WORLD RESOURCES INSTITUTE

Working Paper

DESIGNING GREENHOUSE GAS REPORTING SYSTEMS: LEARNING FROM EXISTING PROGRAMS*

NEELAM SINGH AND AVIPSA MAHAPATRA

SUMMARY

Businesses measure their greenhouse gas (GHG) emissions for a variety of reasons—to assess their climate change risks and opportunities; to respond to demands from consumers, investors, and other stakeholders to access carbon markets; and to comply with government regulations. GHG emissions reporting programs offer a platform for companies and facilities to capture this information and can serve multiple objectives. For example, reliable data from a GHG reporting program can inform mitigation policies in a given jurisdiction. Programs can improve emissions data quality and help assess industry progress toward achieving national targets. They can also provide platforms to communicate emissions-related information to stakeholders.

This WRI working paper reviews corporate and facility-level mandatory reporting programs—from Australia, California, Canada, the European Union, France, Japan, the United Kingdom, and the United States—and identifies steps to implement a mandatory reporting program. The discussion is limited to mandatory programs requiring disclosure of GHG emissions (as opposed to voluntary reporting), and to facility- and corporate-level reporting (as opposed to national, regional, or city inventories).

Key steps in establishing a comprehensive mandatory reporting program include: defining program objectives; engaging with stakeholders; assessing capacity gaps and needs; establishing a regulatory framework; defining cov-

*Note: This version of the working paper was updated on 4 December 2013. Corrections were made in Table 9 with regard to data availability.

CONTENTS

Suggested Citation: Singh, N. and Avipsa Mahapatra 2013. "Designing Greenhouse Gas Reporting Systems: Learning From Existing Programs." Working Paper. Washington, DC: World Resources Institute. Available online at wri.org/publication/designing-greenhouse-gas-reporting-systems-learning-from-existing-programs.

erage; providing calculation methodologies; and deciding on reporting, verification, and data disclosure requirements. Each of these steps involves a series of decisions and choices, and this paper identifies factors to consider in making these decisions. Countries with limited resources can implement these steps in phases while investing in stakeholder engagement and critical capacities.

INTRODUCTION

A number of mandatory programs that require disclosure of greenhouse gas (GHG) emissions and related data have emerged in the past decade at regional, national, and subnational levels. WRI researched and conducted interviews with program staff of mandatory GHG reporting programs in Australia, California, Canada, the European Union, France, Japan, the United Kingdom, and the United States, to assist decision makers designing reporting programs (Table 1). This working paper provides insight into the factors influencing the design and development of reporting programs and capacities needed for their effective implementation. It identifies decision drivers and steps in developing mandatory GHG reporting programs.

Table 1 | **List of Mandatory GHG Reporting Programs Assessed**

JURISDICTION	NAME OF PROGRAM
Australia	National Greenhouse Gas and Energy Reporting
California	Mandatory Reporting of Greenhouse Gas Emissions
Canada	GHG Emissions Reporting Program
European Union	European Union Emissions Trading System (EU ETS)
France[a]	Bilan d'Emission de GES
Japan	Mandatory GHG Accounting and Reporting System
United Kingdom	Greenhouse Gas Reporting Guidelines
United States	GHG Reporting Program

[a] France is also part of the EU ETS program.

In this paper, mandatory GHG reporting programs are defined as programs requiring emitters within their jurisdiction to measure and report GHG emissions at regular intervals. The first section, "Program Objectives," presents a range of objectives that mandatory reporting programs can potentially serve. These are based on the purposes being fulfilled by the existing programs. The second section, "Program Building Blocks," discusses some foundational elements that facilitate implementation of reporting programs. These include having the right legal framework to house the program; seeking stakeholder support; harmonizing with existing programs in the region; and assessing institutional, financial, human resources, and technical capacity gaps and needs. The third section, "Program Design and Implementation," covers issues such as coverage, monitoring and calculation methodology, reporting requirements, verification, and data disclosure and presentation. The paper concludes with a discussion of how countries with limited resources can make a meaningful beginning toward developing mandatory reporting programs.

PROGRAM OBJECTIVES

Mandatory GHG reporting programs are designed to collect and track emissions data at the level of individual emitters. Although the overarching objective for reporting is to encourage reporters to reduce their GHG emissions over time, the programs also serve a number of related, intermediate objectives such as providing information to stakeholders and informing national or subnational mitigation policies. Program objectives are typically set in the beginning, ideally in consultation with stakeholders, to help guide the program design (Figure 1).[1] However, these objectives often evolve as the program matures and the industry's preparedness and readiness for reporting and reducing emissions improve. A program may aim for improving data quality and consistency and then shift focus to GHG mitigation in subsequent years. In some instances, the climate policy discourse within the country or region may not allow for an ambitious objective at the outset, thus the program may initially put more emphasis on building a strong foundation for future actions. In interviews, staff from different reporting programs noted the need for flexibility so that as the domestic and international policy and business context evolve, the program and its objectives may be reviewed and modified as needed.

Figure 1 | **Steps in Designing a Mandatory GHG Reporting Program**

Table 2 | **Objectives of GHG Reporting Programs**

PROGRAM OBJECTIVES[a]	AUSTRALIA	CALIFORNIA	CANADA	EUROPEAN UNION	FRANCE	JAPAN	UNITED KINGDOM	UNITED STATES
Support GHG management and mitigation	X	X		X	X	X	X	X
Improve data quality and consistency	X	X	X	X			X	X
Inform existing and future policies, market mechanisms, and national inventories	X	X	X	X	X	X	X	X
Provide information to stakeholders	X	X	X		X	X	X	X

[a] It is possible that the programs are also implicitly supporting other objectives.

Source: Compiled from respective program websites by interpreting and synthesizing stated program objectives and from information obtained through program staff interviews.

The programs studied in this paper illustrate the following broad objectives (Table 2):

1. **Support GHG management and mitigation:** Only a few programs explicitly state emissions reduction as their goal. However, reporting programs are often designed with the expectation that disclosure will eventually result in emissions reduction by increasing stakeholder pressure on poor performers and providing reputational rewards for low emitters. Maintaining a verifiable record of GHG emissions through reporting programs also makes it possible for a future regulatory system to recognize reductions already made. For example, the European Union Emissions Trading System (EU ETS) and California's Mandatory GHG Reporting Program, were both designed to explicitly facilitate emissions reduction through a cap-and-trade mechanism (EC 2012a, CARB 2013). The Bilan d'Emission de GES, France, on the other hand, considers reporting under the program to be an "incentive for corporate action toward GHG reduction" (Kauffmann, Less and Teichmann 2012).
2. **Improve data quality and consistency:** Although emitters in a region may be calculating and reporting their emissions, the existence of a mandatory program with well-defined and standardized calculation methodologies and verification systems can improve data quality and consistency. The U.S. Environmental Protection Agency (U.S. EPA) Greenhouse Gas Reporting Program (GHGRP), for example, aims to collect "accurate and timely GHG data" to inform future policy decisions (U.S. EPA 2013a).

3. **Inform existing and future policies, market mechanisms, and national inventories:** Emissions data analyzed at different resolutions—individual emitter, sector, and across the economy—can help assess the effectiveness of existing policies and inform the development of new policies. For example, Australian reporting program objectives include supporting the introduction of an emissions trading scheme and informing policy formulation (Department of Climate Change and Energy Efficiency 2012). Over time, mandatory reporting programs can become an integral part of any new emissions trading programs, as in the case of EU ETS, the Australian program, and the Californian program. In addition, mandatory reporting programs can complement as well as contribute to a national inventory system, as in Australia and Canada (Environment Canada 2011, CER 2012a).

4. **Provide information to stakeholders:** Apart from policymakers, other stakeholders who may be interested in information on GHG emissions include environmental organizations, citizens, researchers, investors, and other companies. Programs need to find a balance between businesses' willingness to disclose and stakeholders' demand for more information. This balance can help determine the level of disaggregation at which GHG data collection and disclosure is required under the program.

KEY FINDINGS: PROGRAM OBJECTIVES

- Reporting programs serve a wide range of short-term and long-term objectives. Objectives may evolve over time; for example, a program that may aim to be eventually used as the basis for emissions trading may focus on improving data quality in the short-term.
- Objectives inform several decisions regarding program design and implementation such as coverage, verification, and data disclosure.

PROGRAM BUILDING BLOCKS

A sound reporting program that meets its objectives and has a positive impact needs to consider the following building blocks, which provide the foundation for its design:

- Legal basis
- Stakeholder consultation and support
- Harmonization with other programs
- Capacities to implement the program, including institutional, human resource, financial, and technical capacities

Legal Basis

One or more laws establish the legal authority to implement a mandatory reporting program. If the existing legal framework (e.g., environmental protection laws, air quality laws) cannot support the program, new legislation may be needed. Programs are often anchored in existing laws with amendments as needed. Table 3 summarizes the variety of legal bases underpinning different mandatory programs. Both Canada and the United States, for example, have set up their reporting programs under existing environmental protection laws. In Canada, the program is mandated by the Canadian Environmental

Table 3 | **Legal Basis for Mandatory Reporting Programs**

JURISDICTION	LEGAL BASIS
Australia	National Greenhouse and Energy Reporting Act, 2007
California	California Global Warming Solutions Act (AB 32), 2006
Canada	Canadian Environmental Protection Act, 1999
European Union	Directive No. 2003-87-EC establishing a scheme for greenhouse gas emission allowance trading within the Community
France	Grenelle 2 Act, 2010
Japan	Act on Promotion of Global Warming Countermeasures, 1998[a]
United Kingdom	Climate Change Act, 2008; Companies Act, 2006
United States	Clean Air Act, 1963

[a] The original 1998 Act did not include provisions for the GHG mandatory reporting program, which were introduced in the revision of the Act in 2005 (enforced in April 2006).

Figure 2 | **Stakeholder Groups Typically Involved in Designing Programs**

Protection Act, 1999 (Environment Canada 1999) and in the United States, the Mandatory Reporting of Greenhouse Gas Rule was promulgated under the authority of the Clean Air Act and codified as Title 40, part 98 of the Code of Federal Regulations. The French program is governed by Grenelle 2 Act[2] dealing with several issues under the broad topic of sustainable development. The Australian, Californian, and Japanese programs were established under specific climate change laws.

Interviews with program staff suggested that, compared with a voluntary program, having legislation in place strongly enhanced program uptake, reduced industry resistance, and built industry leadership (Bode 2012, Hopkins 2012). Further, in a mandatory program the legal framework can facilitate compliance by including provisions for penalties, even if the emphasis in the beginning may be on outreach and helping entities comply. Reporters in Japan can be fined up to US$2,544[3] (¥200,000) for failing to report or submitting a false report (Ninomiya 2012, Sekiya 2007). Australia's National Greenhouse and Energy Reporting (NGER) Act also imposes a fine for failure to meet the obligations under the Act. For example, the fine for not applying for registration could be as high as $A340,000 (CER 2013). The legal framework also provides ways to address data confidentiality issues by giving regulators the right to ask for emissions-related information while supporting the reporters' request to exercise discretion and not publicly release confidential information.

The timeframe to pass a bill and institute the legal framework may vary in different jurisdictions and needs to be factored in the timeline to establish GHG reporting programs. The United Kingdom, for example, had intended to announce its program in 2011 but finally announced it a year later because the regulation process took longer than expected (Hopkins 2012).

Stakeholder Consultation and Support

Early and continuous engagement with stakeholders improves program outreach and uptake. Stakeholder discussions can generate positive interest in the program, create ownership, and secure support for the program. Consultations can start as the program objectives are being considered and the program is being designed. All the interviewees emphasized the importance of early engagement with stakeholders and incorporating their feedback in the program design and decisions (Hopkins 2012, Bode 2012, MacDonald 2012, Gemmill 2012, Ninomiya 2012, Sibold 2012, Sturgiss 2012). Figure 2 shows the types of stakeholders that may be consulted on a regular basis.

Stakeholder engagement continues into the implementation phase, when training and information dissemination is particularly significant. Reporting entities need relevant information to comply with the reporting requirements if programs are to be effectively implemented. The U.S. EPA, for instance, has engaged closely with owners/operators of potential reporters since 2008, using a variety of forums such as live seminars, webinars, and an electronic hotline for outreach. Special attention was paid to assisting facilities that did not routinely deal with air pollution regulations (Federal Register 2009). The U.S. EPA also provides sector-specific guidance covering 41 industrial emission sources. The websites of most programs considered here offer a number of resources (presentations, flowcharts, FAQs, among others) to support and inform reporting entities.

Harmonization with Other Programs

Several mandatory reporting programs overlap with other programs within their jurisdictions (Table 4). Requiring reporters to submit emissions-related information under multiple programs and using different methodologies increases their reporting burden. Harmonizing requirements across programs can reduce inefficiencies and

Table 4 | **Examples of Overlapping Programs**

PROGRAM	EXAMPLES OF OTHER PROGRAMS WITHIN A JURISDICTION'S BOUNDARY
National Greenhouse Gas and Energy Reporting, Australia	Greenhouse Gas Abatement Scheme (GGAS); Clean Energy Legislative Package.
GHG Emissions Reporting Program, Canada	Various provincial reporting programs such as Alberta's Greenhouse Gas Reporting Program, GHG reporting regulations in Ontario and British Columbia, Quebec's reporting regulation for certain contaminants.
Bilan d'Emission de GES, France	Bilan Carbone; European Union Emissions Trading System (EU ETS), French environmental product labeling, mandatory program for CO_2 information for transport facilities.
Mandatory GHG Accounting and Reporting System, Japan	Japan's Voluntary Emissions Trading Scheme (JVETS); Experimental Emissions Trading Scheme; Japanese Energy Consumption Reporting Program.
Greenhouse Gas Reporting Regulations, United Kingdom	Carbon Reduction Commitment Scheme; Climate Change Levy; Department for Environment, Food and Rural Affairs guidance.
GHG Reporting Program, United States	California's Mandatory Greenhouse Gas Emissions Reporting, the Regional Greenhouse Gas Initiative.

duplication and make it easier for entities to report and for users to analyze and interpret reported information (CDSB 2012). Existing and/or past voluntary/mandatory programs can also provide rich lessons for the program design and planning phase.

In certain regions of Canada and the United States, businesses must report at the federal as well as the state/provincial level because of overlapping reporting programs. As of 2010, 17 U.S. states had reporting systems in addition to a federal reporting program (Shea and Gelardi 2010). For example, a business in California must report to the state program and the federal program. However, California has aligned most reporting methods and requirements with those of the U.S. EPA to reduce the burden on reporters. Some differences remain because of California's need for more robust and complete data to support its cap-and-trade scheme (Bode 2012). For instance, California requires third-party verification from accredited verifiers, whereas the U.S. EPA does not; both the U.S. EPA and California use the same tiers of methodology to calculate emissions, but California limits the choice of tiers for certain fuels.

In Canada, in addition to the federal program, five provincial jurisdictions require facilities to report GHG emissions under specific regulations. Although there is alignment between federal and provincial levels, differences exist in some aspects such as reporting thresholds and third-party verification requirements. Different program objectives—supporting broad policy development at the federal level versus supporting a provincial cap-and-trade program—explain these differences in program design. Environment Canada and several provincial jurisdictions have streamlined the reporting process and introduced a single-window online reporting system to reduce industry's burden and to keep government costs low. The new system allows one-time entry of information for both federal and provincial programs as well as data specifically required by one program (MacDonald 2012).

Japan's reporting program was built on the Japanese Energy Consumption Reporting Program under the Energy Conservation law. Because reporting entities already submit data on CO_2 (which accounts for more than 85 percent of GHG emissions in Japan) under this energy program, it was decided that they need not submit additional data for the GHG reporting (Ninomiya 2012).

In an effort to reduce the burden on companies, the UK program allows companies to submit relevant information

from other domestic and international regulatory reporting processes, such as EU ETS or CRCS, to fulfill their mandatory reporting obligations (Hopkins 2012).

Capacities Needed to Implement the Program

Setting up a mandatory reporting program requires a range of capacities, including institutional, human resource, technical, and financial capacities. The presence and quality of these capacities play a significant role in determining the scope of the program, as well as its implementation success. These capacities are discussed below.

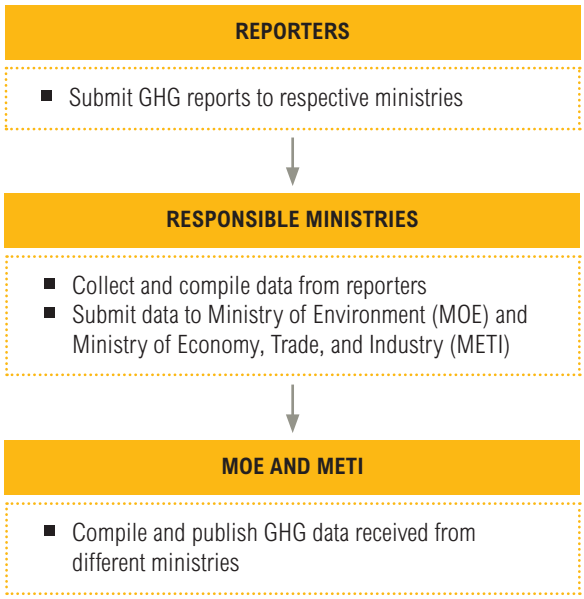
Institutional capacities

Institutional capacity refers to the presence of effective institutions/agencies with a mandate to take the lead on, provide, and/or support services for the reporting program. An efficient and cost-effective institutional arrangement is needed to smoothly implement the reporting program. In most instances, an existing government agency is identified as the program administrator, often an environmental department or agency with mechanisms and experience in collecting and verifying large amounts of self-reported data. For example, federal environmental agencies such as Environment Canada, Australian Department of Climate Change and Energy Efficiency,[4] and the U.S. EPA manage the reporting programs in their jurisdictions. Management roles include collecting, verifying, analyzing, synthesizing, and presenting the reported data (CER 2012a, Sibold 2012).

Some programs have set up a new agency or a new branch in an existing agency, which may incur significant upfront costs and require capacity building in all program areas. For example, Australia established an independent statutory authority to increase synergies between the National Greenhouse and Energy Reporting Act (2007) and other related laws and to establish a single, centralized platform for energy and GHG emissions. The new agency, called the Clean Energy Regulator (CER), replaced the Greenhouse and Energy Data Officer[5] as the program administrator beginning April 1, 2012 (CER 2011).

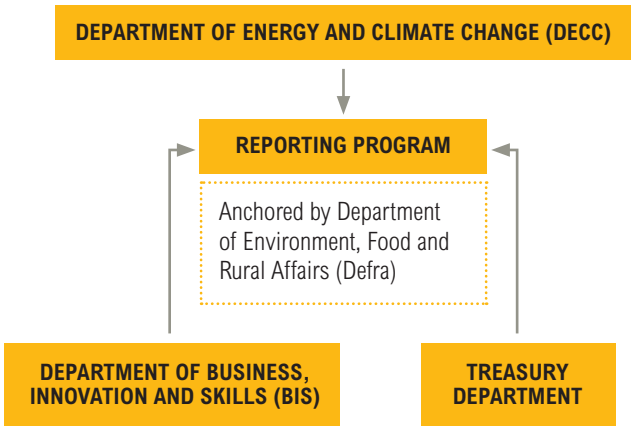
Other programs have used multiple agencies. In such a situation, clarity on division of functions and authority among the involved agencies is important. Employing multiple agencies can accommodate existing institutional structures and spread out the upfront investment, but it can also lead to coordination and communication challenges. In Japan, the Ministry of Environment (MOE)

Figure 3 | **Institutional Arrangement for GHG Reporting In Japan**



Source: Ninomiya 2012.

Figure 4 | **Institutional Framework for UK Emissions Reporting Program**



acts as the program administrator, but different ministries manage different sectors and reporters submit GHG reports directly to the sectoral ministry (Figure 3).[6] Individual ministries manage the database for reporters under their jurisdiction and compile and submit GHG reports to MOE and Ministry of Economy, Trade, and Industry (METI) (MOE 2010). Under the EU ETS, member states have independent institutional arrangements for data collection and verification. However, the new monitoring and

reporting regulation requires coordination by the member state if multiple agencies are involved within the country (EC 2012b).

GHG reporting programs usually involve issues under several departments/ministries such as environment, climate, energy, industries, treasury, and commerce. Therefore, even when a single agency designs and/or implements the program, it may be helpful for all related departments to be engaged from the outset. For instance, as illustrated in Figure 4, the UK program is anchored in the Department for Environment, Food and Rural Affairs (Defra), but three other departments—Department of Energy and Climate Change (DECC), Department of Business, Innovation and Skills (BIS) and the Treasury department—are consulted for design and planning (Hopkins 2012).

Human resource and technical capacities

Human resources capacity refers to the availability of skilled staff to support technical as well as nontechnical functions (such as managerial and convening) needed to establish and maintain a reporting program. Technical capacity refers to knowledge related to emissions accounting standards; sector-specific and cross-sector emissions calculation tools and methodologies; and data-collection, management, and presentation systems.

Table 5 | **Current Program Administration Cost Levels of Various Components**

COST	AUSTRALIA	CANADA	CALIFORNIA	FRANCE	JAPAN	UNITED STATES
Low	■ Preregulation outreach and discussions ■ Analysis/ summarizing reported data	■ Preregulation outreach and discussions ■ Verification system ■ Support systems	■ Preregulation outreach and discussions ■ Analysis/ summarizing reported data	■ Initial introduction to reporting entities ■ Verification system	■ Preregulation outreach and discussions ■ Verification system	Analysis/ summarizing reported data[a]
Moderate	■ Drafting regulation ■ Initial introduction to reporting entities ■ Reporting system ■ Verification system	■ Drafting regulation ■ Initial introduction to reporting entities ■ Analysis/ summarizing reported data	■ Initial introduction to reporting entities ■ Verification system ■ Drafting regulation ■ Initial setting up of program infrastructure	■ Drafting regulation ■ Initial setting up of program infrastructure ■ Reporting system ■ Support systems ■ Analysis/ summarizing reported data ■ Staff	Analysis/summarizing reported data	■ Preregulation outreach and discussions ■ Drafting regulation ■ Initial setting up of program infrastructure ■ Initial introduction to reporting entities ■ Verification system
High	■ Initial setting up of program infrastructure ■ Staff	■ Initial setting up of program infrastructure ■ Reporting system ■ Staff	Reporting system	Preregulation outreach and discussions	■ Initial introduction to reporting entities ■ Reporting system ■ Support systems ■ Staff	Reporting system
Very high					■ Drafting regulation ■ Initial setting up of program infrastructure	

[a] Although currently low, this cost is likely to increase as the U.S. EPA collects multiple years of data and can effectively evaluate trends.
Source: Compiled based on the program staff's assessment of the relative costs associated with different program components.

A mandatory reporting program requires human resources and technical capacity to design and launch the program, as well as to operate it. Technically equipped staff is needed to manage online reporting platforms and tools to verify and compile GHG reports/data at the administrator level. The number and skill level of staff will depend on the nature and scale of the program. For instance, California's program with its rigorous calculation, reporting, and verification requirements has about 12 staff members—mostly with graduate degrees. The UK program, which is in its initial phase, has three staff members.

In the absence of adequate skilled staff, some programs have outsourced human resource-intensive tasks to qualified consultants. For instance, in Japan, the program has four regular staff members. Some of its operations such as help desk service for technical questions and data validation have been outsourced to private consulting companies (Ninomiya 2012). The U.S. EPA's program team has grown to 20 staff members in its third year of implementation. The program has sought support from specialized contractors on several technical aspects, including engineering, data systems, and IT support (Sibold 2012). The California program relies on its own staff of 12 for most activities, but outsourced its data system development. During an interview, senior staff from the California program suggested involving staff members in all activities because being in regular contact with different stakeholders on a day-to-day basis helps develop in-house expertise and capacity (Bode 2012). Australia has a team of 50 spread across different divisions and engaged in a range of activities, such as data collection, verification, outreach, and education. The team does random audits and investigates suspicious reports.

Financial capacities

Financial capacity refers to the availability of adequate financial resources to implement the program. Assessing the cost to the regulators of designing and implementing the program and calculating the cost of compliance for the reporters are important inputs toward seeking political and stakeholder buy-in. Table 5 presents a summary of the proportion of costs incurred by program administrators toward various components in different programs. Different components have different price tags depending on their nature and objectives, the existing capacity in the jurisdictions, and the degree of detail and sophistication in the program, among other factors.

If multiple program design options are under consideration, analyzing associated costs can help advance decisions. For example, the UK considered four choices for its new program: enhancing voluntary reporting; mandating reporting for UK- quoted companies;[7] mandating reporting for all large companies; and mandating reporting using an energy consumption criterion. The program finally went with the option involving the lowest regulatory cost—emissions reporting in annual reports of UK- quoted companies (Defra 2012a). The regulation will be reviewed in 2015 to consider extension to all large companies (Hopkins 2012).

Assessing costs expected to be incurred by reporters is also important to ensure that the program does not put a disproportionately high economic burden on them. Costs to the reporters can vary substantially across programs depending on monitoring, reporting, and verification requirements. For example, the U.S. EPA estimated the compliance cost for the private sector (for approximately 13,000 reporters) to be about US$115 million in the first year and about US$72 million per year in subsequent years (U.S. EPA 2009). The UK program, covering over 2,000 companies, estimates one-off costs for companies to "read and understand GHG reporting guidance" to be in the range of US$22,604–US$27,436[8] (£14,000-£17,000) (Defra 2011).

Administrators may be able to reduce program costs through measures that facilitate implementation and improve the quality of reported data. For instance, measures such as a standardized reporting template, easily accessible guidance on reporting through program websites and helpdesks, and periodic forums to discuss concerns can streamline the reporting process (Gemmill 2012, Sibold 2012, Bode 2012, MacDonald 2012).

KEY FINDINGS: PROGRAM BUILDING BLOCKS

- The legal basis supports program design and lays the foundation for effective implementation.
- A first step in establishing a reporting program is to identify relevant stakeholders and seek their continued engagement in key program-related decisions.
- Harmonizing with existing programs in the region avoids duplication and reduces reporting burden. Existing programs can offer valuable lessons in designing new programs.
- Assessing institutional, human resource, technical, and financial capacities early in the process can help channel resources toward filling gaps and set a realistic timeline for program implementation.

PROGRAM DESIGN AND IMPLEMENTATION

Mandatory reporting programs can be designed at the subnational level (e.g., California, United States; Alberta, Canada), national level (e.g., Canada, Japan, France) or multinational level (e.g., the European Union). This section presents an overview of the essential design elements illustrating main decision points under each element.[9]

Coverage: Who Reports What?

The first design element that will help define the scope of the program is determining the coverage of reporters and of information collected. When designing a mandatory GHG reporting program, two fundamental questions are:

1. Which entities will be subject to the program requirements? (Who)
2. What emissions information will be collected from those entities? (What)

Defining the reporting entity: Who

The reporting entity can be an individual facility, company, or other entity. In several mandatory programs, such as the United States, Canada, and EU ETS, reporting entities are facilities. Facility-level reporting is useful for supporting regulatory programs as well as emissions-trading programs. Some programs define the reporting entity at the level of a company. For example, the UK's mandatory reporting program applies to companies to promote disclosure of corporate GHG emissions and related risks and opportunities. To meet multiple objectives, both facility- and corporate-level reporters may be included. For example, programs such as those in Australia and Japan require reporting at both corporate and facility levels.

Where emissions are reported at the corporate level, the program needs to define how to consolidate emissions from different facilities within the company. The GHG Protocol Corporate Standard outlines three methods that can be used to consolidate emissions at the corporate level: equity share, operational control, and financial control.[10] Under the equity share approach, a company accounts for GHG emissions from each facility according to its share of equity in it. Under the two control-based approaches, a company accounts for 100 percent of GHG emissions from facilities over which it has operational or financial control depending on the approach being considered. The company does not account for GHG emissions from facilities over which it has no control. Australia uses operational control approach to consolidate GHG emissions at the corporate level (CER 2012b) whereas France allows a choice between operational and financial control approaches (MEDDE 2011).

The program must also decide *which* facilities and/or companies are subject to reporting. Most programs define a reporting threshold, above which facilities or companies must report. The threshold determines the number of reporting facilities and the percentage of direct emissions covered (Table 6). Different kinds of reporting thresholds include:[11]

Table 6 | **Direct Emissions Covered by Mandatory Reporting Programs**

JURISDICTION	APPROXIMATE NUMBER OF REPORTING FACILITIES (REPORTING YEAR)	PERCENTAGE OF DIRECT EMISSIONS COVERED (YEAR)
Australia	10,000 (2011)	65 (2011)
California	581 (2011)	~85 (2011)
Canada	537 (2010)	38 (2010)
European Union	11,500 (2012)[a]	41 (2010) [b]
France	4000 (2012)	15–30 (2012)
Japan	12,000 (2009)	50 (2009)
United States	8,000 (2011)	~85-90 (facilities and suppliers combined) (2011)
United Kingdom (anticipated)	About 1,100 quoted companies	NA

[a] Excludes aircraft operators.
[b] At regional level for European Union.
Source: Bode 2012, Environment Canada 2012, Gourdon 2012, Hopkins 2012, Ninomiya 2012, UNFCCC 2012, U.S. EPA 2013b

1. **EMISSION THRESHOLDS:** The Canadian program, for example, applies to all facilities in the country that emit 50,000 metric tons or more of carbon dioxide equivalent (CO_2e) annually (Environment Canada 2010). In general, the U.S. threshold is set at 25,000 metric tons of CO_2e per year for emissions from those source categories[12] where a threshold applies (Federal Register 2009). California has a reporting threshold of 25,000 metric tons of CO_2e. The state has also defined a lower threshold of 10,000 metric tons of CO_2e with simplified reporting.
2. **ENERGY AND/OR EMISSIONS THRESHOLDS:** Some programs employ both energy and emissions thresholds, and others have set just one of these thresholds:
   - In Australia, entities emitting 50,000 metric tons of CO_2e or consuming greater than 200 terajoules of energy need to report (CER 2012a).
   - Japan has different thresholds for energy-based CO_2 and non-energy based gases (CO_2, CH_4, N_2O, HFC, PFC, and SF_6). For energy-based CO_2, companies with annual energy consumption of 1,500 kiloliters of oil equivalent or more must report. For nonenergy based gases, companies report if they emit 3,000 metric tons of CO_2e or more of any of the specified gases and have at least 21 full-time employees (MOE 2010).
3. **SOURCE CATEGORIES:** Some programs include all facilities in certain source categories irrespective of how much they emit. For instance, the U.S. EPA requires all facilities producing nitric acid, cement, or petrochemicals to report (Federal Register 2009).
4. **PRODUCTION TONNAGE THRESHOLDS:** The EU ETS, for example, specifies several sectors where thresholds are set in terms of production tonnage, such as over 2.5 metric tons per hour capacity for steel production and above 20 metric tons per day production capacity for paper mills (DOE 2003).
5. **NUMBER OF EMPLOYEES:** France, for example, requires reporting from all public bodies with 250 or more employees, all companies with more than 500 employees, and subnational governments with more than 50,000 inhabitants (Grenelle de l'environnement). It has no emission/production/consumption threshold (Kauffmann, Less and Teichmann 2012).
6. **PUBLICLY TRADED COMPANIES:** The UK mandates all UK-quoted companies to disclose emissions data in the annual directors' reports (Defra 2012b).

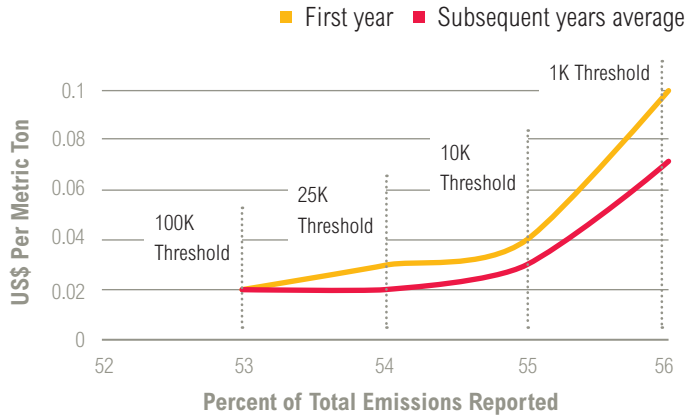
Several programs begin by requiring only a small number of entities to report and then lower the threshold limit over time to include more facilities. Programs may also expand to cover additional sectors. Starting small allows programs to gain experience and build capacity to implement at a larger scale. For example, France started with only the largest companies and subsequently added others. The EU ETS has gone beyond industrial installations to include aircraft operators (EC 2008). In the United States, the U.S. EPA increased the covered source categories from 29 in 2010 to 41 in 2011 (U.S. EPA 2010a). Canada lowered its threshold from 100 metric kilotons CO_2e to 50 metric kilotons CO_2e in 2009 leading to an almost 50 percent jump in the number of reporters and capturing an additional 4 percent of emissions (Environment Canada 2011).

In some countries, like Canada and Japan, reporters have to evaluate their status against the threshold annually (Environment Canada 2010, MOE 2010). Simple, user-friendly online tools that let potential reporters check their eligibility under the program are considered helpful, particularly for small emitters. Facilities not meeting the threshold and emitting lesser quantities can report voluntarily in some programs, such as Canada's.

Programs may decide their reporting thresholds based on several factors:

- The objectives of the program
- The percentage of total emissions seeking to be captured in the economy
- The desired number of facilities reporting under the program
- Cost to the reporters
- Cost to the program administrator
- Existing reporting programs (voluntary or mandatory, GHG or non-GHG) and the consequent reporting burden
- Capacity of the reporters and program administrator

Figure 5 | **Average Cost Per Metric Ton of Emissions Reported by Threshold**



Source: U.S. EPA 2009

When deciding on the reporting threshold, the U.S. EPA, for example, analyzed the average reporting cost per metric ton of emissions (Figure 5). It found that lowering the threshold beyond a certain point (from 25,000 metric tons to 10,000 metric tons) increased the cost but did not cover a correspondingly large percentage of additional emissions (U.S. EPA 2009).

Emissions coverage: What

A key decision for a reporting program is emissions coverage in terms of sources and GHGs. Most programs studied here require facilities to report emissions of the gases covered under the Kyoto Protocol.[13] The EU ETS earlier required only CO_2 emissions data to be reported but now also covers nitrous oxide and perfluorocarbons from certain sectors (EU 2013). Sources that can be covered include stationary and mobile combustion sources as well as those sources involving process and fugitive emissions. Once the greenhouse gases and sources are chosen, pro-

Table 7 | **Emissions Coverage in Reporting Programs**

JURISDICTION	LEVEL OF REPORTING	DIRECT EMISSIONS	INDIRECT EMISSIONS FROM PURCHASE OF ELECTRICITY, HEAT, OR STEAM	OTHER INDIRECT EMISSIONS
Australia	Corporate and facility	X	X	Encouraged
California	Facility (+suppliers)	X	[a]	X[b]
Canada	Facility	X		
European Union	Facility	X		
France	Corporate	X	X	Encouraged
Japan	Corporate and facility	X	X	Optional
United Kingdom	Corporate	X	X	Encouraged
United Staes	Facility (+suppliers)	X		X[b]

[a] California requires reporting of purchased electricity, heat, or steam, but does not require the industrial user of those purchased energy to calculate the emissions associated with the indirect energy because the suppliers of electricity and steam are covered under the program.

[b] Suppliers report at corporate level. Not all suppliers are considered sources of indirect emissions (e.g. CO_2 supply can be used in nonemitting applications).

Source: Compiled from respective program websites and from program staff interviews.

KEY FINDINGS: COVERAGE: WHO REPORTS WHAT?

- A reporting threshold level can be determined by analysis of a number of factors including percentage of emissions covered and costs to the reporters and program administrator.
- Reporting programs can start with a high threshold and limited coverage. Over time, they can gradually lower the threshold to expand the number of reporters as capacity is built and familiarity with the program increases.
- Programs can provide online tools that allow potential reporters to quickly assess their eligibility under the program. These tools are particularly useful for small emitters.

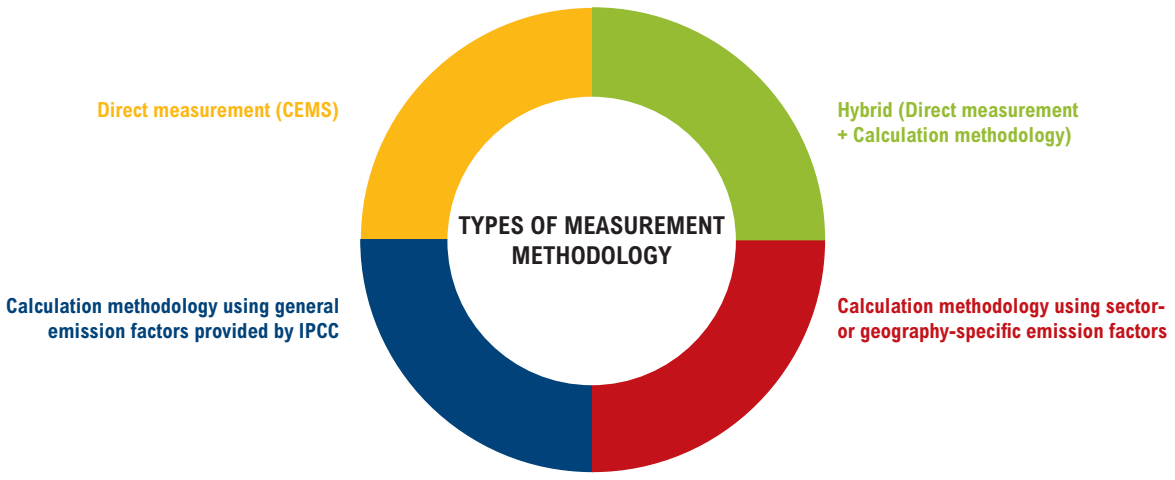
grams need to determine whether the program requires reporting of direct and/or indirect emissions. Direct emissions (Scope 1 emissions as defined in the GHG Protocol Corporate Standard (WRI and WBCSD 2004)) are emissions that occur from the sources owned or controlled by the facility. Information from direct emitters is useful for policies that are applied downstream such as end-use emission standards. Indirect emissions are a result of a reporting entity's activities and are categorized as Scope 2 and Scope 3 emissions (defined in the GHG Protocol Corporate Standard (WRI and WBCSD 2004)). Scope 2 emissions result from the use of purchased electricity, heat, or steam, whereas all other indirect emissions (e.g., employee commuting) are considered Scope 3 emissions.

Australia, Japan, and France require reporting of direct emissions and indirect emissions from purchase of electricity, heat, or steam, while encouraging reporting of other indirect emissions (Table 7). The EU ETS and Canadian programs require only direct emissions to be reported. The U.S. EPA and Californian programs require suppliers of fossil fuels and industrial GHGs from upstream sources to report, in addition to requiring reporting from direct emitters. Covering suppliers means that the emissions associated with fossil fuels and industrial gases are captured without requiring reporting from the hundreds of small customers of the suppliers. Also, upstream data from suppliers informs development of policies that are only applicable upstream, such as low-carbon fuel standards (U.S. EPA 2011a). The UK program will require reporting of direct emissions as well as indirect emissions from the use of purchased electricity, heat, or steam by covered companies beginning October 1, 2013 (Hopkins 2012).

Emissions Calculation Methodologies

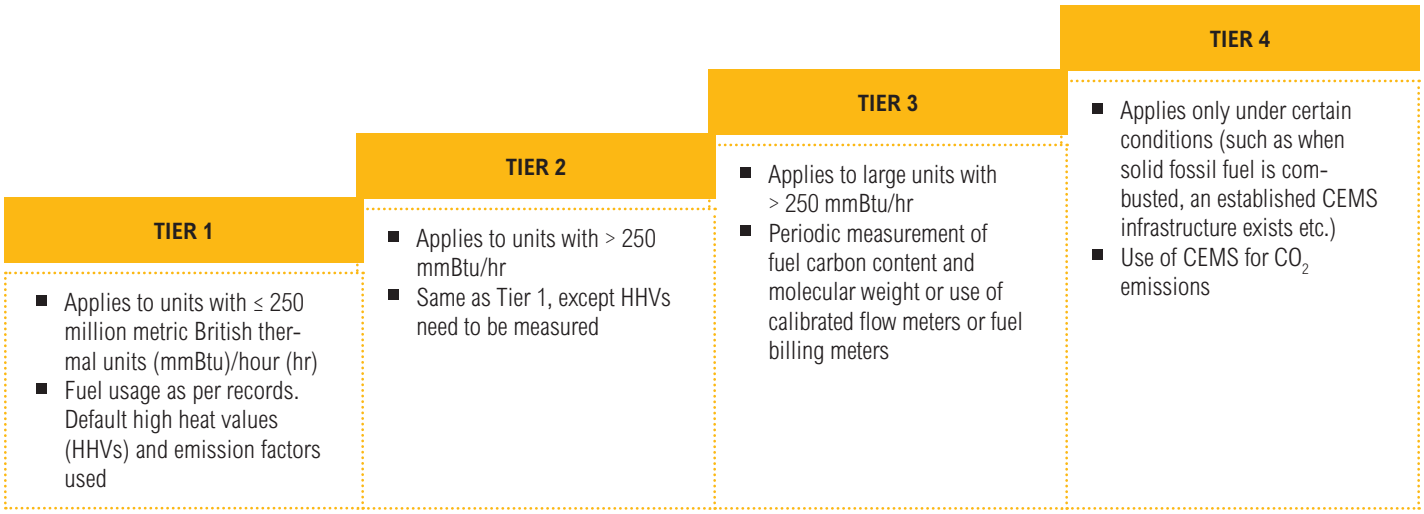
Once coverage is determined, programs can specify methodologies to calculate and monitor emissions. Prescribing a set of quantification/calculation protocols or methodologies brings standardization, consistency, and comparability in reporting. Although calculation protocols exist for several industrial sectors and can be customized for industry in a particular region, new methodologies may be developed with adequate stakeholder participation and review. Programs such as those managed by the U.S. EPA and California also allow continuous emissions monitoring systems (CEMS) under specific criteria (U.S. EPA 2010c). The EU ETS allows use of either calculation or a

Figure 6 | **Types of Measurement Methodology**



Note: CEMS = continuous emissions monitoring systems, IPCC = Intergovernmental Panel on Climate Change

Figure 7 | **Simplified Representation of the U.S. EPA's Tier-Based System for Calculating CO_2 Emissions**



Note: CEMS = continuous emissions monitoring systems

Source: U.S. EPA 2010c

CEMS approach. CEMS may work well for large emitters or when there are few stacks per installation, but in the case of small emitters or multiple stacks per facility, it could be more expensive (Gemmill 2012). Figure 6 shows various types of measurement methodologies that programs can provide.

Most programs provide detailed calculation methodologies, emission factors (EF), and global warming potential (GWP) values. For instance, the EU program, which needs a high level of accuracy and consistency as a basis for the trading scheme, provides detailed guidelines under the European Commission Monitoring and Reporting Regulations. Similarly, Australia also provides detailed technical guidelines to estimate GHGs from different sources and sectors. Environment Canada has guidance materials on its website and a help desk to support facilities that may not be as familiar with calculating emissions from specific sources.

Several programs (such as the EU ETS, the U.S. EPA, and the Australian program) use a tier-based system for choosing the appropriate methodologies (Figure 7). Generally programs require applying higher tiers for a greater quantum of emissions. The higher the tier, the more rigorous and accurate the methodology. For example, the EU ETS tier system corresponds to progressively higher levels of methodological accuracy (e.g., site-specific emission factors) as the quantum of emissions increases. Unless reporting entities can prove associated costs to be unreasonably high or associated technology to be infeasible, they are required to use the highest possible tier applicable to them (EC 2012b). Programs often allow simplified methodologies for smaller operators recognizing that they may be constrained for resources needed to monitor, calculate, and report emissions. Also, the environmental risk associated with their emissions being misreported is correspondingly small.

KEY FINDINGS: MONITORING AND CALCULATION METHODOLOGY

- Detailed calculation and monitoring methodologies improve standardization and data quality and accuracy. They support reporters that may not be familiar with GHG emissions calculation and need guidance.
- In a tier-based system, the requirement for methodological accuracy increases as the quantum of emissions increases. This system avoids undue burden on smaller emitters.

REPORTING REQUIREMENTS

A central design element to be decided during the inception phase of the program is determining the reporting requirements, including what kind of information should be reported, how often, the desired level of disaggregation of emissions data, and how to deal with data confidentiality. Elements that can be included in emissions reports include:

- Name and contact information of the reporting entity and its designated representative responsible for submitting, signing, and certifying the reports
- Emissions information: Total emissions in CO_2e with additional information including emissions by gas, emissions disaggregated by facility in a corporate-level program, uncertainty estimates, and CO_2 emissions from biomass combustion. Most programs ask for reported emissions data to be disaggregated by emission site, by gas, and by source or activity type. Disaggregation gives more useful data, which can be used to identify inefficiencies and emissions management opportunities even though it may involve more effort and resources.
- Any information that the reporter does not want publicly disclosed, as applicable
- Third-party verification or self-certification statement, as applicable
- Information on emission offsets and sinks. For example, Australia requires facilities with carbon capture and storage activities to report fugitive emissions from transport, from injection and the storage site, and from carbon dioxide captured, imported, and injected (Department of Climate Change and Energy Efficiency 2012).
- Information on records and documentation such as relevant documentation that has been retained and length of retention. For example, the U.S. EPA and Canada require reporting entities to retain all supporting documentation for three years (Environment Canada 2010, Federal Register 2009). EU ETS requires document retention for 10 years (EC 2012c).

All programs described confidentiality issues related to emissions and/or activity data to be a major concern for reporters and have dealt with it in different ways after stakeholder consultations. The U.S. EPA requires emissions data of all covered facilities to be reported and publicly available. However, reporting of certain activity data that are inputs to emissions calculations that could potentially be considered confidential business information has been deferred to 2015 (U.S. EPA 2011b, U.S. EPA 2012a). The California program recognizes GHG emissions as publicly available information. Other information, such as activity and process-related data, is reported to the program administrator but can be designated as confidential business information by the reporter. This designation allows the reporter to protect information that it believes could threaten its competitiveness. However, if someone files a request for public information, the responsibility to defend confidentiality is on the facility, and not on the program administrator (Bode 2012). In Canada, facilities can request confidentiality and must provide appropriate justification to support their request. They can also appeal within 30-days if the confidentiality request is denied (Environment Canada 2010). Japan also allows requests to treat certain data as confidential (Ninomiya 2012).

Programs also need to decide on the reporting period and on related issues such as the legality of electronic submission and cessation of reporting. Most jurisdictions opt for annual reporting. France is an exception with reporting required every three years (Kauffmann, Less and Teichmann 2012). Also, whereas some programs (e.g., the Australian program) use the fiscal year to report, others (e.g., the Canadian program) use the calendar year (CER 2013, Environment Canada 2010). In France, the reporter chooses the most appropriate “12 month period” (Gourdon 2012).

Since most programs require online submission of data, it is important to ensure that the electronically submitted data has the same legal weight as paper submissions. For example, the U.S. EPA’s Cross-Media Electronic Reporting Regulation (CROMERR) provides electronic submittals with the same level of legal dependability as the corresponding paper submittals (U.S. EPA 2012b).

Guidance is needed as to when reporters can stop reporting. For example, in Canada, reporters notify the program administrator if they no longer meet the reporting threshold in a particular year because of changes in production levels, technologies, or for any other reason (Environment Canada 2010). In the United States, if reported emissions are less than 25,000 metric tons of CO_2e per year for five consecutive years, or less than 15,000 metric tons of CO_2e per year for three consecutive years, or if a facility or supplier ceases to operate all applicable GHG emitting

processes and operations, it can notify the U.S. EPA and stop reporting. Reporting must resume if annual emissions in any future calendar year increase to 25,000 metric tons of CO_2e or more (Federal Register 2009).

KEY FINDINGS: REPORTING REQUIREMENTS

- Reporting-related decisions include information to be reported, level of disaggregation and confidentiality of reported data, frequency of reporting, legality of electronic submissions, and cessation of reporting.
- Stakeholder consultations regarding confidentiality concerns and level of disaggregation may help reach a suitable compromise.

VERIFICATION

Emissions verification helps ensure the accuracy and integrity of reported data and, therefore, can provide additional confidence in the program. Detailed feedback on nonconformities with required monitoring or calculation methods can significantly improve data quality, particularly from smaller operators (Gemmill 2012). Reporting programs can employ the following approaches for verification of reported data: third party verification with self-certification by the reporting facility; verification of submitted information by the program administrator along with self-certification by the reporting facility; and self-certification by the reporting facility (Table 8). The approach chosen depends on program objectives and factors such as the cost for the program administrator and reporters, consistency with other programs, and existing capacity and resources within the program to take on verification role (ERG 2009).

Programs in the European Union, Australia, and California require verification from an independent, third-party verifier who has been accredited by a designated body. Verification must be done in accordance with a specified process (CARB n.d., Gemmill 2012, Sturgiss 2012). Programs underpinning trading schemes tend to favor third-party verification owing to their need for confidence in the robustness and completeness of data from each reporter. However, this approach entails additional costs for the reporters. Canada's program has left it to the discretion of the reporter to get its emissions report verified by a third-party. Environment Canada conducts internal compliance and data quality checks of the submitted data and follows up with facilities if there are doubts or questions (MacDonald 2012). The U.S. EPA program verifies submissions itself by electronic checks of the data and reviewing the emission reports. This approach was selected to reduce the cost to the reporters (U.S. EPA 2009, ERG, Review of Verification Systems in Environmental Reporting Programs 2009). The U.S. EPA has the authority to conduct audits and site visits of selected reporting facilities.

The French program does not require third-party verification because it was established to supplement the EU ETS reporting system and to promote emissions reduction through disclosure (Gourdon 2012). Similarly, the UK program has decided not to require monitoring or verification by a third party. It is expected that the reputational risk for a quoted company if it were to publish inaccurate GHG information in its annual report would be enough of a deterrent to discourage fallacious reporting. Also since the program is housed under the

Table 8 | **Verification in Reporting Programs**

JURISDICTION	SELF-CERTIFICATION	VERIFICATION BY REGULATORY AUTHORITY[a]	THIRD-PARTY VERIFICATION
Australia	X	X	X[c]
California	X	X[b]	X
Canada	X	X	
European Union	X		X
Japan	X		
United Kingdom	X		
United States	X	X	

[a] Depending on the program, this verification could include random checks or systematic/periodic verification.

[b] California audits a random sample of GHG reports in addition to a full review by the third-party verifiers.

[c] Required only for those reporting under the carbon price mechanism.

Source: Compiled from program websites and from program staff interviews.

Companies Act, which has its own requirements and language around assurance, additional GHG assurance could not be enforced (Hopkins 2012).

KEY FINDINGS: VERIFICATION

- Verification brings greater confidence in reported data. Reporting programs can decide on one of three verification approaches based on factors such as program objectives, expense, and burden on reporting entities and program administrators.
- If the program administrator assumes monitoring and verification responsibility, enhanced human, technical, and financial capacity and resources will be needed.

DATA DISCLOSURE AND PRESENTATION

Reporting programs are often set up to promote emissions disclosure among other objectives. How the data are shared publicly is, therefore, another key program design element. Programs may not always share the data in the form they are submitted or even at the same level of disaggregation depending on how confidentiality concerns have been resolved. For example, Japan collects facility data by gas but shares the data in this level of detail only on request. The reported data may be disclosed in a summary form or may be disaggregated and searchable through an online database. In addition, programs may present annual data analysis identifying trends, hotspots, and key messages. This analysis can entail significant resources depending on the sophistication of the data collection system and the level of analysis undertaken. Table 9 *(see page 18)* summarizes how the data submitted under different programs are publicly disclosed in terms of access to information, data presentation, and the level at which they are shared. For example, in the UK program, the public will have access to the emissions data reported by the quoted companies through the companies' annual reports. While all programs have downloadable Excel or pdf files, programs such as the U.S. EPA provide an interactive, user-friendly interface to browse the reported emissions data using different filters like GHGs, location, or industry.

KEY FINDINGS: DATA DISCLOSURE AND PRESENTATION

- Whether the data and information collected from the reporting entities are disclosed to the public and in what form and detail depends on the objectives of the program and the stakeholders involved.
- Programs with the objectives of encouraging disclosure-based GHG reduction or providing information to stakeholders can create a public online interactive, searchable, central database, depending on available resources.

A PHASED APPROACH FOR DEVELOPING COUNTRIES

Establishing a mandatory GHG reporting program is a resource- and time-intensive process. For example, Turkey is in the process of establishing a GHG reporting program, which is expected to cover 1,500 installations responsible for about half of national emissions (Icmeli 2012a). The program staff estimates that it will take four years before the program is fully operational and begins to receive the first emissions data from covered installations (Icmeli 2012b). A large part of this time is expected to go toward aspects such as finalizing program-related legislation; developing monitoring, reporting, and verification guidelines; building domestic capacity; and establishing systems (e.g., an emissions registry, a data management system, and a program website with knowledge tools) (Icmeli 2012b).

However, jurisdictions in the developing world considering a reporting program with their limited resources and multiple development priorities need not be discouraged by the lengthy process. Three steps can be taken to move forward:

- First, start with foundational steps including building capacities.
- Second, awareness-raising can help prepare stakeholders and create a constituency for the program.
- Third, adopt a modular approach and implement GHG reporting programs in a phased manner. Start with a few major sectors or large emission sources and simpler methodologies. A phased approach can be useful if it is not possible to define all the program objectives from the outset.

CAPACITY BUILDING: Strengthening institutional, human, technical, and financial capacities can be one of the first areas of focus. Jurisdictions can begin with a fair assessment of their capacity needs. Adequate preparedness for a GHG reporting program includes putting in place a sustainable framework of institutions and agencies to administer the program. It may be more cost-effective to task an existing agency or department familiar with

Table 9 | **Access to Data in Different Programs**

DATA ELEMENT/ INFORMATION	AUSTRALIA	CALIFORNIA	CANADA	EUROPEAN UNION	FRANCE	JAPAN	UNITED KINGDOM[c]	UNITED STATES
Program Type	Corporate and facility	Facility	Facility	Facility	Corporate	Corporate	Corporate	Facility
I. ACCESS TO DATA								
Public Access to Information	X	X	X	X	X	X	X	X
Information available on a central-ized online platform	X	X	X	X		X		X
II. DATA PRESENTATION								
Downloadable format (pdf or Excel files)	X	X	X	X	X	X	X	X
Information online (web pages)	X	X	X	X	X	X	X	X
Searchable/ interactive database	X		X	X				X
III. LEVEL OF DETAIL								
By individual GHGs		X	X	X	X	X	X	X
Facility level		X	X	X		X[b]		X
Corporate level	X				X	X	X	X (for suppli-ers)
Sector level		X	X	X		X		X
Geography-based[a]		X	X	X	X			X

[a] Some programs allow viewers to access emissions data for their choice of geographic units such as state or province level.
[b] Available on request.
[c] Anticipated.
Source: Information compiled from program websites and from program staff interviews.

climate change-related issues to design and implement the program. The agency will need technical preparedness on program design, implementation, and monitoring. Industries will need technical preparedness on activity data collection, calculation methods, and reporting. It may be useful to also build a community of experts in emissions accounting, verification, and management. Lining up financial resources, (e.g., through budget allocations and through global climate finance), can provide the desired impetus to the program. Developing countries can seek to attract global climate finance for capacity gap assessment and fulfilling the identified needs to ensure a high-quality, credible program. For instance, the World Bank's Partnership for Market Readiness initiative helps build systems for GHG data monitoring, reporting, and verification in developing countries, among other things. The initiative is financially and technically supporting countries such as Turkey and Chile to design and implement GHG reporting systems (PMR 2013).

STAKEHOLDER ENGAGEMENT: Creating awareness and building a constituency for the program is an important first step that can be started with limited resources. It can help identify relevant stakeholders and seek their engagement in formulating program objectives and design elements. Awareness-raising exercises can include outreach as well as consensus building on issues such as the legal framework to house the program; the institutional, technical, financial, and human capacities needed; and potential objectives the program could serve. Early stakeholder involvement and a shared understanding of program objectives and purpose can enhance program uptake.

PHASED APPROACH: Jurisdictions can initiate the program at a smaller scale, beginning with a few major GHG emitting sectors (e.g., the electricity sector) or adopt a higher emissions threshold so that only large emitting entities from different sectors are covered. Jurisdictions can move gradually toward an economy-wide reporting program. National inventories can provide information to identify emissions-intensive sectors. Major emitting facilities within sectors can be identified through available sector-specific data. New reporting programs can successively move from a simpler methodology (lower tier in terms of accuracy and completeness) to a more rigorous calculation methodology (higher tier) with a verification requirement. This method will avoid placing undue burden on reporters in the beginning and allow them time to gain expertise, build their capacity, and put data collection and inventory systems in place.

SUMMARY OF KEY FINDINGS

Mandatory reporting systems help build a strong foundation to manage GHG emissions and strengthen countries' capacity to adequately tackle climate change. Over the past two decades, a number of countries have developed mandatory programs that offer rich insights for those considering similar programs. Although program design must be context specific, some common elements can guide jurisdictions planning mandatory reporting programs:

- A reporting program can fulfill a number of short-term and long-term objectives, which may be periodically reviewed to ensure they remain relevant and realistic with the country's evolving policy landscape. Objectives influence the program design and implementation-related decisions.
- Building blocks that support program design and operation details include a sound legal basis; effective stakeholder engagement; and adequate institutional, human, technical, and financial capacity.
- Harmonizing with existing programs and learning from them can allay concerns about duplication and strengthen the reporting program.
- Issues related to program design—coverage, monitoring and calculation methodologies, reporting requirements, verification, and data disclosure and presentation—are influenced by program objectives, stakeholder interests, and the level of preparedness and capacity in the country. Jurisdictions may make different choices at each step. The decision drivers underpinning these choices provide an insight into the kind of analysis policymakers can undertake to arrive at appropriate and justifiable decisions for their reporting programs.
- Developing countries with competing priorities and limited resources may find it easier to adopt a gradual, phased approach to develop a reporting program. Immediate investments in capacity building and stakeholder engagement can assist in strengthening implementation later.

ENDNOTES

1. Refer to WRI and WBCSD 2007 for a detailed discussion on how program objectives guide program design.
2. Grenelle 2 is an overarching environment and sustainable development law governing France's national commitments on issues including energy efficiency, air pollution, climate change, and urban development.
3. As per the exchange rate on September 18, 2012.
4. The Department of Climate Change and Energy Efficiency was replaced by the Clean Energy Regulator (CER) beginning April 1, 2012.
5. Under the Department of Climate Change and Energy Efficiency, which retains formal oversight of the scheme and under which the program was established.
6. For instance, manufacturing industries submit their reports to the Ministry of Economy, Trade and Industry (METI), agriculture-based corporations to the Ministry of Agriculture, Forestry and Fisheries, and transportation-related businesses submit reports to the Ministry of Land, Infrastructure, Transport and Tourism (MLIT).
7. As defined by the Companies Act 2006. Quoted companies in this respect are those that are UK incorporated and whose equity share capital is officially listed on the main market of the London Stock Exchange, or is officially listed in a European Economic Area State, or is admitted to dealing on either the New York Stock Exchange or NASDAQ.
8. As per the exchange rate on September 26, 2012.
9. The design elements were identified through interviews with program staff and based on the framework presented in the GHG Protocol's publication Measuring to Manage on designing corporate reporting programs WRI and WBCSD 2007.
10. Refer to chapter 3, "Setting Organizational Boundaries," of WRI and WBCSD 2004 for details.
11. Applicable to direct emissions unless otherwise specified.
12. Source categories refer to specific industries or similar sources of GHG emissions grouped together such as "Off-Site Waste and Recovery Operations."
13. Carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride. Some programs such as the U.S. EPA also require reporting of the new Kyoto GHG, nitrogen triflouride (NF3). Federal Register 2009.

REFERENCES

Bode, R. 2012. Chief, Greenhouse Gas Emission Inventory Branch, California Air Resources Board. Interviewed by A. Mahapatra, July 26.

CARB (California Air Resources Board). n.d. "Verification of GHG Emissions Data Reports." http://www.arb.ca.gov/cc/reporting/ghg-ver/ghg-ver.htm

———. 2013. "Article 5: California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms." http://www.arb.ca.gov/cc/capandtrade/ct_rf_april2013.pdf

CDSB (Climate Disclosure Standards Board). 2012. "The Case for Consistency in Corporate Climate Change-Related Reporting." http://www.cdsb.net/sites/cdsbnet/files/the-case-for-consistency-in-climate-change-related-reporting.pdf

CER (Clean Energy Regulator). 2011. *Clean Energy Regulator*. http://www.climatechange.gov.au/media/whats-new/clean-energy-regulator.aspx

———. 2012a. "National Greenhouse and Energy Reporting." http://www.cleanenergyregulator.gov.au/National-Greenhouse-and-Energy-Reporting/Pages/default.aspx

———. 2012b. "Supplementary Guidelines: Operational Control." March. http://www.cleanenergyregulator.gov.au/National-Greenhouse-and-Energy-Reporting/Fact-sheets-FAQs-and-guidelines/Guidelines/Documents/Old%20guidelines/Operational%20control.pdf

———. 2013. "What does the NGER scheme involve?" https://www.cleanenergyregulator.gov.au/National-Greenhouse-and-Energy-Reporting/About-NGER/what-does-the-NGER-scheme-involve/Pages/default.aspx

Defra (UK Department for Environment, Food and Rural Affairs). 2011. "Impact Assessment of Options for Company GHG Reporting." https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/82354/20120620-ghg-consult-final-ia.pdf

———. 2012a. "Key Performance Indicators Guidance and GHG Reporting Draft Regulations Consultations." http://www.defra.gov.uk/environment/economy/business-efficiency/reporting/

———. 2012b. "Leading Businesses to Disclose Greenhouse Gas Emissions." http://www.defra.gov.uk/news/2012/06/20/greenhouse-gas-reporting/

Department of Climate Change and Energy Efficiency. 2012. "National Greenhouse and Energy Reporting Technical Guidelines." http://www.climatechange.gov.au/climate-change/greenhouse-gas-measurement-and-reporting/company-emissions-measurement/technical

DOE (UK Department of Energy). 2003. "EU Emissions Trading Scheme Guidance Note 1." http://www.doeni.gov.uk/niea/eu-ets-guidance01.pdf

EC (European Commission). 2008. Directive 2008/101/EC Of the European Parliament and of the Council of 19 November 2008 amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:008:0003:0021:en:PDF

———. 2012a. "The EU Emissions Trading System (EU ETS)." http://ec.europa.eu/clima/policies/ets/index_en.htm

———. 2012b. Commission Regulation (EU) No 601/2012 of June 21, 2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:181:0030:0104:EN:PDF

———. 2012c. "The Accreditation and Verification Regulation-Explanatory Guidance." http://ec.europa.eu/clima/policies/ets/monitoring/docs/exp_guidance_1_en.pdf

Environment Canada. 1999. *The Canadian Environmental Protection Act*. http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=040E378D-1, and http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=26A03BFA-1

———. 2010. "Technical Guidance on Reporting Greenhouse Gas Emissions." http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=90113F7F-1

———. 2011. "Reporting to the Greenhouse Gas Emissions Program." http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=F3E7B38E-1

———. 2012. "Facility Greenhouse Gas Emissions Reporting Program: Overview of Reported Emissions 2010." http://ec.gc.ca/ges-ghg/default.asp?lang=En&n=9780F398-1

ERG. 2009. "Review of Verification Systems in Environmental Reporting Programs." Memorandum to U.S. EPA. http://www.epa.gov/ghgreporting/documents/pdf/archived/tsd/Verification%20approaches%20memo%20%282-10-09%29%20Final.pdf

EU (European Union). 2013. "The EU Emissions Trading System." (factsheet.) January. http://ec.europa.eu/clima/publications/docs/factsheet_ets_2013_en.pdf

Federal Register. 2009. *Mandatory Greenhouse Gas Reporting*. Vol 74, No. 209, October 30, 2009, pp. 56374–56519. http://www.epa.gov/ghgreporting/documents/pdf/2009/GHG-MRR-FinalRule.pdf

Gemmill, M. R. 2012. DG Clima, the European Union Emissions Trading System (EU ETS). Interviewed by A. Mahapatra, September 21.

Gourdon, T. 2012. Bilan GES / Base Carbone, Service Climat -ADEME. Interviewed by A. Mahapatra, October 15.

Hopkins, C. 2012. Policy Adviser, GHG Corporate Reporting, Department for Environment, Food and Rural Affairs (Defra). Interviewed by A. Mahapatra, July 30.

Icmeli, T. 2012a. "Key Challenges Regarding MRV Legislation in Turkey." 4th PMR Technical Workshop. Sydney. October 21.

———. 2012b. Expert, Department of Climate Change, Ministry of Environment and Urbanization, Turkey. Interviewed by N. Singh, October 24.

Kauffmann, C., Less, C. T., and D. Teichmann, 2012. "Corporate Greenhouse Gas Emission Reporting: A Stocktaking of Government Schemes" OECD Working Paper 2012/1. OECD Investment Division.

MacDonald, L. 2012. A/Manager, GHG Reporting Section, Pollutant Inventories and Reporting, Environment Canada. Interviewed by A. Mahapatra, August 23.

MEDDE (Ministère de l'Ecologie, du Développement Durable, et de l'Energie). 2011. "Bilans des émissions de gaz à effet de serre." September 15. http://www.developpement-durable.gouv.fr/Bilans-des-emissions-de-gaz-a.html

MOE (Ministry of Environment, Japan). 2010. *Greenhouse Gas Emissions Accounting, Reporting and Publication System Guidelines*. Tokyo: Ministry of Environment.

Ninomiya, Y. 2012. Market Mechanism Group, Institute for Global Environmental Strategies (IGES). Interviewed by A. Mahapatra, August 13.

PMR (Parnership for Market Readiness). 2013. PMR Brochure. May. https://www.thepmr.org/system/files/documents/PMR_brochure_web.pdf

Sekiya, T. 2007. "Mandatory Greenhouse Gas Accounting and Reporting System." http://www.arb.ca.gov/research/seminars/japan/japan2.pdf

Shea, K., and M. Gelardi. 2010. "GHG Emissions Reporting begins Jan. 1." *Power*, January.

Sibold, K. 2012. Outreach, Communications and Training Coordinator, GHG Reporting Program (GHGRP). Interviewed by A. Mahapatra and N. Singh, August 9.

Sturgiss, R. 2012. Director Emissions Inventory Team, Department of Climate Change and Energy Efficiency. Interviewed by A. Mahapatra, August 28.

UNFCCC. 2012. *Report of the In-Depth Review of the Fifth National Communication of the European Union*. http://unfccc.int/resource/docs/2011/idr/eu05.pdf

U.S. EPA (United States Environmental Protection Agency). 2009. *Regulatory Impact Analysis for the Mandatory Reporting of Greenhouse Gas Emissions Final Rule (GHG Reporting)*. September. http://www.epa.gov/ghgreporting/documents/pdf/archived/EPA-HQ-OAR-2008-0508-2229.pdf

———. 2010a. "Greenhouse Gas Reporting Rule." http://www.epa.gov/ghgreporting/documents/pdf/2010/Part-98-Training-Complete.pdf

———. 2010b. "Economic Impact Analysis for the Mandatory Reporting of Greenhouse Gas Emissions under Subpart W Final Rule." http://www.epa.gov/climate/ghgreporting/documents/pdf/2010/Subpart-W_EIA.pdf

———. 2010c. "Mandatory Greenhouse Gas Reporting Rule." Presentation at EPRI CEM User Group Meeting. Cleveland, Ohio. http://www.epa.gov/airmarkt/presentations/docs/epri10/EPRI%20Mandatory%20GHG%20Rule.ppt

———. 2011a. "Why are Both Downstream and Upstream Reporting Required?" http://www.ccdsupport.com/confluence/pages/viewpage.action?pageId=91553964

———. 2011b. "Factsheet Part 98: Action to Defer Reporting of Certain Data Elements." August.

———. 2012a. "Inputs Whose Reporting Deadline Was Deferred until 2013." http://www.epa.gov/ghgreporting/documents/pdf/2012/documents/2013-inputs-factsheet.pdf

———. 2012b. "Cross-Media Electronic Reporting Regulation." http://www.epa.gov/cromerr/

———. 2013a. "Basic Information on GHG Reporting." http://www.epa.gov/ghgreporting/basic-info/index.html

———. 2013b. "GHGRP 2011: Reported Data." http://www.epa.gov/ghgreporting/ghgdata/reported/index.html

WRI and WBCSD (World Resources Institute and World Business Council on Sustainable Development). 2004. *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard*. Washington DC: WRI and WBCSD.

———. 2007. *Measuring to Manage: A Guide to Designing GHG Accounting and Reporting*. Washington DC: WRI and WBCSD.

ABOUT THE AUTHORS

Neelam Singh, nsingh@wri.org (Associate, Climate and Energy Program, WRI)

Avipsa Mahapatra, (former research intern, Climate and Energy Program, WRI; currently is a Climate Policy Analyst at another environmental non-profit)

ACKNOWLEDGMENTS

We would like to thank several colleagues whose reviews and comments contributed greatly to this publication, including Siddarthan Balasubramania (WRI), Wee Kean Fong (WRI), Céline Kauffmann, Thapelo Letete (Department of Environment Affairs, South Africa), Kelly Levin (WRI), Steve Nicholls (National Business Initiative, South Africa), Samantha Putt del Pino (WRI), David Rich (WRI), Kaleigh Robinson (WRI), and Ranping Song (WRI).

We would also like to thank the interviewees from the greenhouse gas reporting programs, including Richard Bode, California Air Resources Board, United States; Robert Gemmill, European Commission, Belgium; Thomas Gourdon, Bilan GES / Base Carbone, France; Carla Hopkins, Defra, United Kingdom; Anhar Karimjee, Katherine Sibold, Kong Chiu, and Bill Irving, Environmental Protection Agency, United States; Loretta MacDonald, Environment Canada, Canada; Yasushi Ninomiya, Institute for Global Environmental Strategies, Japan; and Rob Sturgiss, Department of Climate Change and Energy Efficiency, Australia.

Finally, we would like to gratefully acknowledge Mary Paden for copyediting the paper and Jen Lockard for formatting the paper.

This work is supported by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) under its International Climate Initiative.

Supported by:

based on a decision of the Parliament
of the Federal Republic of Germany

ABOUT WRI

WRI focuses on the intersection of the environment and socio-economic development. We go beyond research to put ideas into action, working globally with governments, business, and civil society to build transformative solutions that protect the earth and improve people's lives.

Solutions to Urgent Sustainability Challenges
WRI's transformative ideas protect the earth, promote development, and advance social equity because sustainability is essential to meeting human needs today, and fulfilling human aspirations tomorrow.

Practical Strategies for Change
WRI spurs progress by providing practical strategies for change and effective tools to implement them. We measure our success in the form of new policies, products, and practices that shift the ways governments work, businesses operate, and people act.

Global Action
We operate globally because today's problems know no boundaries. We are avid communicators because people everywhere are inspired by ideas, empowered by knowledge, and moved to change by greater understanding. We provide innovative paths to a sustainable planet through work that is accurate, fair, and independent.