations regarding its stability (Agnolucci 2007). This timing aspect was particularly salient in evaluations on emissions trading schemes and renewable energy policies (Haug et al. 2010). In the case of emissions trading schemes, the time-frame considerations included the length of the trading periods; some studies concluded that their relatively short duration limited their effectiveness by failing to reduce investment risks (Lipp 2007; Anderson and Di Maria 2011; Kneteman 2010; Mitchell, Bauknecht and Connor 2006). Regarding renewable energy policy, and most often comparing the relative merits of FIT and RPS programs, several authors judged the FIT to be comparatively superior due to its positive effect on investor confidence (Lipp 2007; Fouquet and Johansson 2008).

Figure 21

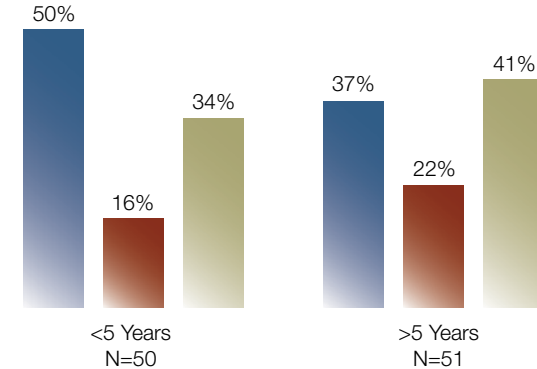
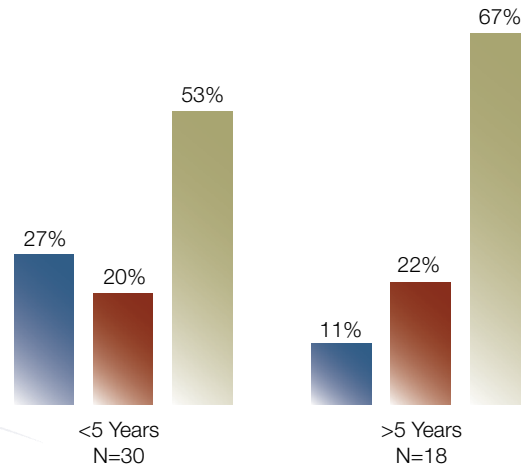
PROPORTIONS OF RESULTS FOR (A) EFFICIENCY AND (B) PROCESS EVALUATIONS, BY TIME FRAME OF POLICY

(A) EFFICIENCY EVALUATIONS

(B) PROCESS EVALUATIONS

Mixed Negative Positive

Mixed Negative Positive

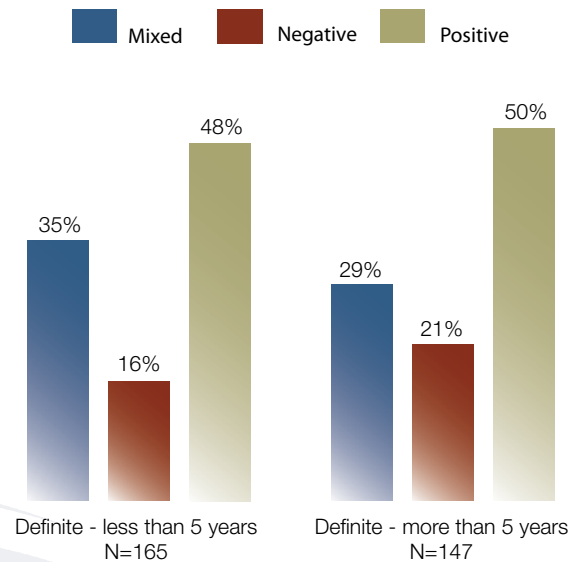


When examining the potential role of time frame and policy effectiveness for low-carbon technology policies, we found no significant differences between these two factors (Figure 22). So, building on the example above that touts the advantages of FIT over RPS programs, there are caveats to be addressed. In this instance, one potential risk is the possibility of “locking” a country in an inappropriate policy pathway (Haug et al. 2010). For example, while potential investors in renewable energy in India argued that a 10-year time frame was

insufficient to recoup investment costs (Mallett et al. 2009), Frondel, Ritter and Schmidt argued that the guarantee of the German FIT over 20 years effectively “locked” the country’s domestic climate policy onto a path of massive subsidization of highly inefficient electricity production, which did not, according to the analysis, result in significant increases in employment, energy security or innovation (Frondel, Ritter and Schmidt 2008; Frondel et al. 2010).

Figure 22

EVALUATION RESULTS FOR LOW-CARBON TECHNOLOGIES BASED ON THE TIME FRAME OF THE POLICY



Synthesis

KEY FINDINGS

- There is the potential risk of a trade-off between accountability and efficiency depending on a policy instrument's source of authority. This indicates that decision-makers using policies that target the private sector must carefully balance a need for practical and feasible policies against the threat of becoming captured by these interests.
- Expenditure instruments perform better than regulatory instruments in overall and impact evaluations.
- Policies with built-in flexibility are more likely to have positive overall, process and efficiency evaluation results.
- Policy instruments with voluntary reporting procedures are much less likely to be positively evaluated than those with mandatory reporting procedures.
- There is a possible trade-off between environmental effectiveness and cost-effectiveness depending on the stage of activity that a policy targets.
- As the defined time frame of policies increases, the likelihood these policies will be positively evaluated for efficiency and process also increases.

- The bulk of studies reviewed centred on impact evaluations, which, while important, present only a partial portrayal of the policy under scrutiny. For example, an impact evaluation of the Norwegian carbon tax indicated it helped reduce GHG emissions (Larsen and Nesbakken 1997). However, cost and accountability assessments indicate the tax's burden is unfairly shared and provide a more complete picture of the tax's macro effects on society (Bruvoll and Larsen 2004).
- No actor as a regulatory target stands out as a clearly superior performer. This means policy-makers have to be careful in assessing what roles different actors should and can play in both promoting low-carbon technology and managing water resources.
- While government policies are relatively good at achieving policy effectiveness, instances of policies considered unsuccessful have led to a growing trend of policies through alternative forms of governance structures (e.g. voluntary agreements through governments and industry, public private partnerships, industry-led leadership and consumer demand marketing schemes).

CONSIDERATIONS FOR INTERPRETING FINDINGS

There are several considerations to be aware of when interpreting these results. First, it must be noted that the findings present an empirical analysis of the state of the literature on climate policy evaluation for our two selected problems, and not actual empirical analysis of policies themselves. As such, because the policies may have been evaluated for a variety of reasons

such as availability of data or trends in the literature (e.g. a penchant for expenditure instruments among economists), one has to be careful generalizing our results broadly. Furthermore, while evaluations were grouped in smaller categories to facilitate analysis, the strength of our findings hinges on both the methods and the evaluation criteria selected by authors. Indeed, as previously noted, evaluation is an activity that is “knee deep in values, beliefs, party politics and ideology,” (Haug et al. 2010). As a result, the same policy evaluated through different criteria, possibly for the same type of evaluation, may obtain a series of different outcomes, thus skewing the interpretation of our findings. For example, when the German FIT was evaluated from the cost perspective of investors or consumers in the short run, it was deemed efficient because it saved investors money that would have been spent on hedging price risk (Mitchell, Bauknecht, and Connor 2006) and produced electricity at a lower price than would have been achievable under renewable portfolio standards (Lipp 2007). However, Frondel, Ritter, and Schmidt evaluated the same instrument from the cost perspective of government expenditure that would have been incurred by the subsidization scheme over time and concluded that the policy was far from cost-effective (Frondel, Ritter and Schmidt 2008; Frondel et al. 2010).

Second, our own methodology must also be addressed. The coding process may not capture all the subtleties of policy design; as well, the robustness of findings is clearly affected by the size of the sample (illustrated on Figures throughout the text), such that some trends appear more pronounced than others.

Third, there are also more general aspects to be considered. Although our methodology identifies trends of varying strength between policy design characteristics and evaluation results, each of these trends has a substantial number of policies that go against the very same finding. As illustrated above, there are cases where evaluations judge that too much flexibility hampers effectiveness and that an overly long time frame locks countries in a certain pattern of development. Therefore, it cannot be concluded that some characteristics are superior to others as a rule.

If one clear trend emerges from the literature, it is that for an individual instrument, design and subsequent performance are strongly dependent on a

jurisdiction's particular history, policy style, institutional framework, existing policy mix, distribution of power and various socio-political factors (e.g. the general public's level of awareness and interest), such that nearly any policy can be considered unique in its own right and unlikely to be replicable elsewhere (Lipp 2007; Krarup and Ramesohl 2002; Bailey 2008; Michaelowa 2004). Nevertheless, there is an inherent need to assist decision-makers to determine how to assess and choose appropriate policy responses. In the following section, we will draw from our findings to develop a framework and decision tree to provide this guidance. We also return to these interpretation considerations by outlining areas meriting future research.

Implications

The Policy Framework is a guide for making policy. It includes three components: the policy environment, cross-cutting policy functions and the issue life cycle.

The Decision Tree identifies several contextual factors and specifies questions decision-makers need to consider when evaluating and choosing between different policy options.

Introduction

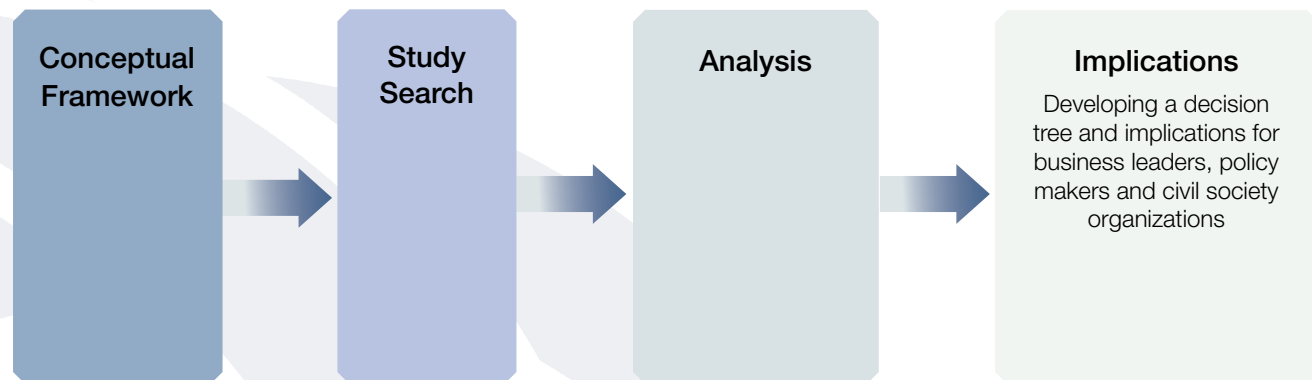
Drawing from the analysis in the previous section, in particular the Key Findings, this section aims to provide guidance to decision-makers who would like to use our findings to maximize the effectiveness of their policies addressing environmental problems. This section serves as the final step in our assessment, as represented in Figure 23.

We begin by describing a broad policy framework with three component parts: the policy environment, cross-cutting policy functions and the issue life cycle. Next, since a critical point in an issue's

life cycle is the development and selection of policy, we develop a decision tree that specifies questions decision-makers need to consider when they are evaluating, and choosing between, different policy options. Earlier in this report, we concluded that effective policy design should incorporate a jurisdiction's contextual factors, such as its institutional framework and existing policy mix. We also found that many studies noted negative results for process evaluations of low-carbon technology policies, which further justifies our focus on policy design and implementation. The decision tree identifies several of these factors to help decision-makers maximize the chances of a successful policy result.

Figure 23

MOVING FROM OUR ANALYSIS TO IMPLICATIONS FOR BUSINESS LEADERS, POLICY-MAKERS AND NON-GOVERNMENTAL ORGANIZATIONS



We then move on to illustrate the decision tree in practice, using the two focal policy problems, water management and low-carbon technology. The discussion of each problem draws from the reviewed studies and findings about specific policy instruments. However, the decision tree includes questions to ensure decision-makers take care to recognize, and account for, the interactions between different policies. Indeed, a number of studies such as Sawin (2004) argue that “generally, a mix of instruments is essential and a key for success.” This is one of our key findings: decision-makers who do not recognize the importance of using instruments from all the policy buckets miss opportunities to improve policy outcomes.

To close, we identify some lessons that have general application and others that may have more particular relevance for government, businesses or non-governmental organizations, respectively. We believe that all involved parties will benefit from considering our 12 takeaways. These takeaways are a product of our review; the insights gleaned from individual studies and scrutinized in the light of the teams’ collective research and professional experience.

Policy Framework

Figure 24 outlines the three components of our policy framework: the policy environment, cross-cutting policy functions and the issue life cycle. These components encompass important factors for decision-makers to consider when making policy choices. We do not present this as an explanatory framework; rather, it is meant as a guide for making policy. It builds upon the framework we presented in the first section (see Figure

2), the literature from which we derived the framework, the analysis in the second section and a qualitative assessment of the included studies.

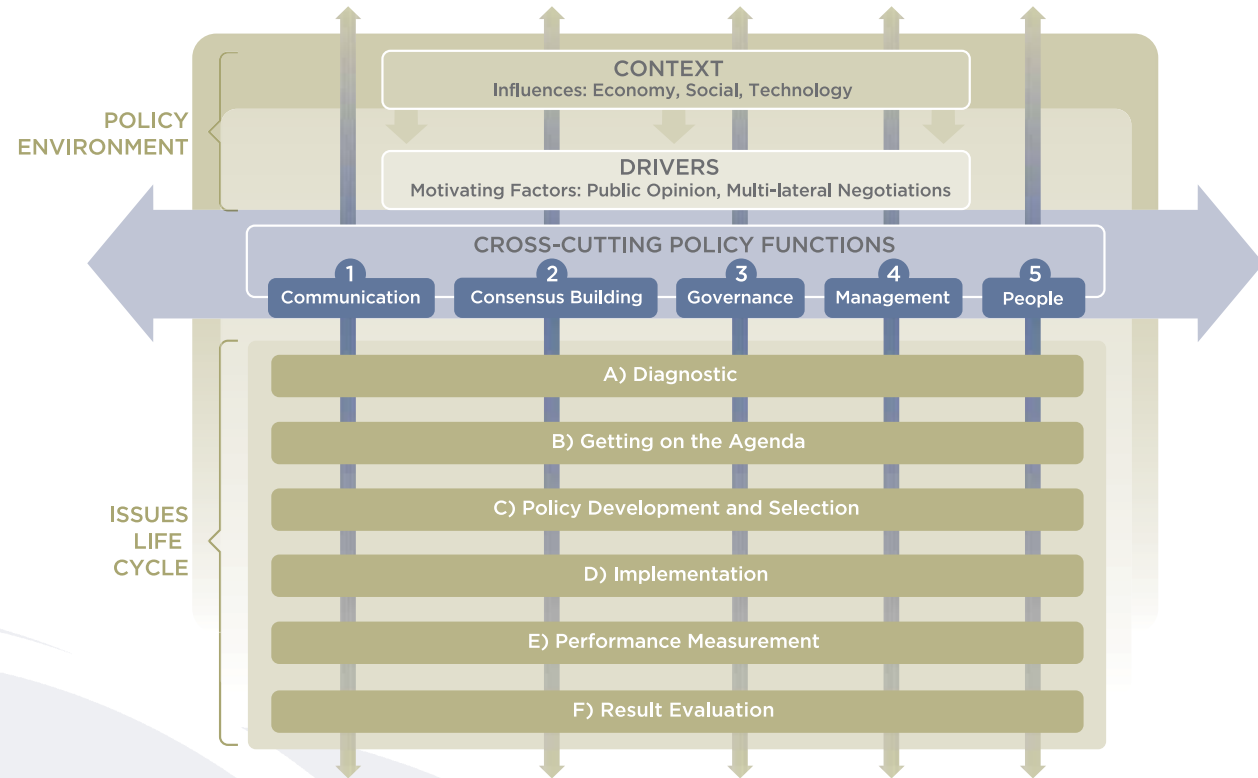
POLICY ENVIRONMENT

The policy environment is composed of the key background considerations pertinent to the issue at hand. Discussing policy environment typically includes describing drivers, for example, multilateral negotiations aimed at producing a convention; domestic pressures for action; state of knowledge; stakeholder interests; equity and distributional effects, in both space and time, for economic, social and environmental factors; public opinion; and political preferences and dynamics. Assessing the policy environment also includes reviewing the past history of the issue, or of related issues, as well as the performances of other actors, which could be governments (domestic or international), industrial sectors or non-governmental organizations.

The *context* is one step removed from environment and includes the status of relevant trade negotiations, competitiveness and productivity, demographics and technology, factors that shape the drivers. Some of the drivers are reasonably stable, whereas others can change unpredictably and rapidly. Maintaining the currency of the context for any issue is an important investment.

Figure 24

SCHEMATIC OF POLICY FRAMEWORK. THE POLICY ENVIRONMENT, INCLUDING DRIVERS AND CONTEXT, AFFECTS EACH OF THE FIVE CROSS-CUTTING POLICY FUNCTIONS AND SIX STAGES OF AN ISSUE LIFE CYCLE



CROSS-CUTTING POLICY FUNCTIONS

There are five interrelated functions that cut across all stages of the issue life cycle. How they apply will vary depending upon the nature of the issue.

Good *communication* is essential to ensure all parties are informed and aware of the issue, the evidence, the goals and the status of performance by all parties. The maxim is that good policy and

implementation can only be achieved through good communication. Operationally, this means getting information to decision-makers when they need it and in the form they need it.

Consensus building is an essential process at each stage of the issue life cycle. The process will, however, be different for each stage because different people and institutions will be involved. At the same time, success or failure at one stage will influence the

ability to create consensus at other stages. More broadly, *governance* is a cross-cutting requirement. It entails the organization and exercise of authority involving governments, business and civil society organizations to achieve agreed to, coordinated and integrated results. More operationally, *management* practices are necessary to organize work, set priorities, obtain and allocate resources, and account for changes of performance, with adjustments as warranted. A premium should be placed on flexible and adaptive management in recognition of the pioneering nature of these issues.

Finally, the success of any enterprise is dependent on securing the services of competent, energetic and committed *people* skilled in core technical capacities, integrated thinking and adaptive management, and with strategic outlooks. At the same time, they will need to have the ability to pay attention to a wide range of details, work under pressure and have a high tolerance for ambiguity. In fact, as discussed on pages 22 and 23 on agenda setting, policy or issue champions — which are often individuals — are key triggers for policy action (Bernstein et al. 2007). Attentive recruitment, development and retention of personnel by those governing policy play a role in ensuring a policy's ongoing progress; conversely, neglecting these functions may result in a high staff turnover that can interfere with all stages of the issue life cycle.

THE ISSUE LIFE CYCLE

The six stages are presented as sequential in the diagram and below, but in reality they are highly iterative within a stable context and can change significantly in less stable contexts, as a result of shifts in various factors.

The *diagnostic* stage makes the case for action. It requires the assembly of evidence describing the nature and scope of the problem — causes, effects both direct and indirect, reversibility, significance and certainty — and the integration of economic, sociological and environmental information. Trends and the consequences of both action and inaction, are important. The critical determinant in the quality of the diagnostic is scientific and technical information, which must be widely endorsed by authoritative peers, robust enough to withstand the vigorous policy debate to follow, and clear enough to be communicated to all parties with a stake in the outcome. Targets and schedules for action and expected results provide the clarity that facilitates decision-making.

Getting on the agenda is essential for an issue to receive policy attention. And in this respect, for some interests, it is just as important to keep certain issues off the agenda or to delay attracting attention until the next year or next election. In this report we are addressing environmental problems in a context where governments have important public trust and stewardship responsibilities to fulfill on behalf of all citizens. They also have many legal authorities that can be brought to bear upon the subject. As a consequence, getting on to the government agenda — whether the jurisdiction be multilateral, national,

provincial or municipal — is a prime objective for interested parties if they wish to be accorded serious consideration. The views of the public, political parties and business interests weigh heavily. Because all institutions have limited resources, time and energy this is also a highly competitive exercise; if a new entry is accepted onto the agenda, then something else, de facto, has to drop off (Pal 2010).

The *policy development and selection* stage is where one policy, or a bundle of policies, is identified to address an issue. We have considered a policy to be an authority for an action designed to contribute to the solution of a problem. The authority for governments at all levels can be found in activities following cabinet or council decisions. These actions include the identification of who will lead and how the policy selection process will be carried out, and then the application of existing or new regulatory measures. For the private sector — and for many of the hybrid instruments we assessed — this stage may require the decision of the board of directors or agreement among a partnership of different private stakeholders.

There are many potential factors that need to be considered in selecting a final policy package. These include efficiency and effectiveness, including how to measure them; horizontal coordination within governments — and with industry and NGOs, in the case of hybrid instruments — and vertical integration between orders of governments; fit with government mandate; distributional and equity issues; and assessments of the additional benefits and threats of unintended consequences when a new, discrete policy is integrated into existing government programs and policies. In the next section, we provide an expanded

discussion of this stage, offering a decision tree as a guide for decision-makers.

In the *implementation* stage, regulated parties convert policy prescriptions into practical measures to achieve the agreed-to targets and schedules. Prime factors at this stage include transaction costs and efficiency, clarity and predictability, and appropriate management practices.

Performance measurement involves checking and verifying the implementation of measures, targets and schedules and the preparation of reports, evaluations and feedback from prior stages. The measures will necessarily flow from a policy's objectives.

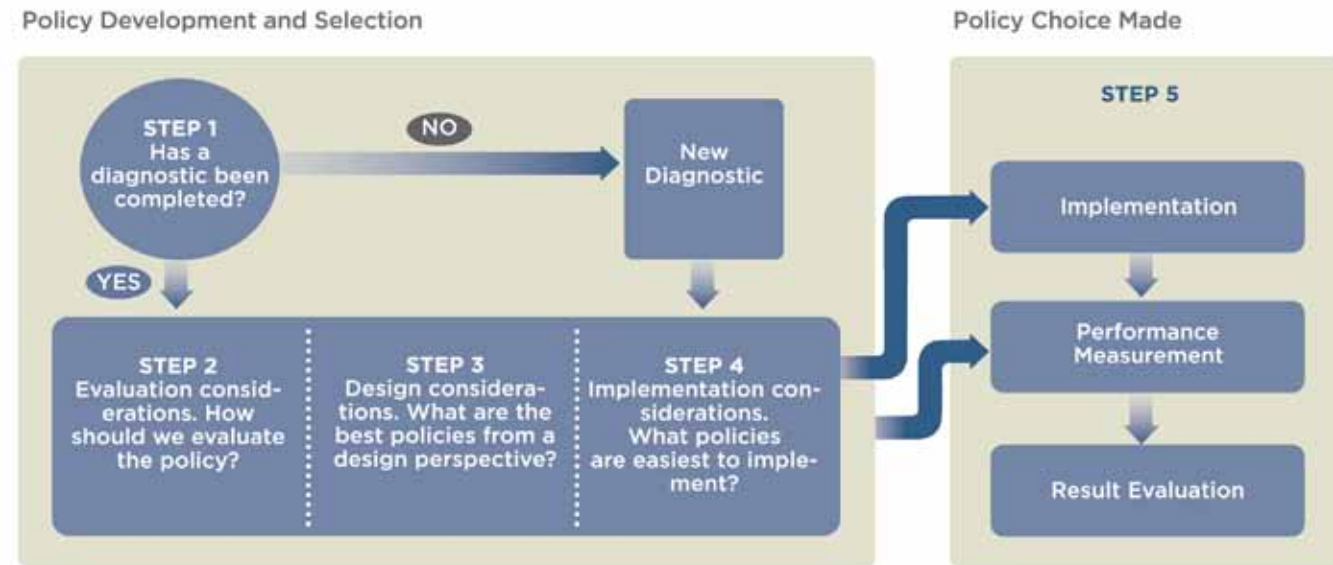
Results evaluation seeks to determine whether societal goals are being achieved in the manner predicted or whether there is a gap between implementation of policies and results. This stage should feed back into prior stages. Often indicators from the assessment of prior policies can serve as indicators to bring an issue back on to the government agenda.

Decision Tree for Policy Development and Selection

To illustrate how the framework we have described above may be applied as a decision tool, we focus here on the “policy development and selection” stage in the issue life cycle (Figure 25).

Figure 25

DECISION TREE FOR POLICY DEVELOPMENT AND SELECTION



Step 1: Has a diagnostic been completed and is it sufficient?

The first step is to assess the context of the issue under consideration. In many instances, an issue reaches the agenda because it has already been subject to careful diagnosis. In our review, a number of studies stressed the importance of champions, which used the diagnosis of a problem to drive the issue and potential solutions onto the agenda of decision-makers (see page 22). However, a diagnosis is not always the driver. Several reviewed studies identified key events

— for instance, the meltdown of the Chernobyl nuclear reactor (Wüstenhagen and Bilharz 2006) — as factors that can put an issue onto a government's agenda. In these cases, a diagnosis may still be needed. Hence, a decision-maker should first ask: Has a diagnostic been completed?

If a diagnostic has not been done, or the decision-maker determines that a previous one is outdated, one is necessary and should be undertaken. Any diagnostic should incorporate the five cross-cutting policy functions: Are the most appropriate *people*

available to perform the diagnosis? Are there key parties to whom the diagnostic process needs to *communicate* its activities and outcomes? Is it necessary to *build consensus* around the process? And what kinds of *governance* mechanisms and *management* practices are necessary to facilitate all of the above?

In addition, the diagnosis should assess the context of the issue: what are the drivers for the issue? And how are they shaped by the context? Understanding the drivers is essential to developing policy options that correctly target root causes. It is also critical to note that there may need to be an iterative back-and-forth between the diagnostic and policy development, and selection stages of the issue life cycle. This exchange may be necessary to build consensus for a particular understanding of the problem and its causes, or support for a proposed policy option.

Indeed, the highest stakes in this stage surround the process of moving from analysis to selection of the policy package to be presented for decision-making, a step that is frequently contentious. In making this move, decision-makers have three interrelated questions to consider. With each, the five cross-cutting functions will feature prominently. We discuss these functions throughout.

Step 2: What performance measurements should the policy be evaluated against?

The second step is determining the appropriate performance measures. These lead to operational goals by indicating what the policy is meant to achieve in measurable terms (e.g. indicators and proxies for difficult-to-quantify objectives). Performance measures should flow directly from the diagnosis, and can include

ensuring a new policy does not negatively affect contextual considerations, such as competitiveness or productivity, or aspects of the problem being addressed, such as a target for GHG emission reductions. These performance measures become critical for assessing implementation. Because of their significance in assessing the performance of the chosen policy, a consensus around the appropriateness of different goals and measures can be important.

Step 3: What are the most effective policies from a design perspective?

The third step focuses on policy design. Design considerations, as noted above and in previous sections of the report, are extensive. Drawing from the review, one area that deserves particular attention is horizontal and vertical coherence among different policies and/or programs. Studies we reviewed noted the importance of understanding how bundles of policies interact (Krarup and Ramesohl 2002; Gupta et al. 2007; Henriksson and Söderholm 2009; Michaelowa 2004; Johannsen 2002). In many countries, the legislative landscape in the fields of environmental and innovation policies are complex. In Canada, for instance, different governments share constitutional authority, their jurisdictions sometimes overlapping: federal, provincial, territorial governments and more recently First Nations or aboriginal groups, pursuant to land claim settlements. The result is concurrent legislation that allows for a single human activity to be subject to intervention by more than one party.

From a design perspective, therefore, a key question is: Are there other programs and/or policies in place that interact with the issue under consideration?

If there are, can they be altered easily to incorporate the issue? When they can be altered easily, there is an opportunity to optimize the interplay of different policies and enhance horizontal coherence. For example, in the UK the climate change agreements between the government and industry sectors were accompanied by reforms to the energy taxes, which became the climate change levy. The levy, as we discuss below, was a key incentive for participation, as the agreements lessened the tax burden on companies by up to 80 percent (Agnolucci 2009; Ekins and Etheridge 2006). By contrast, when policies or programs are not easily changed, the policy design needs to find ways to minimize the negative interactions. All of these considerations underscore the importance of carefully considering the feasibility of different policy designs.

Step 4: What policies are the easiest to implement?

Implementation issues can be as important as policy design (Pal 2010). The best designed policy can fare poorly if implementation is not borne in mind. As Toke (2007) aptly put it when referring to models touting the advantages of economic-based policy tools: “Economists may craft designs that look elegant in their imagination of markets, but real-world institutional complexity may often frustrate the ability of such designs to deliver the desired objectives.” Hence, considerations for implementation include administrative burden, support from critical stakeholders, and the transfer and use of an appropriate amount of funds. Many of the studies we reviewed noted how complex contextual conditions, such as overlapping or competing jurisdictions or interests vested in business as usual, greatly impeded policy implementation

(Pittock and Connell 2011; Huntjens, Pahl-Wostl and Grin 2010). Affordability also enters as a critical consideration when translating policy design into programmatic action.

Similar to the diagnostic stage, the five cross-cutting functions require careful attention. For instance, consensus building can be paramount for garnering support for a policy among the parties responsible for, involved in or affected by implementation. Having them onside early on can greatly reduce headaches later. Several studies underscored this point with their findings that engaging relevant stakeholders early on and making them an integral part of the policy development, selection and implementation process helped to ensure a policy's success (Purkey et al. 2007).

Balancing the different design and implementation considerations will lead to different outcomes depending on the context of the problem and the importance stakeholders place on different goals, including effectiveness, efficiency and flexibility, among others.

Step 5: Selection, implementation, performance measurement and results evaluation

After these deliberations are undertaken, a policy or bundle of policies must be selected. This step should depend on all of the contextual information outlined above, which the decision-maker will need to adjudicate against the evaluation criteria. As with each of the previous steps, having consensus on the appropriateness of the criteria will make subsequent implementation of the policy easier.

Application to Low-Carbon Technology and Water Management

Drawing from the reviewed studies, we illustrate the application of the decision tree's five steps to low-carbon technology and water-management problems. Our attention to low-carbon technology is more extensive because most studies addressed this issue.

To provide an alternative vantage point, we detail the most frequently assessed policies instrument by instrument. These results are provided in Tables 7 and 8, starting on page 100, and cover conclusions from the qualifying studies about the conditions facilitating or limiting the success of individual instruments.

Our assessment points to the following key issues for the five steps of the decision tree (Table 5). These are developed based on findings of the included studies. The details presented illustrate the many interrelated considerations involved in moving from a diagnostic of a problem through to implementation and beyond. We return to considering these interconnections when we conclude, through a discussion of the importance of policy bundles, and when we take a step back to provide takeaways of general application and those specific for government, businesses and non-governmental organizations.

Step 1: Has a diagnostic been completed and is it sufficient?

There are many factors and contextual considerations implicated with the development, promotion, adoption and diffusion of low-carbon technologies, and with the management of water in the context of climate change. In considering the diagnosis of our two focal problems, we found that three points in particular emerged from our analysis.

First, both low-carbon technology and water management can be *policy means and ends*. Low-carbon technologies were either conceived as tools with which to address GHG mitigation and/or reduce reliance on certain energy sources, such as fossil fuels, and/or as an outcome — or a goal — to pursue to increase the economic competitiveness of a country or region. Increased development and production of low-carbon technology, in this latter sense, was a positive sign of successful industrial or innovation policies.

It is important for a decision-maker to understand which role or roles for low-carbon technology is at play. Each implies different drivers the analyst and decision-maker should have in mind. When emissions reductions and energy savings are the key aims, understanding why and how households, individuals, firms or other actors adopt existing technologies is likely to be the priority concern. By contrast, when spurring innovation and bolstering competitiveness are the central aims, it becomes much more important to understand market dynamics in the low-carbon technology sector. Understanding the role

How will producers respond to a subsidy or tax? Ensuring the uptake of low-carbon technologies requires careful attention to these behavioural uncertainties.

Table 5

KEY ISSUES IDENTIFIED BY REVIEW FOR THE FIVE STEPS OF THE DECISION TREE

DECISION TREE STEPS	DESCRIPTION OF KEY ISSUES
Diagnostic	<ol style="list-style-type: none"> 1. Consider whether issue is an end and/or a means to an end. 2. Understand the nature of uncertainty about the issue.
Appropriate Performance Measure	<ol style="list-style-type: none"> 1. Tailor the goal-setting process. 2. Align with high-level political priorities to aid success. 3. Consider the nature of goals and measurements.
Best Policy Design	<ol style="list-style-type: none"> 1. Reflects and fits with different contextual conditions. 2. Understands target audience. 3. Incorporates monitoring and enforcement.
Ease of Implementation	<ol style="list-style-type: none"> 1. Know your target and how its attributes affect implementation. 2. Leverage any history of communication between government and industry to facilitate implementation. 3. Use appropriate incentives. 4. Time initiatives wisely.
Selection, Implementation, Measurement and Evaluation	<ol style="list-style-type: none"> 1. Plan for ongoing measurement to improve policy implementation over time.

of low-carbon technology in a given context can help decision-makers determine what kinds of technologies to pursue and how.

There are also different roles for water management. Managing water for the purpose of ensuring continued economic prosperity and competitiveness treats water as an input rather than examining water quality, flow and other characteristics as outcomes in and of themselves. Understanding this difference at the diagnostic stage is important.

Second, both problems come with *uncertainty* that requires consideration, but the nature of this

uncertainty is different for each. With low-carbon technology, as just noted, the uncertainty frequently involves the behaviour of market actors. Will consumers adopt a new low-energy appliance if they are informed of its environmental or economic benefits? How will producers respond to a subsidy or tax? Ensuring the uptake of low-carbon technologies requires careful attention to these behavioural uncertainties.

For water management, by contrast, uncertainty about the hydrological and biophysical systems is often the critical matter for policy-makers to tackle. The management of water has long required

careful attention by governments, non-governmental organizations and firms. From agriculture to municipal planning to road and building construction, decision-makers need to account for where water will be, in what form, in what quantities and in what quality. Accounting for variability is, therefore, a hallmark of water-management policy, which is challenging in new ways, as many studies we reviewed indicated (Hay, Larson, and Perez 2007). This is because our understanding of what constitutes a 10- or 20-year rainfall or a flood event has shifted to become more volatile and less predictable in step with the mounting effects of climate change (Pittock and Connell 2011; Mawdsley, O'Malley, and Ojima 2009). These changes will have profound effects, such as the ripple effects of a drought-induced collapse of the Australian rice crop in 2008, which drove up prices and led to food shortages in import-dependent countries in the Middle East and Caribbean (Morrison et al. 2009).

Much of the research and policy work to date has focused on identifying and preparing for this problem. For instance, the Global Environment Facility (GEF) funded a five-year, US\$7.5 million project aiming to: “(1) enhance scientific capacity in developing countries to assess climate change impacts, vulnerability and adaptation; (2) advance scientific understanding of these issues; and (3) improve links between climate change science and policy communities to enable adaptation planning and action.” Engaging hundreds of scientists and policy-makers across several developing countries, this project has progressed understandings of these challenges in important ways, including through some of the studies reviewed in this report (Hay, Larson and Perez 2007).

In other words, for water management, decision-makers are, in many respects, still in the

diagnostic stage, with fewer governments and certain firms having begun to develop and select policy responses.⁵ Recognizing the importance of physical, regulatory and reputational risks, some businesses have taken strong leadership in this area, as exemplified by Unilever. The company has been systematically measuring water used across its supply chain since 1995. As well, it has been encouraging and assisting its suppliers to reduce water consumption by providing technical and financial assistance for drip irrigation to farmers in Brazil and tea producers in Tanzania (Morrison et al. 2009). How this challenge is tackled hinges on the drivers in a region — often increased droughts or floods, rising sea level — and how these changes affect human activities.

Step 2: What performance measures should the policy be evaluated against?

This second question connects closely to the diagnostic. We discuss two key issues that emerged from the analysis: the process for establishing goals and the specific nature of those goals.

First, conclusions about *how to establish goals* were ambiguous, with the exception of noting the importance of *aligning with higher level political priorities*. For instance, with voluntary agreements, Elliott (2003) argued that the process for selecting targets (imposition versus negotiation) and the coverage of an agreement would affect the success of agreements differently in various contexts. Information asymmetries are one such contextual factor. Studies found that voluntary agreements were less effective for energy-intensive firms with a high level of expertise in energy management when the negotiated targets relied on industry information because these firms were in a position to negotiate targets they knew to

⁵ See Michael Coren on the increasing attention firms are giving to climate adaptation: <http://www.yaleclimatemediaforum.org/2011/07/more-companies-begin-adapting-to-a-warmer-world/>

represent “business as usual,” (Lutsey and Sperling 2007). Voluntary agreements were more effective for low-energy intensive sectors because these firms lacked prior experience and were thus unlikely to have the same information advantage when negotiating commitments with governments (Lutsey and Sperling 2007; Henriksson and Söderholm 2009). This same concern applied with water allocation. Given the economic significance water allocation can have, a democratic process that helps build consensus was key. Water-sharing schemes, water pricing and buyback schemes might be perceived as favouritism among different parties and bring discontent among all stakeholders. Thus, from that perspective, equity among stakeholders should be addressed when designing and selecting policies (Loch, Bjornlund and Kuehne 2010).

The Dutch benchmarking agreements illustrated another way to address an information asymmetry. Benchmarking agreements required reaching targets that evolved over time and became increasingly difficult to achieve, thereby promoting innovation and competition (Crocini 2003). The experience of the City of Rotterdam with water management provided a further illustration of how goals could be set to advance adaptive water planning. The key challenge was how to accommodate increasing flood waters without relying on increasing the height of dykes. Accepting that inundation would occur, the plan set standards for how frequently different land-use types could be inundated: every 10 years for pasture; every 100 years for urban areas. The standards were set through a democratic, inclusive process, drawing on technical data. Decision-makers also built in a flexible mechanism whereby if it were agreed that an area would face a greater likelihood of inundation than the default standards for pasture

or urban areas, the landowners would be financially compensated (Hendriks and Buntsma 2009). This ambiguity aside, the studies generally concluded that for any policy to be adopted, it needed to align with issues high on the political agenda. For instance, as noted earlier, climate change was the focus of Ontario’s Green Energy and Economy Act 2009, which aimed to promote innovation, job creation and the reduction of GHG emissions (Yatchew and Baziliauskas 2011). This tactic was also prevalent in various policies within the EU, where innovation and energy security were concurrent objectives (De Vita et al. 2009; Lefevre 2009). Ignoring these aspects could cause an otherwise sound policy to fail. For instance, in the Netherlands, the voluntary quota system to encourage renewable energy use was working, but was ended because 75 percent of the credits and subsidies were being distributed to foreign rather than domestic producers (Sawin 2004). This view also resonated within industry. In a study of the poultry and textile sectors of North Carolina, Elliott (2003) found that “energy savings alone will not usually motivate industry or agriculture to change its energy use patterns. Projects that produce economic, productivity or environmental co-benefits are more likely to capture industries’ or farmers’ attention, especially if the project addresses a current, pressing need.”

The value of alignment with high-level priorities was also apparent in the experiences of the City of Rotterdam. The Dutch government had made a high-level commitment to “climate proofing” over the coming years, setting three guiding principles for adaptation actions: “adaptation to climate change is paramount in spatial development; natural process such as sand dynamics in coastal areas should be utilized; and risk prevention includes the minimization of possible

Studies claimed that more detailed, targeted, scheduled and planned agreements had a higher chance of success.

impacts,” (Hendriks and Buntsma 2009). This kind of political commitment provided a more favourable setting in which basin-level adaptive management actions could progress. Its importance was even more apparent when contrasted with the situation in Spain and Portugal. Cots et al. (2009) study on Gabinete de Iniciativas Transformadoras Algrave-Alentejo-Andalucia, an effort at integrative management on the Lower Guadiana river shared by Spain and Portugal, found that the “absence of strategic political direction in the form of an overarching sustainable development strategy for the river basin” worked against integrated planning. Moreover, speaking to the importance of consensus building, Cots et al. (2009) stressed that the lack of high-level political commitment to addressing climate change limited adaptive management efforts at the basin level. Traditional concerns with development remained dominant, with one of the researcher’s interview subjects remarking “climate change is for penguins.”

Second, the specific *nature of goals and measurements* were also considered important in that they were seen to directly affect whether policies were to prove successful. For voluntary agreements to do with low-carbon technology, studies claimed that more detailed, targeted, scheduled and planned agreements had a higher chance of success (Lindén and Carlsson-Kanyama 2002; Croci 2003). Ideally, the targets, in particular, should be quantified (Bailey 2008) because indeterminate performance metrics and unclear pre-agreements introduced ambiguity and made it harder to identify which industry actions were “business as usual” and which were “new” (Lutsey and Sperling 2007). With information campaigns, cost-effectiveness was affected by the reach and rate of participation (Natural

Resources Canada 2006), in that small information campaigns with limited participation and few variable costs might be more cost-effective with greater breadth. Promotional approaches needed to target and focus on potential participants and forgo costly activities such as direct-mail campaigns (Natural Resources Canada 2006). Finally, messaging efforts needed to be consistently integrated across other key related programs and initiatives, including, if applicable, those at the provincial levels (Environment Canada 2006; Francis and Tremblett 2005).

Similarly, with water, a key challenge for decision-makers considering adaptation to climate change was deciding what to measure and when. As Engle and colleagues (Engle et al. 2011) noted “adaptive capacity is latent in nature, meaning that it can only be actually measured after it has been realized or mobilized. Hence, at best, prior to climate-change impacts, adaptive capacity can be assessed based on assumptions about different factors that might facilitate or constrain response and action.” These scholars suggested five factors — stakeholder participation, representation, accountability, knowledge use and equality of decision-making — as useful performance measures for predicting adaptive capacity.

As with low-carbon technologies, a number of studies highlighted certain trade-offs between different goals and the ability of management tools to achieve them. For instance, adaptive management, associated with technocratic flexibility, social learning and efficiency, could be at odds with integrated water-resource management, which was seen to foster pluralistic accountability, concessionary negotiations among stakeholders and deliberation (Engle et al. 2011; Engle and Lemos 2010). Put another way,

Technologies may be mature in certain markets but not in others, such as in poorer or more rural communities, implying that different policy responses may be needed for these different communities.

adaptive management was flexible and likely expert-driven, whereas integrated management was inclusive and democratic but likely less flexible. One study took the position that for water management to be transformative, the frame of reference and priorities in water infrastructure planning had to be reworked. Rather than being “deadline driven” and reliant on “proven, on-the-shelf technologies with listed suppliers and certain delivery times,” Van der Brugge and de Graaf (2010) argued that “infrastructure should be made more adaptable to changing circumstances. Consequently, the lifespan of infrastructure should be much lower while time horizon should be larger. The infrastructure itself should be context specific and decomposable and therefore the planning process should change as well.”

Step 3: What are the most effective policies from a design perspective?

Devising the best policy design is a process that requires careful attention to the context and drivers. Our analysis pointed to three key considerations at this step in the decision tree.

First, *how a policy fit with different contextual conditions* was considered critical by many studies. For example, with policies aiming to promote low-carbon technologies, whether the key barriers to mitigation were more of an economic or non-economic nature had bearing on the effectiveness of voluntary agreements. With economic barriers — uncertain energy prices or sunk investments in existing technologies — voluntary agreements were less likely to be effective (Korevaar et al. 1997). The opposite held with non-economic barriers such as insufficient information, technological uncertainty about performance or the lack of specialized personnel, in which cases the potential for institutional

learning was higher (Ramesohl and Kristof 2001; Koehler 2007).

Another market consideration concerned the maturity of a technology that policies sought to promote. There was a clearer case for government subsidies supporting research and development into immature technologies. Such subsidies would be more cost-effective than policies promoting the large scale deployment of an immature technology (Frondel, Ritter and Schmidt 2008). By contrast, subsidies were less defensible for mature technologies. For instance, one study examining the Energy Premium Regulation in the Netherlands, a program providing a grant to households to undertake predefined energy-saving actions (e.g. double-glazing of windows, installing of high-efficiency boilers), argued that existing market penetration resulted in a high share of free riders (Harmelink, Josen and Blok 2005). Decision-makers must carefully determine what maturity means because technologies may be mature in certain markets but not in others, such as in poorer or more rural communities, implying that different policy responses may be needed for these different communities.

One of the clearest examples of policy linkages to emerge from the review was regarding the role of information. Free technical assistance to firms should be limited to segments of industry known to have gaps in appropriate information (e.g. low-energy intensive firms; see Lutsey and Sperling 2007). And if such information were to be provided, it would be best delivered via direct, one-to-one contact with industrial end-users and plant-site managers. Such information significantly increased the adoption of commercially available and emerging energy-efficient technologies (Laitner et al. 1994).

Information needs to be tailored to levels of environmental awareness and concern in a given society.

Information instruments were broadly considered to affect the performance of other instruments by promoting better-informed choices and support for governmental policy. However, there was no evidence suggesting the provision of information alone could achieve emissions reductions, as consumer or citizen awareness seldom translated into behavioural changes (Gupta et al. 2007). As such, it is important to understand how information instruments fit into the larger context of existing policy instruments (Löfstedt 1993).

With water, many studies noted how adaptation policies often required integrated thinking and adaptive management approaches, two requirements that more easily fit with certain pre-existing practices than others. In Brazil, for instance, Engle and colleagues (2011; Engle and Lemos 2010) found that river basins with a history of technical and hierarchical management had an easier time adopting adaptive management than integrative management approaches. The study noted that more research was needed on “the explicit tensions and trade-offs among existing water-management regimes and novel approaches to address emerging complex stressors,” (Engle et al. 2011). A 1994 change to the South African Constitution giving all citizens water rights provides another example of this challenge. The marked discrepancy in the water allocated for productive purposes to various geographic and ethnic groups, a legacy of apartheid, presented serious challenges to the constitutional change (Stuart-Hill and Schulze 2010).

The City of Rotterdam’s Water Plan, by contrast, illustrates how a set of contextual factors helped facilitate the adoption of a plan at odds with existing practices. In particular, the visioning project

undertaken as part of the international architectural event, as we explained on page 22 on agenda setting, provided an understanding of the problem that propelled the integration of urban design and water management — two issues that had previously been addressed separately (Van der Brugge and de Graaf 2010). The situation was, nevertheless, helped by the other ways it fit with existing practices. Dutch water boards, which are elected and funded by water users in a basin, have a long-standing, democratic history of governing water quality and quantity (Hendriks and Buntsma 2009).

Second, it is critical to *understand the target audience*. As our discussion of Step 1, this can be critical when a policy is seeking to change an actor’s behaviour. This issue is clearly highlighted by the studies reviewing information instruments. These find that the information needs to be tailored to levels of environmental awareness and concern in a given society; in other words, an understanding of the target audience is important. Bearing in mind that preferences and habits vary at the individual level, common trends can be found at the level of communities, economies and countries. Recognizing and reflecting these aspects in policies is important (Francis and Tremblett 2005). For instance, evaluations have found that “many [Canadians] are only likely to make changes to their habits and lifestyles if it will be reflected on their utility bills or in their pocketbook,” (Environment Canada 2006). Moreover, many consumers attached more importance to “non-energy benefits” of technologies, such as quieter appliances; this means campaigns that made value appeals or solely stressed environmental benefits might not resonate with the general public. They would only appeal to those individuals already

interested in reducing their environmental impacts (Löfstedt 1993; Freeman and Skumatz 2007; Boardman 1997). Furthermore, policy-makers needed to be conscious of the image of the actor delivering the message: could mistrust in political institutions, for example, lead certain segments of the population to ignore a government-sponsored campaign (Environment Canada 2006)?

More broadly, if individuals and households were the target for an information campaign — as was the case with the UK Energy Efficiency Advice Centres' campaign — forging bonds through excellent service interactions with clients would be a critical determinant of success (Timmins 2001). Similarly, tailoring marketing campaigns to appeal to individuals' preferences for non-energy benefits, such as aesthetic appeal or quality, over environmental impact was a prime design consideration. Information instruments were advised to highlight how an energy-efficient appliance provided both environmental benefits and cost savings, or other features that might be more appealing to a buyer's private interests (Freeman and Skumatz 2007; Amann 2006). Building a "brand" such as klima:aktiv in Austria or the One Tonne Challenge in Canada provided more credibility to both pan-national and local activities (Mahapatra and Gustavsson 2009; Environment Canada 2006).

Third, the studies highlighted the challenge of having adequate *monitoring and enforcement* without creating too high an administrative burden. While rigorous auditing and monitoring of compliance were considered key determinants of environmental effectiveness (Elliott 2003; Bernstein et al. 2007; Khan 2006), they were also expensive and administratively burdensome. Hence, effectiveness could work counter

to efficiency, as effectiveness required "complex data gathering, negotiation and monitoring in order to set credible targets," thus increasing administrative and transaction costs (Crocchi 2003; Chidiak 2002).

An interesting alternative, adopted in the case of the UK Climate Change Agreements, was termed "two-level agreements," and involved branch framework agreements, or those at the sector level and individual company agreements (Crocchi 2003; Bailey 2008). This approach was considered beneficial because it provided a binding target and flexibility. Under the agreements, 44 energy intensive sectors were eligible for an 80 percent discount to the climate change levy if they met energy efficiency and/or emission reduction targets. The Department for Environment, Food and Rural Affairs, which was the implementing agency, limited monitoring costs by assessing sectors first and then only following through with facility-level monitoring if the sector as a whole was missing its targets. Enforcement was backed by the threat that not meeting targets meant a facility would be ineligible for the climate change levy discount for two years (Bailey 2008; Department for Environment, Food and Rural Affairs 2006). In other words, monitoring at the sector-level minimized costs, while the harsh penalties and legal enforceability helped maximize compliance. Because policies relevant to the problem of water management for climate change are in their "infancy," their design can be considered somewhat experimental. Consequently, knowledge and management, especially adaptive management practices, are the key factors to consider in development of these policies rather than the availability of technologies.

One study indicated that a concentrated industrial sector facilitated the implementation of voluntary agreements because fewer large firms reduced the risk of free-riding by smaller firms.

Step 4: What policies are the easiest to implement?

The considerations for implementation are just as varied as those for design. As noted above, the theme of aspects “getting lost in translation” when policies moved from the design and selection to the implementation stage was prevalent in the reviewed studies. For instance, an examination of various trading schemes, including three to do with climate change (Sovacool 2011), underscored that tools designed to outperform other alternatives were, in practice, “prone to compromises in program design, transaction costs, price volatility, leakage and environmental degradation; in essence, that these trading schemes are political tools as much as economic ones,” (p. 582). Here we note four issues that emerged from the review, which are relevant to this step in the decision tree.

First, the *character of the targeted industry* matters. One study indicated that a concentrated industrial sector facilitated the implementation of voluntary agreements because fewer large firms reduced the risk of free-riding by smaller firms (Crocchi 2003). Moreover, a high level of industrial organization facilitated the fulfillment of commitments (Krarup and Ramesohl 2002). Implementation could also be facilitated by protection of early action, particularly if this helped support leaders in the industry to pull along laggard companies (Elliott 2003).

The considerations studies noted for subsidies were similar to those applying to voluntary agreements. For instance, Jaccard et al. (2006), in assessing Canadian policies to address climate change such as the 1995 National Action Program on Climate Change and the Action Plan 2000, suggested that “without substantial restrictions or charges for emitting GHGs, Canadian emissions have continued to grow, outstripping the emission targets and commitments

set by the government. Investments in energy supply, infrastructure, buildings and energy-using devices continue the GHG-intensive path and increase the costs of diverting from it in future,” (p. 27).

For the water-management policies assessed, this point also arose. Adaptation policy often involved enhancing the resilience to the increased volatility of the water cycle. The character of the target industry was found to matter in a number of ways that shaped the implementation of policies. For instance, a study of reef tour operators in Australia — threatened by climate change due to coral reef bleaching — found a difference in the resilience of operators connected to the industry for lifestyle reasons versus those with pure commercial interests (Biggs 2011).

Second, the ease of implementation was also affected by a *tradition of communication and negotiation* between the industrial sector and government, the existence of an appropriate agency capable of administering the agreement (Krarup and Ramesohl 2002; Croci 2003) and an expectation of high marketing reward for participation as determined by levels of public awareness (Koehler 2007). More broadly, the political profile and representativeness of the actors involved, determined by variables such as exposure to political pressure, connections to trade associations and dependence on regulatory agencies, affected success since firms with more exposure tended to have better performance and vice-versa (Delmas and Montes-Sancho 2010).

Information instruments that required the support of firms or industry associations (such as the One Tonne Corporate Challenge or the Canadian Energy Efficiency Awards) needed a dedicated internal team of employees, a commitment from senior management and a compatible organizational

culture in order to be successful (Francis and Tremblett 2005). Moreover, labelling schemes might fail given a lack of industry participation and interest. Such was the case for the Australian Greenhouse Friendly Labeling Program to which the government gave little publicity or support. Many firms felt it demanded time, resources and commitment disproportionate to the scheme's value (Taplin 2004). Communications, skilled people and consensus building — three of the cross-cutting functions — were particularly important for implementation. For instance, studies of labelling schemes found that knowledgeable retail employees were essential for successful transmission of information to consumers (Schlomann, Eichhammer and Gruber 2001).

Third, *incentives* help. Marketing or reputation benefits, as just noted, are one enticement for participating in a voluntary program. Other incentives have also been identified. Providing support in the form of subsidies or information increased the likelihood of success (Krarup and Ramesohl 2002; Croci 2003). Yet the incentives could also take the form of a regulatory threat. Many studies argued that such threats were determinants of success because they incentivized firm performance (Elliott 2003; Bjørner and Jensen 2002). Others argued that they must be used with caution, as the situation could arise where only large firms had an incentive to participate in the voluntary agreement to obtain (carbon) tax rebates, with smaller firms free riding off of these efforts (Jiménez 2007; Bailey 2008).

Communication was also considered critical even when there were financial incentives to adopt a particular technology. Communication by the government or by the producer of a given technology supported by a subsidy has been found to increase the success of demand side management programs (Vine 1995; Mahapatra and Gustavsson 2009).

Fourth and finally, *time and timing* are key determinants of successful implementation. Information instruments can greatly increase their effectiveness if they make use of potential systemic changes in technologies. In Sweden, for example, a marketing campaign targeted district heating when data indicated existing resistance heaters were more than 20 years old and needed to be replaced in the following years (Mahapatra and Gustavsson 2009). Furthermore, depending on the aim of a campaign, effectiveness was influenced by other exogenous factors such as seasonality (considering how seasonality might affect behaviour with respect to transit use, for example) or potential conflicts and/or synergies with business activities (Francis and Tremblett 2005).

Another key aspect for policy effectiveness highlighted by the studies was the importance of having long-term commitments to increase predictability. Germany's approach to promoting renewable energy is an excellent illustration. For instance, the German FiT, where rates (paid for by consumers) agreed-upon within contracts had a long time horizon (e.g. 15 year, 20 year), was largely considered successful, whereas the Dutch FiT program, which was funded by the government and thus "subject to change to political priorities on a yearly basis," has performed less well (De Vita et al. 2009). Germany also fares well in comparison to the instability of US Federal support for renewable energy (Walz 2007). However, other studies note that the "locked in" character of German's long-term commitments reduced flexibility (Frondel, Ritter and Schmidt 2008; Frondel et al. 2010). Depending on the policy objectives, therefore, this trade-off is important to recognize.

Whatever performance measures are chosen, it is critically important that they be assessed over time to ensure they map onto the original objectives of the policy and new information.

Time and timing were also significant for some water policies. The City of Rotterdam provides a useful example. The international architectural event — the 2nd International Architecture Biennale Rotterdam — which we have discussed several times — illustrated nicely how the timing of a focusing event helped shepherd to fruition a new approach to water management that brought together the concerns of urban design and climate adaptation concurrently (Van der Brugge and de Graaf 2010).

Step 5: Selection, implementation, performance measurement and results evaluation

Whatever policy choice was made in a given circumstance, a reoccurring theme stressed by the studies was the *importance of following up with performance measurement*. For instance, an assessment of a program providing financial incentives for households to increase energy savings, through the German Climate Change Programme (2000), showed that forecasts of energy savings were optimistic upon evaluation after implementation (Wagner, Lechtenböhmer and Thomas 2005).

The importance of ongoing measurement and evaluation was even more apparent with water management. Because adaptation is about reducing the shocks associated with increased climate volatility, it is difficult to determine indicators of success. The case studies in the Netherlands did, however, provide interesting ideas about how a novel approach can be used. For instance, as we noted above, the use of set time periods for when inundation by flood waters would be acceptable for different land uses (e.g. every 10 years for pastures) was a great example of an innovative performance measure. Whatever

performance measures are chosen, it is critically important that they be assessed over time to ensure they map onto the original objectives of the policy and new information obtained over time. Ultimately, as well, it is important to step beyond the narrow assessment of a policy to ensure that the results obtained are addressing the root causes identified in the diagnostic.

Conclusions and Takeaways

In this study, we assessed three questions:

1. How effective are different environmental policy instruments in achieving environmental objectives?
2. How cost-effective are these instruments for governments, regulated parties and society?
3. What accountability implications do different instruments have for government?

The report provided insights for these questions from a review of 204 studies that were empirically oriented and assessed environmental policies designed to promote low-carbon technology or address water management in the context of climate change.

To close, we detail three sets of conclusions. First, we review key points from the study to do with the importance of policy bundles. Although not a panacea, taking a bundle approach, according to many studies, helped ensure the effectiveness of policy interventions. Second, we briefly note a few implications from the study for researchers. And finally, we offer key messages that have general relevance and a few specific takeaways tailored to government, businesses and non-governmental organizations.

POLICY BUNDLES

Throughout the discussion of water management and low-carbon technology policies, there were a number of illustrations of when policies did and did not work well together. Information policies, as a whole, were the most likely to be coupled with other policies. Indeed, most studies concluded that information policies alone were not sufficient to measure well on impact evaluations. There were other examples of useful combinations, such as directing revenues from carbon taxes for research and development for low-carbon technologies. Or, in the case of water management, benefits accrued for Rotterdam when it merged its attention to urban renewal with its ongoing and longer-term flood mitigation planning.

To add to this, we consider one example of synergies and risks decision-makers ought to consider when evaluating how sets of policies will interact. First, when using incentive-based policies, which give regulatory discretion over how to respond, a decision-maker needs to take extra care to understand unintended effects. Promoting renewable energy through subsidies when there is already a price signal sent by a tax or an emissions trading system, for instance, may be counter-productive because it essentially pays massive subsidies for reductions that likely would have happened anyway. When renewable energy policies are not technology specific, they may also skew investment towards least-cost technologies for a given region (e.g. wind power in northern Germany).

IMPLICATIONS FOR RESEARCH

Here we identify gaps in knowledge about the effects of environmental policies. The first most evident gap is on the water management side. More research is needed to examine the leaders in the water management field to understand what works and does not work for adapting to climate change in different coastal and freshwater systems.

Second, and more interesting, is the emerging nexus between water and energy. This relationship is apparent around the world and for various actors, and its repercussions are dramatic. For instance, in the US, 39 percent of freshwater withdrawals come from the electric power industry. Brazil, which relies on hydro power for more than 80 percent of its electricity, experienced water's significance first-hand during the 2000-2001 drought, which brought acute electricity blackouts and energy rationing to the populous southeast (Mallett et al. 2009). This risk also exists in other power generation sources, such as nuclear energy. In France and the US, for example, drought-induced warmer water temperatures forced the shutdown of nuclear plants. In France, the shutdown affected one-quarter of the 58 nuclear plants run by *Électricité de France*, triggering "price spikes of 1,300 percent and about €300 million in losses for the French utility," (Morrison et al. 2009). Countries with a perceived abundance of freshwater supplies are not immune to these vulnerabilities. In Canada, for example, David Schindler, a professor of ecology at University of Alberta, predicts that the flow of the Northern Athabasca river, the main water source the oil sands depend upon for production, will be reduced by as much as 50 percent at certain times of the year due

to climate change and water extraction by the oil sands industry (Middlestaet 2007, as quoted in Morrison et al. 2009). Thermal power production across Canada in 2005 consumed 64 percent of national gross water use, underscoring its high reliance on water and the close connection of water and energy (National Round Table on the Environment and the Economy 2010).

These are issues that demand more research attention, particularly on the side of assessing how well policies do in addressing this intersection. One interesting opportunity may come from the recent announcement of the Clean Development Mechanism's Executive Board that a new methodology is now available for assessing the co-benefits of water efficiency and GHG mitigation.⁶

In sum, we see research productively occurring in three ways. First, we assessed two facets of the complex problem of climate change. Additional examinations of existing research on other facets of this broad and far-reaching problem are merited and would refine our findings concerning how characteristics of problems affect the implementation of different policy options. Second, further insights could be gleaned by applying the same methods to problems other than climate change, including the historical challenges of toxics or the emerging regulatory issues to do with nanotechnology.

Third, we see a need for primary research with business on the rationale, design, implementation and performance measurement of private policy initiatives. While studies of effectiveness have been conducted for some of the flagship initiatives, such as ISO 14001 (Potoski and Prakash 2005a; Potoski and Prakash 2005b), this is an area ripe for further analysis. Similarly, primary research examining a wider swath of policies

would help verify our finding that expenditure policies fare better than regulation in overall evaluations.

TAKEAWAYS

Our **general application** takeaways are:

1. *Look long-term*: Regulatory issues are becoming more complex as the drivers of globalization, technological innovation and changing public expectations emerge. The life cycle of an environmental issue extends over decades, thus demanding sustained attention by all parties to reliable information and processes for decision-making. The context for the issue will require continuous updating.
2. *Focus on opportunities*: Focusing on solutions will unlock greater creativity and ingenuity than any attempt to align discrete actions with legislative authorities entrenched in the status quo. This focus demands special leadership skills and is challenging in terms of process, skill of participants and stamina, but it has potential to move previously intractable problems that have defied conventional approaches.
3. *Avoid "one size fits all" policy*: The choice of specific instruments is dependent upon the nature of the issue and the parties involved. The greater the choice that regulated parties have available, the more flexibility they have and the more efficient and effective their performance will be. The application of best practices from elsewhere is possible but needs care to adjust to the unique circumstance of any issue.

⁶ CDM Executive Board, announcement of website (<http://cdm.unfccc.int/index.html>).

4. *Use policy bundles to make the most progress:*

Research revealed that a combination of legislation-based (regulation, expenditure and information provision) and hybrid policy instruments provides for the most effective and efficient conditions for progress. All parties (government, business and non-governmental organizations) have access to particular authorities and skills, and each player will have specific domains within which it is the best suited to act. Together, the parties allow flexibility in the pursuit of progress. The policy mix will shift over time as the issue moves through its life cycle and as experience is gained. Progress will be best sustained when the combined effort of all parties is aligned to a common purpose. Accountability and transparency in terms of performance is a hallmark of effective governance.

5. *Monitor performance for better results:* Policies that incorporate mandatory reporting requirements perform best. Tracking implementation and ultimate environmental results and applying adaptive management practices will provide the feedback necessary for continuous improvement by all parties.

6. *Communicate frequently and effectively:* Open communications and information transfer between all parties provide an essential foundation throughout the life cycle of an issue and play a critical role in agenda setting. Scientific information, pending obligations from international negotiations, and experience from implementation are examples of information that should be routinely available to interested parties, including the media and the general public. The advent of new information and communication technologies make greater reach and improved content delivery possible. Research shows that systemic policy failure can be attributed to ineffective communications.

Our takeaways for **government** are:

7. *Fulfill your public role:* Government is accorded the public trust to determine the public interest while respecting private interests in regard to the stewardship of ecological resources. It occupies a unique place, allowing it to both define issues and explain the need for action as well as to encourage the engagement of all policy instruments, appropriate jurisdictions and society. Government advice will be sought on the cost of both action and inaction. Its approach will be judicious leadership while avoiding ownership of all matters. At the same time government will be expected to develop a governance model that allows all parties to play their roles, be held accountable for making their contributions and resolve disputes, which inevitably arise. Governments will welcome the assistance of others in consensus building.

8. *Engage all players:* Governments have unique access to regulatory legislative authorities and tend to be cautious about relying on the use of novel approaches such as those based on market forces, taxes, and charges and measures introduced by the private sector. There are real issues associated with accountability and reliability, which have yet to be fully resolved. The prospect, however, of being able to take advantage of the immense investment and operational power of the private sector, which is aware of the value of a social “licence to operate,” makes this an attractive opportunity to pursue. Governments must avoid either the perception or the reality of regulatory capture.

9. Stay the course: The life cycle of environmental issues spans decades far beyond electoral and even career cycles. This fact poses a significant challenge to systems of governance in providing stability and consistency while remaining open to acting upon lessons learned. The evidence suggests that the greater the continuity the better the results.

Our takeaways for **business** are:

10. *Focus on efficient and effective engagement*: Private interests are at stake in every stage of an issue life cycle. It is never too early to engage and establish positions on issues that matter to a firm or a sector. Well-researched objective analysis can be highly influential when presented in a timely way that fits with the style and mores of the target audience. The critical stage for all players is policy development and selection because it is at this stage that they will decide the authorities that will be exercised, the distribution of costs and benefits and the rate at which they will be incurred, and the operational regime that will be imposed. Positions may be established by individual firms or sector associations, depending upon the nature of the issue, the interest seen to be at risk, and the capacity of the organization to effectively represent their interests directly or in collaboration with like interests elsewhere.
11. *Choose to lead or follow*: Leading firms and sectors will see a significant interest at stake and opportunity to get ahead of the “regulatory curve” by committing to performance improvements ahead of any statutory targets being set. The advantage is derived from the freedom to choose the most effective and efficient approach and

the predictability that goes with it. They will avoid being held captive to the uncertainties and cost of complex and protracted negotiations. Mandatory, third-party verification of results is required for credibility. The risk is that the measures ultimately entered into by the formal process will not be completely compatible with the private commitments. Also, getting credit for early action has proved elusive and should not be assumed. If the private interest at stake is deemed not as significant as to merit a leadership role then engagement in the formal process may be warranted.

Our takeaways for **non-governmental organizations** are:

12. *Leverage your voice and positioning*: Non-governmental organizations typically have high credibility and the public and the media pay attention to them as voices of the public interest. They have very limited resources, so their capacity to engage in formal regulatory and policy processes is limited, which is why coalitions of like-minded groups often develop. They will not feel as bound as others to the niceties of establishment protocol because they are founded on different values and practices that they have found effective. This is one of their strengths and allows them to propose novel and challenging solutions. Some organizations have played formative roles in the development of private environmental policy instruments and also been party to independent verification of performance claims. Their credibility has been an important consideration in establishing the legitimacy of such measures.

Methods, Glossary, Analysis Tables and References

This review consisted of two stages:

1. A scoping exercise to identify literature
2. An assessment of three research questions using an inductive approach to identify trends

Research Methods

We approached the review in two stages. In the first, we conducted a scoping exercise to identify literature in the field that considers policy instruments targeting the private sector. These studies served as a broader pool from which to refine the assessment of our three main research questions by developing a conceptual framework to assess the qualifying studies. In the second stage, we assessed the three research questions noted above and used an inductive approach to identify trends beyond our initial expectations.

This section describes the methods we used to conduct this two-stage approach. It proceeds in four steps. First, we provide academic justification for the objectives and research questions tackled by the analysis. Second, we describe the conceptual framework used to classify the studies. Third, we outline the process used to search for and identify qualifying studies. Finally, we review our assessment approach for teasing out trends from the studies.

ACADEMIC JUSTIFICATION

In the last two decades, the changing instruments of government have preoccupied policy-makers and scholars attempting to assess and determine the appropriate mixes of instruments needed to achieve societal goals in an increasingly globalized, interconnected and complex world (Gunningham, Grabosky and Sinclair 1998). Considerable research associates these changes with (1) governments' inability to deal with problems on scales either greater (transnational) or smaller (sub-national) than state policy and regulatory institutions (Cerny 1995);

(2) an increasing capacity among private actors — both business and non-governmental organizations — to resolve public-good problems on their own or in partnership (Knill and Lehmkuhl 2002); (3) the emergence of fundamentally new technologies and the novel application of existing ones; (4) growing and persistent financial constraints facing governments; and (5) neoliberal ideas about the appropriate bounds and tools of governments vis-à-vis the market (Bartley 2003; Bernstein 2002; Braithwaite and Drahos 2000).

Taken together these shifts have drawn attention to an array of smart and soft governance tools that are seen to allow governments to steer society towards policy goals rather than dictating a particular means of getting there (Rhodes 1996).⁷ Hence, whereas command and control approaches have long been used to regulate environmental harms, these instruments faced criticism for their high costs, adversarial approach and shaky effectiveness, and have led to an increased interest in, and push for, the use of market-based instruments (Durant et al. 2004; Keohane and Olmstead 2007). In addition, a wider array of new environmental policy instruments have gained favour, such as eco-labels, environmental management system standards and audits (Kollman and Prakash 2002; Kollman and Prakash 2001), voluntary programs (Prakash 2000b; Prakash 2000a; Jordan, Wurzel and Zito 2003b; Lyon and Maxwell 2003; Lyon and Maxwell 2007) and a diversity of governance mechanisms including private-private partnerships among businesses and non-governmental organizations, multi-stakeholder governance (Fransen and Kolk 2007), corporate codes of conduct and self-regulation, and disclosure and monitoring initiatives (Andrews 1998; Hauffer 2001).

⁷ Governance is understood as “the interactions among private actors, or between private actors on the one hand and civil society and state actors on the other, giving rise to institutional arrangements that structure and direct actors’ behaviour in an issue specific area” (Falkner 2003).

Despite the proliferation of these instruments and the advancement of typologies for conceptualizing their differences, few attempts have been made to systematically assess their effects in practice, and these exceptions leave notable gaps.⁸ Jordan and colleagues, for instance, have compiled extensive information on new environmental policy instruments in Europe; however, the work focused on explaining the adoption of these tools rather than their effects (Jordan, Wurzel and Zito 2005; Jordan, Wurzel and Zito 2003a). Lyon and Maxwell (2007) reviewed empirical work examining the effectiveness of US public voluntary programs aimed at addressing environmental problems, particularly toxics, GHG emissions and waste. They found limited direct impacts, but stressed that the information the programs generated on best practices, technological solutions and performance — harder outcomes to measure — may be their most significant, longer-term effect. There are many more empirical studies of individual programs, such as ISO 14001 environmental management standards (Potoski and Prakash 2005a; Potoski and Prakash 2005b), the US Environmental Protection Agency's 33/50 program (Khanna and Damon 1999), Sustainable Slopes Program for U.S. ski areas (Rivera and de Leon 2004) and the Responsible Care Program (King and Lenox 2000); however, a systematic review of these and other studies has not yet been undertaken. Those reviews that have been conducted focus mostly on health impacts, such as neurodevelopmental disabilities and asthma (Zajac et al. 2009) or on policies concerning the management of terrestrial ecosystems.⁹

We sought to attend to the limited current understanding of the impacts of these instruments. Our

study had three objectives: (1) to understand the direct effects of policy instruments targeting environmental problems and how these policies interacted; (2) to understand how and whether characteristics of environmental problems influenced the effectiveness of policy instruments; and (3) to understand the possible trade-offs between cost-effectiveness, solving the environmental problems and government accountability.

The first objective is motivated by the growing interest among policy scholars in the role of policy bundles (Jordan, Wurzel and Zito 2005; Durant et al. 2004; Braithwaite 2008). Hence, we focused specifically on how governments can and do play a steering role through a suite of different instruments that vary from taxes and charges to negotiated agreements and labelling programs, and what lessons are available to better guide this steering role in the future. We sought to examine empirical cases where new environmental policy instruments — what we broadly classify as hybrid instruments — have been used, as this is an area where systematic assessments of program impacts in practice are most absent. By carefully assessing the role of individual instruments, we sought to identify how and when bundles of policy initiatives, led by government and private actors, work effectively.

The second objective reflects research that stressed the need to match policy instruments to the character of policy problems (Keohane, Revesz and Stavins 1998; Paehlke 2001). There exists a wide diversity of environmental problems. We limited attention to climate change, focusing on two aspects of this large and varied policy problem: (1) finding ways to promote the adoption of low-carbon technologies; and (2) managing ocean and fresh water ecosystems

⁸ Scholars such as Andrews (1998), Börzel and Risse (2005), and Auld, Bernstein and Cashore (2008) provide typologies for classifying new governance instruments.

⁹ See: <http://www.environmentalevidence.org/Reviews.htm> for a complete list of the systematic reviews so far conducted and/or compiled by the Collaboration for Environmental Evidence.

for climate change mitigation and adaptation.¹⁰ These two problems facilitated examining the fit of different policies with problems of natural resource management and technology and/or pollution reduction, and allowed us to assess how and whether similar policies worked differently for different problems.

The third objective builds from research that highlighted how different goals often operate at cross-purposes. Cost considerations can, for instance, limit how far a policy goes in ameliorating an environmental problem. Our category of hybrid instruments raised other questions about government accountability in instances where policy-makers delegate authority or have their authority superseded by private regulatory initiatives. While numerous debates exist regarding what constitutes accountability, many contend it consists of “the responsibility to answer, to explain and to justify specific actions (or inactions), in part by keeping records of important activities,” (Behn 2001, p. 4) . Our study focused on government accountability, acting as a public trustee, and as it relates to other non-state actors, particularly the private sector.

Building from these three objectives, we specifically examined the following research questions:

1. How effective are different policy instruments in achieving environmental objectives, particularly:
 - a) the promotion of low-carbon technologies (low-carbon technology, hereafter)
 - b) management of ocean and fresh water ecosystems for climate change mitigation and adaptation (water management, hereafter)?

2. How cost-effective are these instruments for governments, regulated parties and society?
3. What accountability implications do different instruments have for government?

CONCEPTUAL FRAMEWORK

To tackle the research questions, we developed a conceptual framework designed to capture key working parts of environmental policies (Figure 26). This aspect of the work was deductive. We drew from existing research that identifies characteristics of policies that are thought to matter for how the policies will perform in practice. The framework comprised three components — context, policy design and evaluation — which are discussed on the following page.

Context

The first aspect of the framework included two facets of context. The main contextual considerations we sought to assess were the processes by which a policy arrived on the government agenda and the manner in which problem characteristics shaped policy responses. For the former, we drew on Kingdom (1995) to look at aspects of the policy, politics and problem streams that studies indicated mattered for the policy in question.

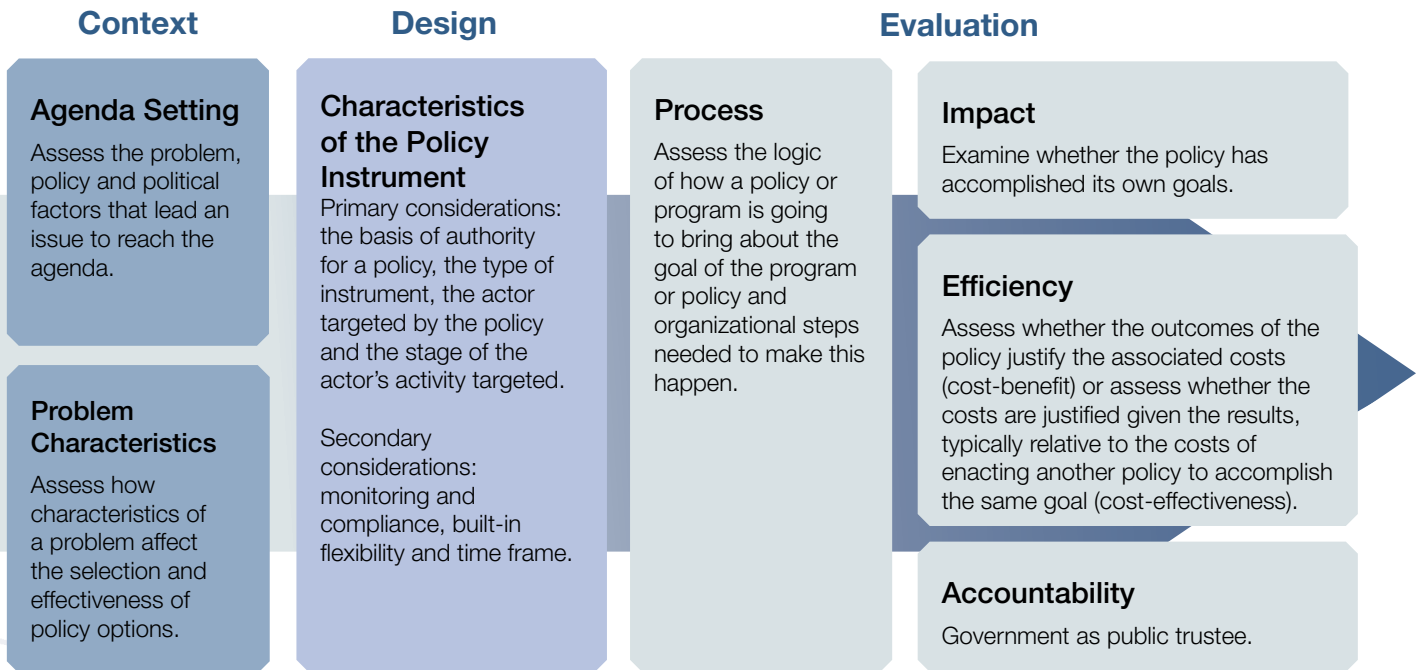
Policy Design

The second component focused on policy design. We primarily examined four simple and sequential questions (Figure 27). First, we asked: What is the source of

¹⁰ We restricted our definition of “adaptation” to those policies that reduce climate change effects on human social and economic systems. We did not look at policies for adapting biological systems, such as moving protected areas.

Figure 26

THE CONCEPTUAL FRAMEWORK USED TO GUIDE OUR SEARCH AND ANALYSIS



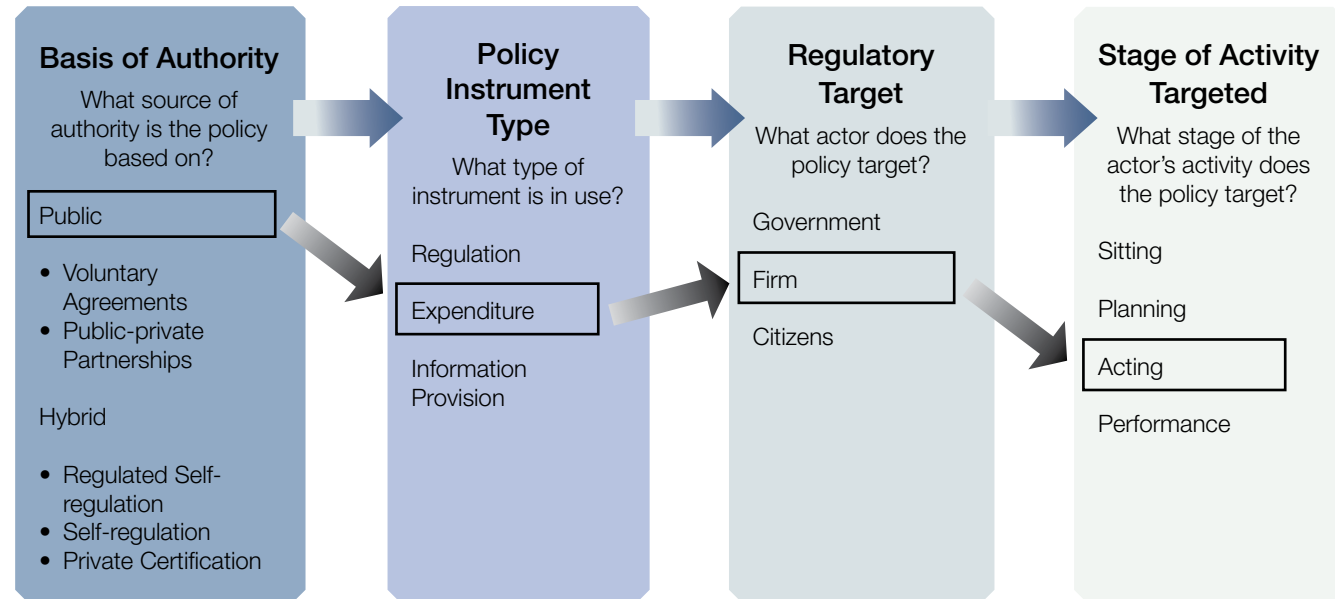
authority the policy is based upon? Two options were offered: public or hybrid. Public refers to instruments that are government-led and sanctioned, and founded on some constitutionally grounded basis of authority. For instance, they are embedded in statutory law, administrative guidelines or regulatory provisions, or court orders.

Within the hybrid type, we delineated different forms of governance. These represent, broadly speaking, a class of instruments referred to by different names, including private regulation and new environmental policy initiatives, among others

(Jordan, Wurzel and Zito 2005; Andrews 1998; Auld, Bernstein and Cashore 2008). We need to be clear that we are not stating that government is not involved in these initiatives. Rather, the crucial point is that hybrid instruments are those coming from private authorities, such as business executives, NGOs or multi-stakeholder collaborations. At the domestic level, it is likely these initiatives will always have the threat of hierarchy in the background (Auld, Bernstein, and Cashore 2008; Börzel and Risse 2005). Still, it is important to recognize that certain private authorities operate transnationally in the absence of any credible

Figure 6

SCHEMATIC FOR CAPTURING KEY FACETS OF THE REVIEWED POLICIES



Note: The black boxes illustrate how the UK Climate Change Levy was classified using our approach.

intergovernmental intervention (Cashore 2002). For instance, in the forest sector a global forest convention was rejected at the Rio Earth Summit in 1992 and has remained out of reach since. In other words, the threat that governments will cooperate to create a set of binding international rules for forest management practices is very low in the short term.

The second question we asked is: What type of instrument is in use? Drawing from Pal (2010, p. 154), we categorized instruments as regulation, expenditure or information provision. On page 22 we define these categories and specify some examples. Here it is

important to note that we further subdivided each of these categories, noting the specific kind of instrument in use. For instance, with expenditure, we identified if the policy was a subsidy or a tax.

Building from this, our third question asked: What actor does the policy target? We included citizens, firms and governments as the main actors, but others also emerged in the process of the research, including industry associations. Fourth, and finally, we asked: What stage of the actor's activity does the policy target? This question drew directly from Coglianesi and Lazar (2003) who distinguished three stages of activity

policy can target: planning, acting and performance. We added siting — policies' encouraging or requiring the targets to alter where and how they develop a new operation — as a step prior to planning.

The combination of the three latter questions allowed us to be more specific about the way in which policy interventions sought to create behavioural change. As an illustration, Figure 27 outlines how this classification tool worked for the UK Climate Change Levy, which was introduced in April 2001 by the UK government. It was coded as an expenditure instrument targeting firms and the acting stage, since the tax focused on fossil fuel inputs with levels set according to the different GHG emissions fuels produced per unit consumed. The policy also included revenue recycling and an offset provision, which reduced targeted operations' national insurance contributions (Bailey and Ditty 2009). We coded these provisions separately to capture the different logic of individual and bundled interventions.

These four main concerns with policy design were complemented by three other characteristics: the type of monitoring and compliance policies included; whether or not a policy had some form of built-in flexibility; and the time frame of the policy.

From an analysis perspective, disaggregating policy instruments into their finer-grained mechanisms allowed us to examine the coupling of instruments we noted in our first objective. This, we expected, would ensure our review made an important contribution, as scholars have long noted policy instruments are rarely undertaken in isolation; rather, they are developed and implemented as a part of a policy “package,” (Pal 2010).

Evaluation

The final feature of the conceptual framework turned to evaluation. Again, drawing from Pal (2010), we searched the studies for lessons relevant to three types of evaluation — impact, process and efficiency — and accountability implications. *Process evaluation* assessed the logic of a policy's or program's plan to bring about its goal and the organizational steps needed to make this happen. *Impact evaluation* assessed whether the policy had accomplished its own goal. *Efficiency evaluation* assessed whether the outcome of a policy justified the associated costs (i.e. cost-benefit) or whether the costs were justified given the results, typically relative to the costs of enacting another policy to accomplish the same goal (i.e. cost-effectiveness) (Pal 2010). We also assessed overall results, which combined the three forms of evaluation and accountability implications.

We coded studies based on how they defined effectiveness rather than by specifying a definition in advance. We chose this approach because we expected some studies would focus on science-based objectives, such as a parts per million (ppm) target for some pollutant, while other studies would focus on cost-effectiveness. Still others would focus on social welfare measures of outcomes as determined by Pareto efficiency (where implementing a policy makes no one worse off) or the Kaldor-Hicks criterion of potential Pareto efficiency (where those who gain from a policy are able to, in theory or actually, compensate those who would be worse off from a policy's implementation) (Boardman et al. 2006; Brent 1996; Perez and Ruiz

2007). Coding for how effectiveness is measured by studies afforded more flexibility and allowed us to evaluate both the impacts of and the patterns in the measures that studies considered.

Our approach also adopted a comprehensive understanding of costs. We considered equity aspects found in climate change studies (Tol et al. 2000) or, more broadly, environment (Johansson-Stenman and Konow 2010); costs of administration, monitoring and enforcement; and costs borne by industry, citizens and others as the consequence of a policy's implementation.

In this component we also sought to understand the accountability implications of policies. While numerous debates exist regarding what constitutes accountability, many contend it consists of "the responsibility to answer, to explain and to justify specific actions (or inactions), in part by keeping records of important activities," (Behn 2001, p. 4). Our study focused particularly on the accountability of government in its role as public trustee and also on accountability as it relates to other non-state actors, particularly those in the private sector.

For all of the above evaluation considerations, we made qualitative assessments of the overall conclusions of each policy discussed in the included studies: positive, mixed and negative. Positive results captured instances when a study found a policy had led to success on one of the above-defined forms of evaluation. For instance, several studies of renewable portfolio standards reported positive outcomes because the targeted utilities had all procured or generated sufficient renewable energy to meet the program's

requirements. Alternatively, it could be about the process of implementation, such as Bailey and Rupp's (2005) analysis in the UK that found the flexibility of the Climate Change Levy aided implementation. Results were considered negative when outcomes fell short of expectations. For instance, Martin and Wagner (2009) found that the UK Climate Change Agreements had negative impacts, because they allowed energy-intensive sectors to negotiate energy-efficient targets that reduced the GHG emission reductions that would have otherwise come about due to the UK Climate Change Levy. Finally, mixed results captured instances where the study noted both things that had gone well and things that were problems.

STUDY APPROACH

Literature searches were performed for our two focal problems. Each search used keywords to identify relevant studies for the substantive topic areas. We then removed studies without an empirical focus, defined as research examining primary data gathered directly from interviews, surveys, observation and sampling, or from the meta-analysis of other such primary-sourced studies. *Ex post* (done at the end of a policy) and *in medias res* (ongoing policy) studies were included. We included some theoretical studies (e.g. *ex ante* economic modelling) in instances when these assessments were done along with empirical, *ex post* analyses. Finally, we removed studies that did not examine the impacts or effects of environmental policy (Table 6).

Table 6

STEPS FOR LITERATURE SEARCHES WITH ILLUSTRATIVE KEYWORDS FOR LOW-CARBON TECHNOLOGY

STEP 1: KEYWORD SEARCHES

Broad search criteria: “Clean energy” OR “Renewable energy” OR “Green energy” AND “adoption”

Narrower search criteria: “Clean energy” AND “Wind power” AND “adoption”

STEP 2: “EMPIRICAL” STUDY FILTER

Does the study draw on primary data gathered directly from interviews and surveys or from the meta-analysis of other such primary-sourced studies?

STEP 3: “POLICY INSTRUMENT” FILTER

Does the study examine the effects (cost, problem impacts or accountability implications) of a given policy instrument?

The studies were found by searching the following sources:

- Databases: Energy Citation Database, International Energy Agency data, Oil, Gas and Energy Law Intelligence, TDM and OGEMID Archive, POPLINE, LILACS, Scopus, Web of Science, ScienceDirect, ACEEE and ECEEE.
- International organizations: World Bank, UN Water, UN Environment Program, the Organization for Economic Co-operation and Development and the International Institute for Environment and Development.
- Government reports: Reports from the Auditor General’s office in Canada and equivalent offices in other countries.

The study included reports, articles and papers published since 1970. This date was chosen given the key events that have happened since, including the creation of Environment Canada in 1971, the Stockholm Conference on Human Environment in 1972, the signing of the first Great Lakes Water Quality Agreement in 1972, and the oil crises of 1973 and 1979, which spurred interest in alternatives to conventional energy sources. We were open to making exceptions, however, in those instances where an earlier study proved germane to the research objectives and questions.

Data Collection and Compilation

Key features of the studies were summarized using a Microsoft Access database. We used these characteristics to assess patterns among the studies, such as identifying research gaps or noting geographic patterns in the kinds of instruments employed. Collected information also included author(s), year of publication, institution/group affiliation, title, disciplinary origin(s), etc. In addition, studies were categorized using the following criteria:

- Context — such as level of analysis (firm, product, economy) and geographic setting (country, city, region)
- Study design (case study, etc.), type (academic, grey literature) and methods (qualitative, quantitative, both)
- Interventions (the types of policies)
- Outcomes — social and/or environmental and/or economic, etc.

We also collected qualitative observations for each of the studies. These were used to inform our assessment of the overall trends emerging from all of the qualifying studies.

ANALYSIS AND SYNTHESIS

The analysis and synthesis took two forms. First, we used Access to explore patterns across the evaluated policies. The aim was to determine general trends in how different characteristics co-varied. For instance, how did the studies evaluate the impacts of expenditure policies compared to regulatory policies? This part of the analysis was designed to check the expectations we brought to the study. Statistical tests were not used; rather, the cross-tabs were assessed to identify patterns that stood out. There were instances where we also reported limited differences, particularly when these implied some significant point for policy-makers.

The second part of the analysis was inductive. Drawing from specific studies, we went beyond the original conceptual framework to tease out lessons from the studies. For instance, communication was not central to our coding; however, there were a number of findings that highlighted how information is important as a supportive and cross-cutting function. We used these insights, along with the feedback from the advisory group, to build the policy framework and decision tree presented in the previous section of the report.

Glossary

Several of the definitions that follow were developed specifically for the research project and draw from the professional and research experience of the study team. The majority of the remaining definitions are from Pal (2010) and Winfield (2009). Exceptions are noted.

Accountability

The responsibility to answer, to explain and to justify specific actions (or inactions), in part by keeping records of important activities (Behn 2001, p. 4).

Accountability Implications

Evaluating a policy or program by analyzing its implications on the government's accountability.

Acting

Policies that encourage and/or require the target to undertake specific activities in its operation (relates to stage of activity regulated).

Action of Feedback Mechanism

Issues are brought to the government's attention through various means including monitoring of expenditures, program administration activities, receiving complaints, public forums and consultations, oversight of implementation and/or policy or program evaluations/audits.

Adaptation

Changing human activities to adjust to the environmental, socio-cultural, social and economic consequences of climate change.

Adaptive Management

An iterative process of decision-making in the face of uncertainty, incorporating flexibility and learning within the process.

Agenda Setting

The social and political process of determining what issues to address and in what priority.

Answerability (Related to Accountability Implications)

Answerability is the provision of factual information without accounting for personal use of power.

Bad Design (Related to Implementation Evaluation)

Does program theory reveal that the “internal logic” of a policy is flawed (i.e. the inputs should not, in theory, cause expected outputs)?

Benchmarking

Comparing one’s firm, building, industrial process, etc. to another of the same unit and/or the average, the “best” and “worst” performing ones (e.g. with respect to energy savings).

Best Available Control Technology (BACT)

BACT is an emissions limitation that is based on the maximum degree of control that can be achieved. It is a case-by-case decision that considers energy, environmental and economic impact. BACT can be add-on control equipment or a modification of the production processes or methods. BACT encompasses fuel cleaning or treatment and innovative fuel combustion techniques. BACT may be a design, equipment, work practice or operational standard if imposition of an emissions standard is infeasible (EPA 2011).¹¹

Buyback Schemes

An energy efficiency program where the government or another agency buys back (either directly, through a rebate, etc.) a good (e.g. a fridge) in order to reduce GHG emissions and/or encourage energy savings. A recent example includes the US Car Allowance Rebate System or “Cash for Clunkers” scheme, which was also adopted in Canada.¹²

Built-in Flexibility

Built-in flexibility comes in two forms. For low-carbon technology, the majority of studies interpreted policies with built-in flexibility to mean policies designed to allow different approaches to achieving the same goal. For example, some policies gave firms the discretion to determine how best to achieve an emissions reduction target (e.g. whether to install energy-efficient technologies or purchase carbon offset credits). With water management, built-in flexibility meant accounting for changing circumstances (due to policy learning or outside events, for instance) through adaptive measures written in to the policy or program from the start.

Cap-and-trade System

See Emissions Trading Scheme.

¹¹ <http://www.epa.gov/NSR/psd.html#best>

¹² <http://www.gm.ca/gm/english/corporate/offers/cashforclunkers/overview>

Carbon Tax

An economic instrument in the form of taxes based on the carbon content of fuels and, by implication, the amounts of GHGs likely to be generated through their use. A tax is one way to put a price on carbon to encourage emission reductions.

“Carrots”

A colloquial term referring to positive incentives (as one might offer a “carrot” to a horse to encourage it to act in a certain way); viewed as being a positive means to encourage behaviour (e.g. expenditures, subsidies).

Clean Development Mechanism (CDM)

Flexible mechanism under the Kyoto Protocol that enables countries with GHG emission reduction targets (Annex B countries) to buy certified emissions reductions from developing countries (non-Annex B countries).

Codes of Conduct

Codes of conduct are set internally and can be thought of as internal policies, not ones required by regulations. Each company (or government organization) may have its own code of conduct.

Cost-benefit Analysis (CBA)

A tool to assess whether benefits of an action outweigh the costs it incurs. Undertaken before, after or during a policy's or program's life. Both benefits and costs are valued in monetary terms. More academic designs monetize social benefits and use various techniques such as the Kaldor-Hicks criteria or Pareto optimality, as well as valuation methods (e.g. willingness to pay, willingness to accept, the hedonic price method).

Cost-effectiveness Analysis (CEA)

A variation of cost-benefit analysis to help answer the question: Do the results justify the resources used? This is a cost-results criterion in which benefits are not (or not only) values in monetary terms. Another possibility in considering CEA is to approach cost-effectiveness comparatively: Could the results have been achieved with fewer resources?

Demand Side Management (DSM)

Activities designed in such a way as to encourage reduced energy consumption by end users.

Disclosure and Monitoring Initiatives

Government or private initiatives that require some information about an actor's behaviour to be disclosed publicly or to a certain audience.

Eco-labels

Labels carrying information about a product's environmental footprint. These labels appear on the product at the final point of sale. The information communicated can vary from a life cycle analysis report to a narrower disclosure about a particular aspect of a good's production process (e.g. "dolphin safe" tuna).

Economic (Criteria for Impact Evaluation)

Criteria that judge the effectiveness of an environmental policy instrument by its economic impacts (e.g. amount of money spent, economic growth, job creation, etc.).

Economic (Policy) Instruments

Include actions that encourage or discourage behaviour through economic tools. Examples include taxes or charges imposed on activities that governments wish to discourage or phase out (e.g. carbon taxes, and/or the creation of markets for certain types of activities, like the emission of pollutants or the harvesting of natural resources).

Effectiveness Evaluation (Related to Policy)

Measures if and how much a particular policy instrument will be, is, or has been effective, in achieving the desired policy outcome.

Efficiency Evaluation

Assesses whether the outcomes of a policy justify the associated costs (i.e. cost-benefit); assesses whether the costs are justified given the results, typically relative to the costs of enacting another policy to accomplish the same goal (i.e. cost-effectiveness). The achievement of the desired result at minimum cost to society as a whole, to the government agencies that will have to implement and administer the chosen instruments, and to the individuals and organizations whose behaviours will be affected.

Emission Trading Systems/Schemes

Type of economic (policy) instrument where a limit (or cap) is placed on the amount of emissions released by firms, countries, or organizations. Emission permits are distributed (usually by government) and can be distributed freely or by auction. Permit holders are then able to buy, sell and sometimes bank permits. Those facing high costs of abatement are likely to buy permits, whereas those with low-cost abatement options are likely to sell. Probably the most known example is the European Union's Emission Trading Scheme.

Energy Efficiency

The ratio of useful outputs to energy inputs for a system, where the latter may be an individual energy conversion device (e.g. a boiler), a building, an industrial process, a firm, a sector or an entire economy. In all cases, the measure of energy efficiency will depend upon how “useful” is defined and how inputs and outputs are measured (Patterson 1996).

Enforceability (Related to Accountability Implications)

Enforceability is the capacity of government to ensure that regulation directed at non-state actors is being effectively implemented.

Environmental Management System Standards and Audits

These are process-based instruments which require the development of environmental plans and systems to achieve the internal targets set by a firm. Continuous improvement is typically required and performance is typically assessed by third-party auditors (e.g. ISO 14001).

Equity Implications (Related to Accountability Implications)

Equity implications refer to the increase or decrease in stakeholders’ capacity to influence policy and/or consider whether or not a policy makes certain stakeholders better or worse off than others.

Ex ante

Form of evaluation conducted before policy or program implementation; includes environmental impact assessment as well as various forms of economic modelling.

Ex post

Means “after the fact”; a form of evaluation conducted after implementation has been completed.

Expenditures

In essence, involve some form of money transfer from one segment to another (e.g. from the public to the private sector; from one government department to another). We have defined mechanisms to gain funds or spend funds both as expenditures, such as taxes, subsidies and financial charges.

External Constraints (Related to Implementation Evaluation)

External constraints refer mainly to natural phenomena, e.g. an unanticipated external factor such as unusual weather or GHG concentration accelerating due to permafrost.

Favourable (Unfavourable) Party Platform

A characteristic of the politics stream related to agenda setting where a political party is aligned (or not) with the issue at hand. The alignment can be an explicit reference to the issue through a codified party manifesto or assumed by the article due to historical trends of the party (e.g. strong environmental policy actions undertaken by the Green Party).

Favourable (Unfavourable) Public Opinion

A characteristic of the politics stream related to agenda setting, where the public opinion is considered to be conducive or not to action with respect to the issue.

Feed-in-tariff (FIT or FiT)

A payment (usually at a premium to the market price for conventional electricity) to renewable electricity facilities for every unit of electricity generated, guaranteed for a number of years by a contract between the generator and some public and/or utility authority.

Fines

A characteristic of prohibition; see Penalties.

Fiscal Constraints

In this situation, the relevant order of government (or organization) is in a difficult fiscal position (particularly pronounced in articles written after the global downturn of 2008-09) and, as a result, is closed to new spending initiatives.

Fiscal Levity

In this situation, the relevant order of government (or organization) is in a comfortable fiscal position and, as a result, is receptive to new spending initiatives.

Fit with Existing Practices (Related to Policies and their Implementation Evaluation)

Does the proposed policy fit well with the existing policy framework? Is it making use of existing channels or does it require creating entire new structures and instruments?

Focusing Event

Sudden catastrophe, crisis or event that forces policy action (e.g. court decision, earthquake affecting nuclear power plant).

Goal-free Problem Effectiveness

This type of (impact) evaluation sets its own targets of impact-effectiveness for a policy or instrument (either because it judges the existing ones inadequate or because there aren't any specific ones) and evaluates whether these targets have been met.

Good Compliance (Related to Implementation Evaluation)

Refers to support and attitude of targeted groups.

Good Design (Related to Program Theory in Implementation Evaluation)

Does program theory reveal that the “internal logic” of a policy is good (i.e. the inputs should [in theory] cause expected outputs)?

Governance

The process of governing or steering complex systems in cooperation with a variety of other actors.

Greenhouse Gases (GHGs)

Gases that trap heat in the atmosphere rather than allowing that heat to be reflected back into space, thereby making Earth's temperature warmer, and, in essence, acting like a greenhouse. Gases include water vapour, carbon dioxide, methane, nitrous oxide, HFCs, PFCs and SF6.¹³

“Hybrid” Source of Authority

This category is varied, ranging from explicit partnerships among government, industry and/or other stakeholders (e.g. NGOs) to entirely private initiatives of individual companies or multi-stakeholder processes where governments are excluded or are just one interest competing with others for policy influence (Cashore 2002).

Impact Evaluation

Examines whether the policy has accomplished its own goals.

Incentives

Policies or programs that seek to encourage an action through positive means (i.e. a “carrot”).

¹³ <http://www.eia.gov/oiaf/1605/ggccebro/chapter1.html>

Industry Standard (For Cost-benefit Analysis of Efficiency Evaluation)

Technique that follows the general CBA methodology but is more in line with private sector practices, by, for example, integrating profits, productivity and market prices in its indicators of benefits, rather than by monetizing social benefits.

Informational (Policy) Instruments

Type of policy instrument related to the gathering and dissemination of environmental information. These instruments seek to change behaviour through the skillful deployment and control of information (Prince 2010). They include public outreach and education campaigns and information disclosure.

Integrated Water Resource Management

Involves “decentralizing institutions around major river basins or a particular watershed scale and joining together various elements of water resources planning, such as groundwater and surface water, water quantity and quality, and socioeconomic, hydrological and ecological aspects of water management,” (Engle and Lemos 2011).

International Process

Bilateral or multilateral negotiation process leading to a convention or some other form of cooperation among states.

Labelling Schemes

A program where an authority (government or otherwise) develops a “label” as an easier way to identify products that are more energy efficient, have a lower carbon and/or water footprint, etc. The scheme can be mandatory or voluntary.

Low-carbon Technologies (LCT)

In essence, technologies (defined as equipment as well as processes, knowledge) that reduce GHG emissions through their use.

Market-based (Policy) Instruments

See Economic Instruments.

Meta-analysis and Systematic Reviews

Researchers review existing literature on a specific issue (problem, policy, etc.), pooling a large number of studies, drawing conclusions based on statistical evidence. Originating from the medical sciences, the idea behind such a review is to help inform decision-makers by aggregating results from individual studies (e.g. the effectiveness of clinical trials overall). “The objective of systematic reviews is to present a balanced and impartial summary of the existing research, enabling decisions on effectiveness to be based on all relevant studies of adequate quality.”¹⁴

Mitigation

Actions, technologies, etc. that slow or stop the emissions of greenhouse gases.

“Mixed” Evaluation

In relation to positive and negative evaluation, this type of evaluation is assessed as partially positive or partially negative.

Negative Evaluation

An evaluation, as defined by the studies assessing a policy or group of policies, that a policy is, on the whole, unsuccessful at achieving its goals as regard outcomes, costs, efficiency and accountability.

Network Coercion

Informal pressure from non-state actors (i.e. peer pressure).

Nominal (Criteria for Impact Evaluation)

Nominal criteria are general criteria for evaluating the effectiveness or impact of a policy and include relevance, persistence (lasting outcome), flexibility and predictability, as well as broad targets with no attached targets, such as “a decrease in GHG emissions.”

Organizational Tool

A type of policy instrument involving creation of specific agencies within or outside of government to act as focal points for policy development, implementation and evaluation, or to provide specific services.

Peer Pressure

An example includes member companies in an industry association regulating each other; see Network Coercion.

¹⁴ <http://www.medicinesox.ac.uk/bandolier/painres/download/whatis/Meta-An.pdf>

Penalties (Fines or Imprisonment)

Consequences for engaging in prohibited activities without appropriate approvals or for carrying out activities that violate rules and conditions imposed by government.

Performance

Policies that encourage and/or require the target to achieve particular outcomes (relates to stage of activity regulated).

Planning

Policies that encourage and/or require the target to change how and when it undertakes certain planning activities such as accident or mitigation plans (relates to stage of activity regulated).

Policy Instrument

“The tools employed by governments to change the behaviour of individuals, communities and organizations in ways needed to achieve desired policy substances,” (Winfield 2009, 46 v).

Positive Evaluation

An evaluation, as defined by the studies assessing a policy (or group of policies), that a policy is, on the whole, successful at achieving its goals as regard outcomes, costs, efficiency and accountability.

Presence of Champions

A characteristic of the policy stream related to agenda setting that centres on the importance of people. The involvement of a particular individual or a collective group through an organization acting as a “champion” with respect to getting a particular issue, as well as the following policy response, onto the official agenda.

Presence of Indicators

The appearance of discrepancies or patterns in the routine monitoring of statistics or other widely agreed upon indicators (government departments, interest groups, etc.).

Private-private Partnerships

Partnerships among non-state actors such as businesses and/or non-governmental organizations (NGOs), community groups, etc.

Problem-institution Fit (Related to Implementation Evaluation)

The (policy) instrument fits well with the existing policy framework because it makes use of existing channels effectively.

Process Evaluation

Assesses the logic of how a policy or program is going to bring about the goal of the program or policy. Relates to Policy Design and Policy Implementation.

Program Review

Specific evaluation of one or more targeted government programs or policies; distinguished from case studies by its more limited scope and application of evaluation methods.

Program Theory (Related to Process Evaluation, Implementation Evaluation)

In an evaluation, the hypotheses and explanations about the causal links that tie program inputs to expected program outputs.

Public Outreach and Education

Formal and informal education and awareness initiatives to encourage changes in behaviour, to increase knowledge about a technology, events, a phenomenon, etc.

Public-private Partnerships

Partnerships between state and non-state actors that generally involve joint governance.

Recognitions

Actions that recognize (best) practice in an official way. Recognitions can take a number of forms. One well-known example is the Leadership in Energy and Environmental Design (LEED) certificate program, which buildings may receive if they adhere to certain specifications in their design or retrofiting.

“Regulated” Self-regulation

Hybrid governance initiative where an industry sector or individual company sets up a self-regulatory program, with the government providing some regulatory oversight.

Regulatory Policy Instrument (i.e. Regulation)

Establishment of legal obligations based in legislation that prohibit certain types of behaviour or that require the explicit permission of the government to engage in specified activities (e.g. standards and codes).

Regulatory Target

A body to whom the policy has been directed, its intended enactor. A regulatory target may be a government, citizen, firm, industry or professional association.

Renewable Energy Policy

Policies used for the promotion of renewable energy in the electricity supply system.

Renewable Portfolio Standards (RPS)

RPS reserve a portion of the broader electricity market for renewable resources by obliging market participants to ensure that a predetermined share of their total electricity supply is provided by qualifying facilities.

Science-based Criteria (for Impact Evaluation)

These are specific science-based indicators for evaluating the effectiveness of the impact of a policy (e.g. a six percent reduction in GHG emissions or parts-per-million concentrations in a body of water).

Self-regulation

A hybrid instrument where an industry sector or individual company sets up an internal set of targets and procedural requirements managing operational activities.

“Sermons”

Informational policy instruments; dissemination of information. See Informational Policy Instruments.

Side-effects Impact Evaluation

This model divides the effects of an instrument into anticipated and unanticipated effects and analyzes whether unanticipated effects cause positive or negative externalities.

Siting

Policies that encourage and/or require the target to alter where and how they develop a new operation (relates to stage of activity regulated).

Social Appeal

A characteristic of the policies stream related to agenda setting, describing a policy that has some level of acceptance within society.

Societal Shaming

Can describe instances where a company, industry association, government or international organization is subject to public criticism. Typically the aim of shaming is to note the discord between societal norms or values and the practices of the targets actor.

Source of Authority

Relates to governmental or hybrid source of authority, or in other words, who has the legitimate “authority” to act for a specified policy instrument.

Stage of Activity Regulated

Refers to siting, planning, acting or performance; see definition for each.

Standard Problem Effectiveness

This type of (impact) evaluation looks at a policy’s or a program’s own targets and impact objectives, and evaluates whether these targets have been met.

“Sticks”

These types of policy tools, often regulations, seek behaviour change through preventing, prohibiting, limiting, etc.; the figurative club the policy-maker wields to discourage certain actions and the disincentive counterpart to “carrots”.

Subsidy

Economic (policy) instrument to encourage behaviour or the development and/or use of technologies that are seen to be more sustainable.

Successful International Processes

International processes are qualified as successful if they result in significant pressure on domestic action (e.g. binding targets or diplomatic pressure), irrespective of the government’s agenda at the negotiations.

Technical Policy Issues (as it Relates to Implementation Evaluation)

A flawed technical choice for a specific policy instrument that harmed a policy’s effectiveness (e.g. rate of a carbon tax, number of emissions permits allocated, etc.).

Transparent Outcomes (Related to Accountability Implications)

Openness about regulated and unregulated behaviours; disclosure and the substantive ends of a policy intervention.

Transparent Process (Related to Accountability Implications)

Openness of governance processes, such as decision-making or adjudication.

Voluntary Agreement

An agreement often made between industry and public authorities to voluntarily go through a regulated process if there is uncertainty of the outcome due to the nature of the project or if there is public interest.

Voluntary (Policy) Instruments

Voluntary initiatives characterized by public challenges by governments to industry to reduce their emissions of pollutants in exchange for public recognition of performance or alternatively, avoidance of future regulatory requirements.

Wrong Fit with Existing Practices (Related to Implementation Evaluation)

If the (policy) instrument does not fit well with existing practices (i.e. does not build upon existing structures and instruments but creates entirely new ones) it impedes effective implementation.

Assessment of the Strengths and Weaknesses of Selected Policy Instruments

Table 7

INSTRUMENT-BY-INSTRUMENT EVALUATION OF SELECTED POLICIES EXAMINED BY THE QUALIFYING STUDIES ON LOW-CARBON TECHNOLOGY

	Examples	Positive Policy Design Considerations and Conditions for Success	Negative Policy Design Considerations and Factors Limiting Success
Emission Trading Schemes	<p>EU Emission Trading Scheme</p> <p>The Regional Greenhouse Gas Initiative</p>	<ul style="list-style-type: none"> • Allowance auctions • Sufficiently tight cap to create price for emissions • Coverage to ensure liquid market and prevent market power while avoiding administrative costs of monitoring multitude of small emitters • Design features to smooth market over time and manage risk (e.g. emission banking, specific time lengths for future trading) • Quantity and monitoring of offsets to ensure innovations in unregulated parties and domestic reductions in emissions 	<ul style="list-style-type: none"> • Grandfathered permits • Poor data for establishing emission baselines • Poor monitoring and enforcement design (e.g. non-compliance penalties less than cost of purchasing allowances)
Taxes or Levies	UK Climate Change Levy	<ul style="list-style-type: none"> • Uniform tax burden • Tax revenue used to offset negative effects on competitiveness and income distribution • Tax adjustments over time to compensate for inflation, innovations or new emission sources • Energy mix where fuel switching cheap way to avoid tax burden 	<ul style="list-style-type: none"> • Generous rebates and exemptions for emission-intensive industrial sectors • Continuation of other policies that work at cross-purposes to the tax (e.g. exemption of sales tax on electricity use)

Voluntary Agreements	Canadian Voluntary Challenge and Registry	<ul style="list-style-type: none"> • Concentrated and organized industrial sector • Tradition of communication between sector and government • Non-economic mitigation barriers dominate (e.g. limited information about abatement options) • Positive and negative incentives for participation (e.g. market rewards, social licence or threat of future government regulation) • Credible, but low cost monitoring procedures; detailed, quantified, targeted, scheduled and planned targets 	<ul style="list-style-type: none"> • Energy-intensive sectors with expertise in energy management stronger at bargaining limited targets, which may only be business as usual • Economic barriers to mitigation dominate (e.g. uncertainty about energy prices) • Indeterminate performance metrics
Labelling Schemes	Energy Star The Australian Greenhouse Friendly Labelling Program	<ul style="list-style-type: none"> • Government support and credibility (e.g., effective communication program about label) • Bundling with financial incentives • Label clarity (e.g. seal of approval or a letter-grade system) • Targeted product category that has low-cost room for improvement 	<ul style="list-style-type: none"> • Lack of effective communication by government in support of label undermining industry support • Retail staff without knowledge necessary to convey the information about labels to potential consumers • Difficulties for retailers associated with handling, attaching or removing labels
Marketing or Advertising Campaigns	One Tonne Challenge Canadian Energy Efficiency Awards	<ul style="list-style-type: none"> • Targeted, avoid a moralizing tone, stress private benefits a program or action provides (such as reduce energy costs) and account for the level of environmental awareness in society • Integration of messaging across related programs at various levels of government • Bundling with financial incentives 	<ul style="list-style-type: none"> • Information campaigns that are not bundled with other policies (regulation or expenditure) are unlikely to reduce emissions or other environmental problems
Subsidies	Dutch Energy Premium Regulation	<ul style="list-style-type: none"> • Facility-specific, tailored promotion of programs • Consultation with industry to ensure promoted technology feasible to use • Target technologies at an appropriate stage of market maturity (e.g. avoid subsidies for immature technologies) • Time subsidies to fit with the life cycle of existing technology 	<ul style="list-style-type: none"> • Subsidies alone usually not enough for behaviour change • Subsidies for technologies already prevalent in the market can provoke free-riding



Note: symbol denotes that businesses can implement without government involvement ().

Feed-in-Tariffs	German Renewable Energy Sources Act (EEG)	<ul style="list-style-type: none"> • Tariffs providing long-term guarantees to sustain investor confidence • Decreasing tariff rates over time to avoid rapid installation of current technologies while still creating incentives for economic efficiency • Soft loans for technologies at an early stage of development 	<ul style="list-style-type: none"> • Tariffs that overcompensate investors, inflating cost of achieving policy objectives • Long-term contract's potential to lock a country's renewable energy policy on a certain path • Programs implemented when other more effective or politically feasible policies for greenhouse gas emission reductions already exist (e.g., the EU ETS)
Renewable Portfolio Standards	<p>State-level RPSs in 30 US states including California, Texas, New, Hampshire and Connecticut</p> <p>The UK's Renewable Obligation</p> <p>The Swedish Compulsory Green Electricity Quota</p> <p>Australia's Mandatory Renewable Energy Target (MRET)</p>	<ul style="list-style-type: none"> • Regulatory commitments consider pay-back and lead to long-term purchase obligations • Standards equally applied to all load-serving entities • Credible enforcement, backed by penalties • Regulated flexibility mechanisms (e.g. tradable certificates to be banked or borrowed) to create transparent and liquid market and manage out-of-region certificates • Bundling with favourable siting processes, production tax credits or requirement that electricity suppliers provide customers option to purchase green power • Policies supporting full range of renewable energy (e.g. banding or carving outs) by reducing barriers to entry must consider negative liquidity effects on certificate market if future costs are expected to drop • Policy design accounts for structure of electricity market (e.g. demand growth and utility ownership) 	<ul style="list-style-type: none"> • Eligibility criteria for sources of renewable energy not accounting for existing capacity or energy type and resulting in no new development or little GHG abatement • Selective application of the purchase requirement to utilities • Uncertain purchase obligations or end date • Insufficient enforcement of the purchase requirement • Not considering the additive effects of various policies on the cost of electricity and the distribution of costs depending on energy taxes for residential versus industrial consumers
Energy Efficiency (Demand Side Management)	<p>Household weatherization programs</p> <p>Refrigerator replacement programs</p>	<ul style="list-style-type: none"> • Monitoring/verification activities include measures to help obligation holders comply • Incentives, free equipment installation and rebates enhance effectiveness; can contain costs by tying incentive payments to effectiveness of efficiency spending and capping • Clear methods for measuring and verifying calculations • Timely period for recovery of program costs • Single program portal with staff providing all relevant services (e.g. incentives, marketing, technical assistance, training) for range of customer end-use application 	<ul style="list-style-type: none"> • Lack of adequate compliance framework • No customer education • Target both industrial and residential customers • Apply same policies to privately and publicly owned utilities • Information programs without incentives or requirements ineffective



Note: symbol denotes that businesses can implement without government involvement ().

Table 8

INSTRUMENT-BY-INSTRUMENT EVALUATION OF SELECTED POLICIES EXAMINED BY THE QUALIFYING STUDIES ON WATER MANAGEMENT

	Example	Policy Design Considerations and Conditions for Success	Negative Policy Design Considerations and Factors Limiting Success
Soft adaptation techniques (use of natural systems rather than built infrastructure to manage water flows)	Flood plain restoration on lower stretches of the River Danube	Successful programs incorporate planning for long-term climate change impacts	<ul style="list-style-type: none"> • Implementation issues (due to political barriers: organizing public meetings and seminars) • Weak political and government commitment • Unbalanced allocation of financial resources to infrastructure measures • Inflexible approach, unable to adapt to changing river dynamics
Water cap and trade (caps on total water removals, with provisions for trading among users)	Australia's Water Management Act (2000)	In some regions (e.g. Queensland region) these water-sharing programs have provided adequate environmental water	<ul style="list-style-type: none"> • Too many licences and water storage structures for irrigation purposes, reducing water availability for environmental purposes • Cap on surface water extraction, increased ground water extraction • Trading failed to address over-allocation and improve environmental outcomes • Regulatory and voluntary market-based approaches have not led to reduced consumption

Subsidies	Spanish subsidies for irrigation modernization (i.e., investment in more efficient irrigation infrastructure)	No documented “pros”	<ul style="list-style-type: none"> • Cost of subsidies produce limited gains for water conservation • Rebound effect: efficiency gains lead to more irrigation and/or switching to more water-demanding crops
Integrated and/or adaptive planning	<p>Santa Clara Valley District, Integrated Water Resource Planning (update that included an economic model considering water-quality objectives and risk-based tool for planning around uncertain water supply)</p> <p>Climate information for South African Farmers (regional climate outlook forums)</p> <p>Dutch river flood protection</p> <p>River basin authorities in Spain (develop and monitor river basin plans and administer water resources, including by granting concessions)</p>	<ul style="list-style-type: none"> • Engagement with public stakeholders • Timing the integration of climate change adaptation with planned overhauls of existing approaches/policies (e.g. South Africa’s attempt to address historical water injustices) • Uses quality, reliable information (e.g. integration of high-quality climate forecasts improve adaptive planning) • Integration of users, scientists and forecasters can result in raised awareness and provided an impetus for adaptation activities 	<ul style="list-style-type: none"> • Struggles when not taking an integrated approach and not targeting all affected stakeholders (e.g. neglecting to include landowners in spatial planning of probable location of flood waters) • Dominance of high-consumption users and engineering experts in decision making; limited involvement of water ecologists • Representation skewed to areas where droughts currently happen, not where they are forecast to happen as a consequence of climate change

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