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# TECHNICAL REPORT

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## Accounting for the future

### International examples

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Prepared for the National Audit Office

The research described in this report was prepared for the National Audit Office.

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# Preface

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The National Audit Office (NAO), as part of its environmental audit activities and in support of the Accounting for Sustainability Group, commissioned RAND Europe to undertake a brief study to identify global examples of interesting practice in the field of sustainability accounting. The aim of the report is to inform the ‘Accounting for the Future’ project of the Group and to support future work by the NAO in this field.

This report draws out some themes on the approaches and initiatives taken by actors in specific countries based on the examples identified. However, this report does not aim to give a comprehensive overview of global accounting for sustainability initiatives and programmes, nor provide an exhaustive overview of initiatives and measures taken in the countries selected. The accounting for sustainability field is emergent and multidisciplinary, with different perspectives, frameworks, and approaches. This report offers a flavour of some of these global approaches with a focus on their implementation and impact. Specifically, the report shows examples of initiatives that aim to internalise the external costs of economic activity and how initiatives aim to change the behaviour of decision-makers and consumers.

The countries selected for this study were Brazil, Canada, China, India, Mexico, South Africa, and the United States of America. The RAND Europe study team also included examples from Europe, Japan and Korea. These countries were selected jointly by the RAND Europe study team and the ‘Accounting for Sustainability Group’. They represent some of the largest global economies and offer a mix between the developed and emerging economies. The structure of this report follows the structure of the main report of the Group. The summary highlights the main findings and themes drawn from the examples. The chapters focus on: government policy (e.g. tax); standards set by the accounting bodies; private sector innovations; and the impact of markets.

RAND Europe is an independent not-for-profit policy research organisation that aims to serve the public interest by improving policymaking and informing public debate. Its clients are European governments, institutions, and firms with a need for rigorous, impartial, multidisciplinary analysis. This report has been peer-reviewed in accordance with RAND’s quality assurance standards.

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# Summary

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1. RAND Europe was commissioned by the National Audit Office (NAO) and the 'Accounting for Sustainability Group' chaired by His Royal Highness The Prince of Wales to undertake a brief study to identify global examples of interesting practice in the field of sustainability accounting. The aim of the report is to inform the 'Accounting for the Future' project of the Group and to support future work by the NAO in this field.
2. The report shows examples of initiatives taken in countries that encourage public and private sector actors to internalise the external costs or wider (environmental and social) impact of economic activity or change the behaviour of decision-makers and consumers towards the mitigation of the environmental and social impact of economic activity.<sup>1</sup> RAND Europe was asked by the Group to identify examples in Brazil, Canada, China, India, Mexico, South Africa, and the United States of America. The RAND Europe study team also included examples from Europe, Japan and Korea. These examples cover several different initiatives. These initiatives include: government policy (such as strategies on the measurement and monitoring of sustainable development, the development of new environmental accounting methods, green taxes, incentives, and enforcement); changes in accounting standards; accounting for sustainability initiatives in the private sector; and market mechanisms (e.g. certification, labelling, and market standardisation). The report does not aim to give a complete overview of the initiatives taken by these countries or of the different initiatives used globally. Rather, the report offers a flavour of the initiatives being used in the countries selected.
3. This research aimed to understand what the impact of sustainable development initiatives is likely to be in terms of the internalisation of costs by the private and public sectors and in terms of subsequent changes in the behaviour of decision-makers. This research also asked some further questions, which were raised as the desk research was undertaken.

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<sup>1</sup> We defined internalisation as follows. A cost is internalised if it is 'felt' by decision makers. To make sure the 'correct' (efficient) decisions are taken, decision makers should bear the full marginal external cost of their activities. This does not necessarily mean full total cost, nor the imposition of costs on people who cannot change external costs. There is a risk of 'double-counting' as many externalities have many causes. Hence, external costs are not always singularly attributable. Where an externality has a single cause, it is possible to impose full liability on the 'polluter'. It is also useful to distinguish between 'ownable' resources (like oil, water, etc.) from common pool resources like air. The latter cannot be tied into property rights, so the accounting principles are different.

- How can the impact of initiatives be measured?
- How will progress on sustainability indicators be monitored, evaluated, and enforced?
- What are the unintended outcomes of the initiatives and how do they affect sustainability?

The main findings and themes drawn from the examples were (see Table 1 on page xii for an overview of the initiatives, examples, and findings):

**The newness of many initiatives precludes in many cases an assessment of their longer-term impact on sustainable development.**

4. The examples of the development of indicators and tax strategies in China show that many initiatives are still in the developmental stage and are not yet being used or implemented. This newness means that any discussion on the impact of these initiatives is mostly speculative or based on projections. Furthermore, some initiatives such as the environmental compensation scheme in Brazil do not yet provide for a systematic monitoring or evaluation of the initiative. A general observation is that more research attention needs to be given to the monitoring and evaluating of the impacts of initiatives.<sup>2</sup>
5. There are two further problems in evaluating and monitoring the impact of initiatives. Firstly, the development of high-level sustainable development indicators is ongoing, which means that the science of the measurement of impacts is also developing.<sup>3</sup> Initiatives of many countries such as the Korean Integrated System of Environmental and Economic Accounting (KORSEEA) and the initiatives of the National Round Table on the Environment and the Economy in Canada are aimed at devising high-level indicators to measure progress on sustainable development. These initiatives provide benchmarks for the measurement of the impact of policy interventions in these countries. The difficulty in designing such indicators is that many country initiatives look at the impact on global public goods, which means that the ability to attribute outcomes to actions is weak. Country initiatives should therefore not be seen in isolation or removed from global progress. Moreover, international standards are continuously developing (e.g. standards for greenhouse gases). Finally, it seems obvious that some impacts are easier to account for than others (e.g. easier to monetise), which means that a comprehensive measurement of the impacts in the sustainable development field is difficult. A contributing factor is that the concept of sustainable development is expanding to include a wider array of social and environmental impacts. Furthermore, initiatives can have unintended consequences that are not necessarily accounted for. For instance, it is unclear what the substitution effect (in terms of the external costs of the use of alternative energy sources) and income effects of China's energy conservation policy will be. In some cases, the mitigation of one externality may lead to the creation of others.

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<sup>2</sup> Initiatives could include for instance balanced scorecards. For an overview of the uses and purposes of balanced scorecards, see <http://www.balancedscorecard.org/basics/bsc1.html>, accessed November 2006.

<sup>3</sup> Many indicators are difficult to measure, which makes monitoring progress difficult.

**Government policy offers many approaches that can contribute to the mitigation of environmental and social impacts of economic activity, but sometimes lacks an integrated approach.**

6. It seems clear that governments have a toolkit to address sustainability issues, which can offer measurement frameworks, strategies, taxes and incentives, regulation and enforcement. Chapter 2 offers various examples. However, the question remains of how well initiatives are integrated across government organisations, across aspects of sustainability (indicators and measurement), and with international initiatives across nations.<sup>4</sup>

Integration is important in four ways. Firstly, as stated in paragraph 5, the mitigation of one externality might lead to the creation of others. Some of the initiatives outlined are geared to specific outcomes, for instance the examples of initiatives against deforestation in Brazil and Mexico in Chapter 2. Therefore initiatives have to be evaluated for unintended outcomes, which have an effect on sustainable development. Possible mitigation of one externality should be related to overall progress on sustainable development. Secondly, some of the initiatives can be somewhat isolated and ad hoc. It can be argued that the different and varied approaches to sustainability taken by Canadian government departments in response to the Auditor-General Act fall short of an integrated and comprehensive sustainability programme. Thirdly, government programmes can suffer from inconsistency and duplication. Fourthly, from the same Canadian example, lack of integration is also characteristic of the gap that still exists in many initiatives between devising a strategy or developing indicators and the actual implementation of sustainability initiatives. For instance, the Canada Revenue Agency was supposed to integrate sustainability criteria into guidelines and documents for partnership agreements. While the Agency had developed the criteria, it had done little to include them in the guidelines or documents. This raises questions of whether elevating sustainability up the political agenda helps or hurts in the promotion of sustainable development and which methods exist to make public sector organisations prioritise sustainability targets.

**Accounting standards can be powerful instruments to encourage companies to internalise environmental costs or indeed to provide incentives to industry sectors.**

7. The examples from Chapter 3 show that accounting standards can be powerful tools to encourage the private sector to internalise environmental costs, or indeed to provide incentives for industry sectors to make specific investments in renewable energy. However, the examples also show that standards need to be targeted and enforced. In the example of South Africa, the asset depreciation allowance extends to industries that should not benefit from it. This extension could mitigate the positive impact of the measure. In the American example, compliance with new standards was not enforced until pressure groups took up the cause.
8. However, in both examples there is limited evidence to suggest what the specific impacts of accounting standards on business decision-making are or are likely to be in the future. For

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<sup>4</sup> It is likely that a common frame can facilitate integration. However, a possible disadvantage of a common frame is a loss of specificity.

instance, in the example of asset depreciation in South Africa will decision-makers opt for increased investment in renewable energy? Here, more research is required to understand the relationships between accounting standards, decision-making, and impact.

**Private sector initiatives on how to account for and report on environmental and social impacts are becoming more sophisticated, but limitations remain.**

9. There are ‘good practice’ examples of companies using environmental accounting to inform business practices and change decision-making. Chapter 4 offers four such examples from Brazil, Canada, Japan, and South Africa. The main motivations behind this use seem to be hedging for potential risks, new accounting standards, preparing to take advantage of new opportunities or gaining a competitive edge, the good standing of the company with investors, and a genuine growing sense of accountability for their impacts.
10. Nonetheless, limitations remain. Firstly, the impact of such decision-making on sustainable development is not always clear. In the example of Suncor, a Canadian oil firm, the impacts varied. Though environmental accounting contributed to the reduction of the per-unit cost of production, the overall level of company emissions has continued to rise. Furthermore, one could also find examples of companies where a divergence exists between reporting and accounting on sustainability, and the actual use of sustainability indicators in the day-to-day management and performance evaluation, i.e. organisations might be aggregating information on their impact without using it to promote sustainability or mitigate possible negative impacts. Sustainability accounting in this way can remain isolated from business governance, especially if investments in the company are not made upon the basis of whether or not the company accounts for environmental or social impacts.<sup>5</sup> This raises the question of the type of instrument that can best promote the mitigation of environmental and social impacts, such as taxes, subsidies, voluntary regulation, mandatory regulation, leaving it to the market, or a mix of these. Finally, the accounting for sustainability field has to address several issues which are normal practice in financial accounting, for instance how to account for opportunity costs, alternatives, and depreciation.

**Standardisation, well-informed consumers, and pressure groups can influence private sector decision-making.**

11. The creation of market standards can allow consumers to make informed choices between products and influence how companies report and account for environmental impacts (see the example of Tata Steel in Chapter 5). The examples of forestry certification in Mexico and energy labelling in China indicate that providing the market with information on the origin of products or the efficiency of products is a direct way to change consumer behaviour. This can have a knock-on effect in terms of how products are produced (see the example forestry certification in Mexico) and the type of products that are being produced (potentially more energy efficient appliances in China) with their associated respective impacts on forest cover and more environmentally friendly production methods in Mexico and energy savings in China. Again, the specific and wider impact of labelling and certification schemes need to be studied further. For instance, one could ask what

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<sup>5</sup> Identified also as ‘business as usual’ by Bebbington and Gray (2001). See also OECD (2002) on governance.

standards produce the most optimal impacts and in what contexts industry-specific, country-wide or international standards are more advisable. For instance, in the context of the World Trade Organisation sustainability is increasingly part of international trade standards. Forest certification is very much tied into international development agendas.

**Table 1: Preliminary taxonomy and observations for examples of accounting for sustainability**

Instigator	Type of initiative	Examples	Preliminary observations
Government	Strategic initiatives	Korean Integrated System of Environmental and Economic Accounting (KORSEEA)	The newness of many initiatives precludes in many cases an assessment of their longer-term impact on sustainable development Government policy offers many approaches that can contribute to the mitigation of environmental and social impacts of economic activity, but sometimes lacks an integrated approach
		Indicator development in Canada	
		Natural resource accounting in China	
	Green tax policy	Energy conservation taxes in China	
		Environmental compensation in Brazil	
	Internalising benefits	Payments for Hydrological Environmental services Program (PSAH) in Mexico	
Ecological value added tax in Brazil			
Green Accounting for India's States and Union Territories (GAISP)			
Litigation	Actions taken against polluters by the State Attorney General of New York, USA		
Organisation and service-level sustainability	Auditor General Act in Canada		
Accounting standards	Asset retirement	Depreciation allowance in South Africa	Accounting standards can be powerful instruments to encourage companies to internalise environmental costs or indeed to provide incentives to industry sectors
		Asset retirement in the United States	
Private sector innovations	Environmental accounting Corporate responsibility reporting	Eskom Sustainability indices in South Africa	Private sector initiatives on how to account for and report on environmental and social impacts are becoming more sophisticated, but limitations remain
		Natura corporate sustainability matrix in Brazil	
		Suncor in Canada	
		Konica Minolta risk measurement in Japan	
Impact of markets	Market standardisation, labelling, and certification	Tata steel and greenhouse gas accounting and reporting in India	Standardisation, well-informed consumers, and pressure groups can influence private sector decision-making
		Energy labelling in China	
		Forest certification in Mexico	
		Socially responsible investors in the United States	

Sustainability accounting and reporting is an emerging but growing field. Public service and private sector actors are increasingly supplementing their normal financial accounting, accounting for and reporting on their wider impact; mainly their impact on the environment and society. International efforts are producing frameworks for accounting and reporting and allowing for 'best practice' to be more readily exchanged between sectors and countries. Drivers of change include the growing scarcity of natural resources (e.g. a major problem in China), the growing evidence of the environmental and social impact of economic growth (e.g. forestry issues in Brazil and climate change on the global level), and growing awareness of and willingness to take responsibility for sustainability issues among policy-makers and business leaders. Moreover, as individuals are becoming aware of the wider impact of decisions taken by government and business, pressure groups from the bottom-up are actively promoting sustainability and try to influence how impacts are accounted for and reported, and how decision-making in the private and public sectors can be changed.

The newness of the field means that definitions are being established and new approaches designed. A main issue was to define the concept of sustainability. A generally accepted and often cited definition for 'sustainability'<sup>6</sup> was put forward by the Brundtland Commission in 1987. It defines sustainable development as the ability - "to meet the needs of the present without compromising the ability of future generations to meet their own needs".<sup>7</sup> The Brundtland definition implied that in the future 'good practice' would require economic decisions to take into account their impact on the environment and their social consequences.<sup>8</sup> Other definitions follow similar lines. The United States President's Council on Sustainability defines it as "economic growth that will benefit present and

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<sup>6</sup> There exists a slight difference between sustainability and sustainable development, with sustainability reflecting 'genuine progress' and sustainable development seen more as material development. However, they are mostly used interchangeably (see for instance the Agenda 21 programme of the United Nations).

<sup>7</sup> Taken from the Brundtland Commission 1987 report 'Our Common Future, accessed at [http://www.are.admin.ch/imperia/md/content/are/nachhaltigeentwicklung/brundtland\\_bericht.pdf?PHPSESSID=f37ad7cfa408a4f3dd94c9a1e34e91ac](http://www.are.admin.ch/imperia/md/content/are/nachhaltigeentwicklung/brundtland_bericht.pdf?PHPSESSID=f37ad7cfa408a4f3dd94c9a1e34e91ac), November 2006.

<sup>8</sup> Sustainability experts are also increasingly focused on cultural sustainability, which is seen as distinct from social sustainability.

future generations without detrimentally affecting the resources or biological systems of the planet".<sup>9</sup>

A wider look at the sustainability of economic decisions as introduced by Brundtland and other government advisory bodies on sustainable development posed important challenges to policy-makers, business, and society at large. The main question was how to create indicators, to measure progress, and design policies and strategies that promote progress towards sustainability.

In terms of indicators, sustainability is a hollow concept unless one could measure what sustainability is and how one is progressing towards achieving more sustainable outcomes. The evidence-base for sustainability indicators is often hard to establish as the wider impacts of economic decisions can be hard to determine, monetise and aggregate.<sup>10</sup> Data are often costly to gather, sometimes of poor quality and out of date, and not necessarily comparable or measured on the same scale.<sup>11</sup> Global and country indicators need to reflect that net savings should take into account the full range of assets underpinning development such as natural resources and human capital, in order to provide a measure of progress towards sustainability (Hamilton 2003). Existing indicators in use today by governments range from extended national accounts (e.g. the United Nations System of Environmental and Economic Accounts, Genuine Progress Indicators, and the World Bank's measure of net savings) to biophysical accounts, such as environmental footprints and eco-efficiency indicators (e.g. resource flows in total and per unit of gross domestic product). Other indicator sets include those developed by the United Nations Commission for Sustainable Development and for instance pressure indices as used in the Netherlands, a set of aggregate indices for specific environmental pressures (e.g. greenhouse gases).<sup>12</sup>

For corporations and the public sector, measuring the environmental and social impacts of operations faces similar problems to the development of indicators by national governments. The development of indicators is slow and often problematic in terms of measurement and accounting approaches, and frameworks for the measurement and reporting of impact are developing (see comment on sustainable cost calculation by Bebbington and Gray 2001). Many initiatives are underway in the private and public sectors to promote means of reporting on and accounting for impacts. Many initiatives on the international level have focused on corporate responsibility reporting and promoting accounting approaches such as triple bottom accounting, full-cost accounting,

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<sup>9</sup> See for instance President's Council on Sustainability 1999 report, 'Towards a Sustainable America: Advancing Prosperity, Opportunity, and a Healthy Environment for the 21st Century', May 1999, accessed at <http://clinton2.nara.gov/PCSD/Publications/>, November 2006.

<sup>10</sup> There are often problems with the attribution of costs and benefits and a distinction needs to be made between private and public goods (see Hamilton 2003). Public goods are not easily monetisable and attribution between outcomes and activities for public goods is difficult.

<sup>11</sup> Indicators should be relevant (easy to interpret; show trends over time, responsive to changes in underlying conditions, and have a reference value) well-founded in scientific and technical terms, measurable, and able to integrate a variety of contributing factors (OECD 1994).

<sup>12</sup> The examples here by no means present an exhaustive overview of the indicators used by governments.



environmental accounting.<sup>13</sup> Some of these initiatives in the United Kingdom (UK) have been promoted by the Forum for the Future, the Association of Chartered Certified Accountants, individual businesses, and industry trade associations (see CIPFA 2004). In general, the private sector in the UK has been ahead in sustainability reporting and accounting compared to the public sector (see CIPFA 2004 assessment). Reporting on sustainability in general has been supported by the Global Reporting Initiative (GRI) guidelines, which have been influential and provide a basic framework for sustainability reporting.<sup>14</sup> Despite the multitude of initiatives, the establishment of regulatory frameworks in the UK has been difficult. The Operating and Financial Review, which would for instance mandate the disclosure by the private sector of carbon emissions, was rejected by the Government.<sup>15</sup> In the public sector, much of the reporting is linked to Public Service Agreements as part of the UK Government's Sustainable Development Strategy. However, such targets still fall short of a comprehensive integrated indicator set.

With reporting and accounting frameworks developing, the main question for the accounting for sustainability field is what the impact of the initiatives of governments, professional accounting bodies, the private sector, and civil society is likely to be. This impact needs to be understood both in terms of whether external costs are likely to be effectively internalised due to the ongoing initiatives in the sustainability field and in terms of whether ongoing initiatives can change the behaviour of decision-makers in the private and public sectors. It is therefore important to understand the dynamic of initiatives and their outcomes better. The desk research undertaken for this research project raised three further questions:

- How can the impact of initiatives be measured?
- How will progress on sustainability issues be monitored, evaluated, and enforced?
- What are the unintended outcomes of the initiatives and how do they impact sustainability?

This report cannot provide complete definitive answers to the questions listed above, but aims to underline the significance of finding answers to these questions as the field of sustainable development matures. A global audit or an international comparison with wider aims would be required for this task. The aim of this report is to provide interesting examples of initiatives taken in countries that encourage public and private sector actors to internalise the wider (environmental and social) impact of economic activity, or change the behaviour of decision-makers and consumers. The countries selected for this study were Brazil, Canada, China, India, Mexico, South Africa, and the United States of America. Furthermore, the study sought to determine in the examples what the impact of the initiative was in terms of whether it was monitored, evaluated, and enforced, whether the

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<sup>13</sup> On accounting standards and approaches in the UK and definitions, see for instance Project Sigma, a partnership between the British Standards Institution, Forum for the Future, and AccountAbility, <http://www.projectsigma.co.uk/Toolkit/SIGMASustainabilityAccounting.pdf>, accessed November 2006.

<sup>14</sup> See GRI, <http://www.globalreporting.org/ReportingFramework/AboutG3/>, accessed November 2006.

<sup>15</sup> The main report of the 'Accounting for the future' project to which this report is an annex makes the distinction between 'inward facing' government initiatives and 'outward facing' initiatives.

initiative changed the behaviour of decision-makers and consumers, and whether there were any unintended consequences.

Examples were gathered through desk research in a non-systematic manner that involved RAND researchers using their experience to identify some of the leading and innovative strategies in this area in the countries selected. The subsequent chapters examine a variety of initiatives in the countries selected. The structure of the report follows the areas the 'Accounting for Sustainability' Group wanted RAND Europe to investigate. The structure is outlined below:

- Government policies that aim to encourage the internalising of the sustainable costs of economic activity or provide incentives that affect decision-making;
- Initiatives on sustainability taken by accounting bodies;
- Private sector innovation aimed at sustainability accounting; and
- The impact of markets on sustainability outcomes.

This chapter provides examples of government policy in the countries selected that encourages the internalising of the sustainability costs of economic activity or changes in the behaviour of decision-makers and consumers. This list of examples is by no means exhaustive in terms of initiatives taken around the world. However, it provides some interesting examples identified in the selected countries. This chapter first categorises government policies and then outlines the examples. The examples give an overview of government policy and attempt to make a statement on the impact of the policy initiatives where possible. A final section broadly sets out what these examples might indicate about the impact of government policy and good practice in government policy.

The main report of the 'Accounting for the Future' project makes a distinction between 'outward facing' government policy and 'inward facing' government policy. 'Outward facing' government policy contributes to the development of sustainable accountancy and influences how decisions are made within the private sector, or at the state and local levels of government. 'Inward facing' government policy focuses on how central government departments and services are promoting organisational and service-level sustainability, i.e. measure their own impact on sustainability, promote ways to mitigate this impact, and monitor and evaluate sustainability.

The study team divided the examples in five categories. The first four categories are 'outward facing'. In these four categories, the examples selected deal with government policy that aims to influence and change the decision-making of private sector actors and government actors at the local and state levels. The fifth category is 'inward facing' and deals with how government is taking measures to assess its own sustainability. The categories are:<sup>16</sup>

- The development of a comprehensive national or state-wide strategy on accounting for sustainability and indicators to measure progress on sustainability;
- Green tax policy;
- Internalising benefits;
- Litigation as a tool to internalise costs; and
- Organisational and service-level sustainability

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<sup>16</sup> Regulation and certification are discussed in the chapter on markets.

In the first category, the examples were: the Korean System of Integrated Environmental and Economic Accounting (KORSEEA); indicator development in Canada; and natural resource accounting in China. In the second category, we identified the following examples: the development of energy conservation taxes in China and Environmental Compensation in Brazil. Examples for the third category were: the ecological value-added tax in Brazil; Payments for Hydrological Environmental Services Program (PSAH) in Mexico; and Green Accounting for India's States and Union Territories Project (GAISP). The fourth category consisted of one example, the use of litigation in the United States. The fifth category contains one example, namely the modification of the Auditor-General Act in Canada.

## 2.1 **The development of a comprehensive national or state-wide strategy on accounting for sustainability**

This category encompasses examples of government initiatives to create comprehensive indicators to measure sustainable development and monitor its progress, strategies to account for sustainability, and the development of natural resource and environmental accounting and their application on an experimental basis.

### 2.1.1 **Korean Integrated System of Environmental and Economic Accounting (KORSEEA)**

According to the 'Basic Environmental Policy Act', the Ministry of Economy in the Republic of Korea is responsible for monitoring progress on the state of the environment and the implementation of environmental policies. This monitoring includes monitoring of national and local Agenda 21 initiatives and also requires the Ministry of Economy to develop wider measures to monitor progress to overall sustainable development. KORSEEA is such an initiative. KORSEEA is a research project run by the Ministry of Economy that adds Environmental Accounting Measures to the National Accounting System. It includes data on expenditures on environmental protection, on charges and subsidies, as well as data on the supply of natural resources, on non-market uses of natural assets by industries and households and on asset accounts of non-produced economic and environmental assets (both in physical and monetary terms, including stocks, changes in stocks through depletion and degradation and other volume changes of land, minerals, forests, fish, air and water).<sup>17</sup>

The impact of the monitoring of environmental policies is not yet known. However, it is noticeable that the Republic of Korea sees such environmental monitoring as part of a wider measurement of sustainable development. This is not only important as an 'outward-facing' measure in that it can influence decisions made by industrial sectors and local governments, but such monitoring can also be used to monitor organisational and service-level sustainability in government.

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<sup>17</sup> Based on United Nations Economic and Social Commission for Asia and Pacific 2000: Environmental Accounting of Korea. [www.unescap.org/stat/envstat/stwes-24.pdf](http://www.unescap.org/stat/envstat/stwes-24.pdf) (accessed November 11, 2006).

### 2.1.2 Indicator development in Canada

Indicator development seems to be a key tool in monitoring the progress towards sustainable development. In general, Canada is at the foreground of indicator development. In 2000, the Canadian government asked the National Round Table on the Environment and the Economy (NRTEE) to develop a set of indicators that could encourage public sector organisations, business, and individuals to integrate environmental considerations into economic decision-making.<sup>18</sup> Its explicit ambition was not to provide a complete and definitive model to measure and monitor Canada's progress towards sustainable development. Rather, the goal of the sustainability indicators is to show the status of capitals such as human, environmental and economic capitals and developing trends, which are important to Canada's current and future sustainability measurement and overall economic performance. The trend lines give an indication whether today's economic activity is threatening longer-term sustainability. The indicators are:

- Air quality in terms of ground-level ozone;
- Freshwater quality in terms of meeting government criteria;
- Greenhouse gas emissions;
- Forest cover;
- Extent (acreage) of wetlands in Canada; and
- Human capital measured by education.

The advantage of these indicators is that they are directly relevant, analytically sound and measurable. In terms of data availability, they can be updated regularly; they can form a base for policy-making; and they can inform wider decision-making. However, as far as the study team is aware there is little evidence on how the systematic measurement of these indicators has shaped policy and informed decision-making. An obvious weakness is that these indicators might provide a less than complete picture of progress on sustainable development in Canada by focusing on specific measurements. For instance, there seems a lack of emphasis on social capital in this indicator set. Furthermore, it is not clear how environmental impacts are attributed to specific activities or how the Canadian strategy is connected to international efforts.

A pilot project in the State of Alberta for the NRTEE developed a Genuine Progress Indicator Accounting Model, which is used to monitor Alberta's progress towards sustainable development. It is seen as one of the most comprehensive redesigns of national and regional accounting systems. The full set of indicators is listed in Appendix A.

### 2.1.3 Natural resource accounting in China

The high consumption of natural resources in China that is both fuelling rapid economic growth and exacerbating the existing scarcity of said resources has prompted the Chinese government to start large pilot projects to account for the impact of economic activity.

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<sup>18</sup> Based on National Round Table on the Environment and the Economy (2003).

Most of the Chinese initiatives are high-level comprehensive programmes. This section highlights two such examples.

The first is the design of natural resource accounting as part of the Agenda 21 priority programme. This design is very much in the developmental stage. The main motivation for the development of an integrated environmental and economic national accounting system is that Chinese policy-makers have a need for a sound basis for the proper valuation, conservation and management of China's limited natural resource base. Policy-makers feel that proper accounting will further sustainable development in every sector and contribute towards effective integration of environment and development at the planning and decision-making level.<sup>19</sup>

Part of the project is the design of natural resource accounting standards and the development of methodologies. This investigates the international experience and standards and tries to apply them in the Chinese context. Another salient aspect of the scheme is the use of pilot projects. Concepts of natural resource and environment accounting are for instance being applied in the forestry sector to determine the impact of the use forestry and mineral resources in selected areas. Pilot projects are currently running in the Shandong region. No impact assessments are available as of yet.

Similarly, a partnership programme, the China Energy Technology Program (CETP), between the Chinese government and ABB, the Swedish/Swiss engineering firm, is focused on developing and applying a methodology to evaluate sustainable electricity strategies for China.<sup>20</sup> The project's aim is to develop a global methodology for assessing the 'real' impact of electric power generation from cradle to grave (lifecycle analysis), taking energy technologies and their environmental impacts into account. The overall goal is to identify the true costs of electrical power generation and develop and use cost-effective and efficient solutions for the future. The project focuses on one province, Shandong, chosen principally because of its independent power grid and diversified energy supply. However, the methodology developed should be applicable for other locations.

These initiatives are part of Chinese efforts to better account for the costs of economic activity and to be able to measure the impact of economic activity on stocks of natural resources and design sustainable economic policies.

## 2.2 Green tax policy

Green tax policy aims to transfer the cost of pollution or the cost of the externality of economic activity to the polluter. Hence, it can be a powerful tool to force or encourage business and individuals to internalise external costs. Specific green taxes and green tax systems are being considered and used in many countries around the world (e.g. the recent

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<sup>19</sup> Based on ACCA21, The Priority Programme for China's Agenda 21 <http://www.sdinfo.net.cn/acca21/indexe8.html> (accessed November 11, 2006).

<sup>20</sup> Based on Integrated Assessment of Sustainable Energy Systems in China. The China Energy Technology Program. A Framework for Decision Support in the Electric Sector of Shandong Province. Alliance for Global Sustainability Book series, Vol. 4 Eliasson, B.; Lee, Y. (Eds.) 2003, 848 p., Springer

debate in the United Kingdom). Green tax policy is often said to have two dividends. The first dividend is the reduction of the overall economic costs, as green tax revenue is used to replace other growth-limiting taxes.<sup>21</sup>

### 2.2.1 Energy conservation taxes in China<sup>22</sup>

Scarcity of natural resources is a main motivation for reform proposals in China. China vows to save energy equivalent to as much as 400 million tons of coal by 2010, and aims to reduce energy use by 2.2% annually during the period, according to the medium and long-term Government energy conservation plans (see Asia Times Article, April 22, 2005). Currently, proposals for the introduction of green taxes are being studied to address the urgent need for energy conservation. Proposals drawn up by the Taxation Administration and the Energy Efficiency Centre at the National Development and Reform Commission (NDRC), incorporate a host of incentive-based measures to encourage the use of renewable energy sources in industrial and transportation sectors. Also, the government is drawing of energy savings targets for provinces. The ambition is to create a complete environmental taxation system, including China's energy sectors, to enable China to restrict its massive consumption of energy.

The tax structure that the Energy Efficiency Centre is developing will cover all sectors involved with energy use, from energy generation to daily energy consumption. Details of the taxation rates are not available, as research has not yet progressed far enough. However, it is known that the rates will be adjusted depending on China's GDP growth and the other economic indicators, such as the consumer price index.

The tax levy will start with sectors that make fewer efforts to implement relevant energy conservation policies and have less impact on the nation's economy, say producers of refrigerators and automobiles. These producers might be asked to compete mostly on energy efficiency rather than the prices of an automobile. A carbon tax that would be levied on sectors such as power and petrochemicals that emit carbon dioxide would take up to five years to develop and implement, as such a tax would have a far-reaching effect on China's economic development drive.

The impact is not yet known, as the tax structure is still being designed. The potential impact is quite significant given the highly energy-intensive production methods used in China. However, despite government targets on energy conservation, it seems likely that economic interest, such as the need for continued economic growth, will mean that the development of a complete environmental taxation scheme will take a long time and

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<sup>21</sup> For an overview of how green taxes can be introduced and what some of the potential effects are, see for instance the Green Fees project at the World Resources Institute, [http://business.wri.org/project\\_description2.cfm?ProjectID=205](http://business.wri.org/project_description2.cfm?ProjectID=205), (accessed November 2006). There is lively debate in the literature on the exact nature and extent of dividends, see e.g. Fullerton, D. and Metcalfe, G.E. (1997) NBER Working Papers, [www.nber.org/papers/w6199.pdf](http://www.nber.org/papers/w6199.pdf), (accessed November 2006).

<sup>22</sup> Most of this information was taken from the University of Alberta China Institute information portal on China's energy conservation. For access, see <http://www.uofaweb.ualberta.ca/chinainstitute/nav03.cfm?nav03=43605&nav02=43096&nav01=42792> (accessed November 2006).

exemptions might be given to certain industrial sectors, which are likely to be the most energy-intensive.<sup>23</sup>

### 2.2.2 Environmental compensation in Brazil

Federal Law No. 9985 of July 18, 2000, establishes Brazil's National System of Protected Areas (SNUC). Article 36 of the law requires that when a public or private project causes a significant environmental impact, the project's proponents have to pay a tax or compensation of no less than 0.5 percent of the total value of the project as compensation for the residual damages. The policy mechanism is a means of forcing planners to internalise the negative externalities, such as loss of biodiversity, associated with their projects.

The law establishes criteria for the amount of environmental compensation a project must pay; the amount of compensation above the 0.5 percent minimum is determined by the anticipated impact on biodiversity. Thus far, the values have been roughly 2.0-3.5 percent of the project value (Young, 2005). When a project is expected to harm a particular conservation area, the office that manages the conservation area is charged with approving the environmental license for the project and determining the appropriate compensation.

Federal Decree No. 4340 of August 22, 2002, establishes priorities for how the compensation monies are to be spent. Priority is given to fixing conservation area boundaries, improving implementation of the management plan, and paying for equipment and facilities. Between 2002 and 2004, the federal government collected USD\$60 million in compensation and observers are projecting that this amount will increase enough to become a substantial source of support for biodiversity protection (Young, 2005).

The impact of the initiative seems promising as it internalises some of the wider impacts of planning, while creating a fund to aid biodiversity. However, the net-impact in terms of the loss of forests, biodiversity, and the possible negative social impacts is less clear.

## 2.3 Internalising benefits

Governments can also offer incentives in order to change the behaviour of decision-makers in the public and private sectors to mitigate some of the external costs of economic activity. Here costs are not as much internalised as averted due to changed producer/consumer behaviour. These incentives are mostly aimed at specific outcomes, for instance the prevention of deforestation and flood management. Such measures in the examples below are aimed at individuals, business, and local and state government.

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<sup>23</sup> There is indeed much debate in China and India whether the implementation of international protocols such as the Kyoto agreement will harm their prospects of continued economic growth. Nonetheless, the Chinese government in these initiatives shows a willingness at least to balance the various interests and to recognise the level of their natural resources stocks.



### 2.3.1 **Payments for Hydrological Environmental Services Program (PSAH) in Mexico**

The Mexican government began PSAH in 2003 to prevent deforestation in areas with severe water problems and where commercial forestry is not competitive. It offers cash payments to land owners for conserving forests on their property in good condition—thus compensating them for the watershed protection that the forests provide. With PSAH, Mexico became only the second developing country in the world to develop a Payment for Environmental Services (PES) program on a national scale (Costa Rica was the first).

An innovative aspect of PSAH is that its funding comes from federal water fees, which creates a direct link between those who provide the environmental service and those who benefit from it. As originally designed, the program's budget would have been 2.5 percent of the fees, which would have allowed it to increase as water use increased. This mechanism faced significant political opposition and was changed to be a fixed amount of the fees—\$200 million pesos (\$18.2 million USD) for 2003 and \$300 million pesos for 2004 and 2005 (Alix-Garcia, et al, 2005).

PSAH pays 300 pesos per hectare of forest conservation and 400 pesos per hectare of cloud forest conservation. In 2003, from 900 applications covering almost 600,000 hectares, program administrators selected 271—covering 127,000 hectares—for inclusion in the program. (WB, 2006) They added 184,000 hectares in 2004 and 169,031 in 2005. (WB, 2006) There are currently 879 contracts covering roughly 480,000 hectares (WB, 2006). The contracts last for five years before they must be renewed.

Despite the success of the program, there are some questions about its impact. Only 14 percent of the forested areas enrolled in 2003 and 2004 were located in regions with overexploited aquifers (Alix-Garcia, et al, 2005). In addition, most of the forested areas enrolled during this time were in regions with low risk of deforestation, indicating that the cash payments did not prevent deforestation from occurring.

### 2.3.2 **Ecological value-added tax in Brazil**

The Imposto sobre Circulação de Mercadorias e Serviços – Ecológico (ICMS-E) is a policy instrument for redistributing state revenue to municipalities based on environmental criteria. The mechanism puts an economic value on the benefits provided by standing forests—such as biodiversity and watershed protection—thereby giving municipalities an incentive to conserve and protect the forests for their long-term sustainable use.

Brazil's 27 states generate approximately 90 percent of their overall state tax revenues from the ICMS value-added tax, which is collected on commercial transactions and exchanges of goods and services (May, et al, 2002). The tax is an important source of revenue for local municipalities as well. Since 1988, Brazil's Federal Constitution has stipulated that 25 percent of ICMS revenues must be allocated to the municipalities and that 75 percent of this funding for municipalities must be distributed based on the economic output of the municipality. The states define the criteria for distributing the remaining 25 percent.

The pressure to create the ICMS-E came from municipalities in the state of Paraná, which has large amounts of land restricted from development for conservation and watershed protection purposes. The restrictions prevented the municipalities from generating economic activity and receiving more of the value-added tax from the state.

Beginning in 1992, Paraná adopted the ICMS-E and began allocating 5 percent of its ICMS revenues to municipalities according to new environmental criteria. Decision-makers in the state were concerned about the long-term effects of both reduced biodiversity and increased costs of water treatment due to development of watershed areas. Therefore, they decided to distribute half of the ICMS-E revenue based on the proportion of municipality land in protected watershed areas and half on the proportion of land in either totally protected or restricted sustainable use areas. These 'conservation units' (CUs) may be publicly managed areas (at the federal, state, or local level), public-private partnerships, or privately owned.

Following Paraná's lead, nine other states have adopted their own versions of ICMS-E with differing proportions of ICMS revenue subject to the criteria. The criteria themselves differ from state to state and besides CUs and watershed protection include solid waste disposal and sanitation, slashing and burning control, soil protection, and local environmental policy. In states that implemented ICMS-E, there have been significant increases in the number and size of protected areas. In the first ten years of the programme in Paraná, there was a 165 percent increase in CU area in the state. (May, et al, 2002)

Municipalities with more protected areas benefit by having more funds to spend on a variety of activities, such as well-drilling, garbage collection, and infrastructure improvements (May, et al, 2002; Ring, 2004). Some local governments carry out information campaigns to communicate the link between environmental protection and the additional benefits. In this way, local government is being incentivised to make decisions that can have a positive impact on the environment.

### 2.3.3 **Green Accounting for India's States and Union Territories Project (GAISP)<sup>24</sup>**

The 'Green Accounting for Indian States & Union Territories Project' (GAISP) aims to recalibrate the existing annual State Domestic Product (SDP) accounts to incorporate changes in each state's stock of natural capital (minerals, arable land, forests & freshwater) and investment in human capital (education, health, and pollution control). This information on natural and human capitals will be a useful frame of reference for future dialogues on public policy and it is expected to sharpen the focus on preserving environmental capital and increasing human capital. The publication of the capital stocks will further enable policy makers to make inter-state comparisons based on benchmarking of states' performance. It is hoped that a policy consequence of Green Accounting may be gradual changes in how states and territories are incentivised and funded and the promotion of increases in budgetary allocations towards improvements in education, public health, and environmental conservation.

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<sup>24</sup> Based on Green Indian States Trust (2006) and Haripriya, Gundimeda, Sanyal S, Sinha R, Sukhdev P. (2005).

## 2.4 **Litigation in the United States**

Litigation is a powerful policy tool used to force companies or governments to internalise the costs of their activities. The actions taken by Eliot Spitzer, the attorney general of New York State and its governor-elect, are good examples of the power of litigation.<sup>25</sup>

Spitzer has been particularly aggressive in enforcing regulations in a number of areas, including environmental regulations. For example, in 2004, the Attorney General assembled a consortium of eight states and New York City as plaintiffs in a suit against five top greenhouse gas polluters. The case was based on public nuisance laws, which gives a right of action to the states even if the pollution is emanating from sources in other states. Spitzer also spearheaded a suit in 2005 to force the Bush Administration's Environmental Protection Agency (EPA) to enforce the 'Clean Air Act'. The EPA had removed power plants from the list of pollution sources subject to pollution controls under the federal 'Clean Air Act'. The suit was later expanded to include the EPA's cap-and-trade rules to reduce mercury emissions, since such a scheme would cause far slower reduction in mercury emissions than previous rules and would have allowed mercury "hot spots" to persist. A further effort led by Spitzer was a 2001 suit against Cinergy Corporation of Ohio's interpretation of the 'New Source Review' provision of the 'Clean Air Act', which requires power plants to install pollution reduction mechanisms when upgrading a plant. Cinergy had attempted to exempt their operations from New Source Review by categorising their actions under 'routine maintenance'. Taken together, Spitzer's actions, which have so far been upheld by the courts, demonstrate that federal environmental regulations can be enforced even when the federal executive does not promote enforcement. It also shows that common law provisions, such as public nuisance laws, can be used to provide standing in large environmental suits.

These cases, in addition to forcing remediation and the payment of damages in individual instances, also increase the likelihood that environmental regulations will be enforced and means types of pollution can be linked to legal liabilities. While these liabilities may or may not be of a similar magnitude to the real social costs of the pollution, they do help to ensure that companies are more likely to factor in pollution when making investment decisions.

## 2.5 **Organisation and service-level sustainability: the Auditor-General Act in Canada**

While the previous examples mostly offered examples of 'outward facing' government policy tools, governments are also increasingly concerned about organisational and service-level sustainability. A good example is the Auditor-General act in Canada. This example was chosen because it provides an interesting example of 'inward facing' measures that are monitored and enforced by the Auditor-General of Canada (House of Commons 2006).

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<sup>25</sup> Based on Office of NY State Attorney General Eliot Spitzer, (2004), Office of NY State Attorney General Eliot Spitzer, (2006a), Office of NY State Attorney General Eliot Spitzer, (2006b).

In 1995, the Auditor General Act was modified to create the position of Commissioner of the Environment and Sustainable Development. The Commissioner is tasked with monitoring and reporting on the progress of Canadian government departments towards sustainable development, 'which is a continually evolving concept based on the integration of social, economic and environmental concerns' (Auditor General Act, 21.1). Included in the Canadian conception of sustainable development is the requirement that entities take 'an integrated approach to planning and making decisions that takes into account the environmental and natural resource cost of different economic options and the economic costs of different environmental and natural resource options' (Auditor General Act, 21.1).

The Commissioner issues an annual report on the sustainable development commitments made by departments. The 2006 report provides a useful overview of the Canadian government's efforts to promote and implement effective sustainable development practices. Many of these efforts are still in their infancy - departments are developing policies, frameworks, and plans to support sustainable development. Other departments have reached the stage where they are actually implementing actions that are targeted at improving sustainable development. Of the 39 targets audited by the commissioner, 27 had achieved satisfactory progress. Of these, 17 could be categorised as having reached the implementation stage. For example, the Correctional Service Canada had committed to reducing nitrogen oxides (NO<sub>x</sub>) from its facilities in the Quebec City-Windsor corridor, and after a retrofit project was successful in reducing its NO<sub>x</sub> emissions by 7.2% over the 2004 baseline. Some of the targets were directly related to improving the accounting for sustainability goals. For example, in 2006, Health Canada had succeeded in developing a prototype database on national annual pesticide sales. The full database will be populated with data once industry reporting requirements are in effect.

The picture is not uniformly positive, however. A general weakness is that government departments set their own sustainability targets. The targets are also short of an overall integrated (across government) strategy on sustainable development. Moreover, some of the organisational plans were inconsistent and some departments failed to achieve even minimal planning targets. For example, Canada Revenue Agency was supposed to integrate sustainability criteria into guidelines and documents for partnership agreements. While the Agency had developed the criteria, it had done little to include them in the guidelines or documents.

## 2.6 Observations from examples

These examples offer a flavour of the initiatives undertaken in selected countries. These examples are by no means an exhaustive overview of the initiatives taken by these countries.

A general observation is that the newness of many initiatives discussed in this chapter precludes for the time being an assessment of the longer-term impact on sustainable development of these government initiatives. As highlighted in the examples such as the development on indicators and strategies in China, many initiatives are still in the developmental stage and are not yet being used or implemented. This is also a consequence of the fact that sustainable development has only recently become a salient policy issue for

emerging economies such as China and India and it is not clear to what extent governments in these countries are willing to prioritise sustainable development initiatives over continued economic growth. Furthermore, initiatives do not always incorporate effective monitoring and evaluation. Therefore, monitoring and enforcing sustainable development targets can be difficult. Here, further research into the monitoring and evaluation of initiatives would be welcome.

There exist few comprehensive systems that can measure the impact of economic activities on sustainable development in most countries, though international exchange of practice occurs (see for instance Global Reporting Initiative and initiatives such as Agenda 21) and has an important role to play. This means that many initiatives (such as taxes and redistributive incentives) are taken with a specific outcome (e.g. to counter deforestation) in mind. However, the possible mitigation of one externality is related to overall mitigation and the overall progress on sustainable development. For instance, it is unclear what the substitution effect (in terms of the external costs of the use of alternative energy sources) and income effects of China's energy conservation policy will be. There might be several rebound effects, where higher incomes in China and substitution away from more expensive energy-intensive goods might lead to a higher consumption of both clean and energy-intensive goods. In this case, the mitigation of one externality may lead to others.

Even in the development of indicators, trade-offs are made between the comprehensiveness of indicator sets and the usability and measurability of the indicators. This trade-off could also produce unintended outcomes and additional costs. This is an observation raised earlier for the aggregate development of indicators in Canada, where social capital indicators are less well-represented. Thus, policy initiatives following the Canadian indicator set could for instance have an inadvertent effect on social institutions (e.g. family, marriage, etc.), which is not necessarily assessed. Finally, the difficulty is designing indicators is that many country initiatives look at the impact on global public goods, which means that the ability to attribute outcomes to actions is weak. This observation also reflects on a broader point that the development of comprehensive indicators to measure and monitor sustainable development is difficult.

An initiative from a sustainable development point of view therefore cannot be seen in isolation from other initiatives or the development of indicator sets. Many countries are promoting more comprehensive strategies (e.g. China and Canada), indicator sets, and toolkits (taxes, subsidies, regulation) to promote sustainable development. International exchange of experiences (in e.g. Agenda 21) with the development of strategies and toolkits is occurring. However, initiatives often are poorly integrated across organisations, across policy areas, across countries and sustainability aspects. The different and varied approaches on sustainability taken by Canadian government departments offer an example of poor integration across public sector organisations and sustainability aspects.

Despite the comprehensive definitions of 'sustainable development' many initiatives, particularly in the examples of Brazil and Mexico, are targeted at environmental impacts only. This is partly because of the particular natural resources of these countries (e.g. unique habitats such as cloud forests and rain forests), but also because social impact is not systematically assessed in particular countries.

Though most examples listed above aim at changing the behaviour of decision-makers, companies, and government actors, relatively little evidence is offered of what the effect of initiative on decision-making is and how changes in decision-making affect sustainable development. Again, further research could further inform the impact on decision-making.

This chapter highlights two examples of accounting standards, one in the United States and one in South Africa. Both examples deal with depreciation of fixed assets, although the mechanisms used in the examples vary. South Africa employs an incentive to depreciate fixed assets used in the production of alternative fuels and renewable energy more quickly. In the case of the United States, the standard requires companies to incorporate the potential environmental consequences of an investment into the cost and the depreciation schedule of a fixed asset. This measure aims at the internalising of economic costs associated with fixed assets. A final section makes some observations of what the examples show us in terms of the impact of the initiatives.

### 3.1 **Depreciation allowance in South Africa**

For tax purposes, the cost of fixed assets (buildings, machinery, etc.) are capitalised and written-off over the life of the asset. The amount that may be written-off each year is the 'depreciation allowance'. In theory, the period of time over which the asset should depreciate is the economic lifecycle of the asset. Under an accelerated depreciation schedule, assets may be written off in shorter amounts of time. This allows an asset to generate economic productivity for the owner while having a zero net value for tax purposes.

In 2004, South Africa introduced accelerated depreciation allowances for plant and machinery equipment used in the production of bio-diesel and bio-ethanol. Owners are allowed to write-off 50 percent of the asset's value after the first year, 30 percent after the second year, and 20 percent after the third year (percentages of total original value). In 2005, a similar tax policy was adopted for machinery used to produce electricity from renewable sources.

The accelerated depreciation allowances are essentially incentives to produce renewable energy. They are part of the government's plan to achieve the goal of adding 10,000GWh of renewable energy use by 2013 (roughly 5 percent of South Africa's total), which was established in the 'White Paper on Renewable Energy' in 2003 (DME, 2006).

Accelerated depreciation schedules are not unique to renewable energy. In fact, South Africa uses them for farming equipment and mining as well. In a sustainable development context, this tax mechanism can be useful to promote sustainable technologies. However, it has been criticised when applied to unsustainable agricultural or mining practices. For instance, mining companies may use the much faster schedule of 100 percent depreciation

after one year, which is arguably a less sustainable accounting practice than if a more realistic depreciation rate were used, given the externalities associated with mining operations.

### 3.2 **Asset retirement in the United States**

Financial Accounting Standards No. 143 (FAS 143) was introduced by the Financial Accounting Standards Board (FASB) in June 2001 to clarify and systematise the accounting standards for asset retirement obligations. The FASB was prompted to begin the standard-making process by a request made by the Edison Electric Institute in 1994 to address accounting for the costs of nuclear decommissioning. The project was later expanded to consider accounting for all asset retirement costs.

The approved standard requires that companies must recognise any legal obligations assumed in relation to asset retirement obligations (such as disposing properly of environmental hazards) at the time the asset is acquired, not at the time the asset is retired. This has the effect of requiring companies to recognise and disclose any distant environmental obligations they may be taking on when they invest in 'dirty' asset.

When the standard was first issued, many companies took advantage of a 'loophole' in the standard that requires recognition of asset requirement costs 'if a reasonable estimate of fair value can be made. If a reasonable estimate of fair value cannot be made in the period the asset retirement obligation is incurred, the liability shall be recognised when a reasonable estimate of fair value can be made' (FAS 143, p. 7, footnotes excluded). Companies interpreted the 'reasonable' standard conservatively, delaying recognition until the fair value could be determined accurately. Since many of these assets are very long-lived (e.g. power plants, mines), there are clearly numerous sources of uncertainty when considering costs that will be incurred decades hence. As a result, the costs of cleaning up many 'dirty' assets were never recognised.

By 2004, the socially responsible investor community<sup>26</sup>, which at the time managed approximately \$2.2 trillion, was pushing for a more rigorous interpretation of the standard (CFO.com, 9/9/2004). The movement was aided by a General accounting Office study published in July 2004 that reported Securities and Exchange Commission (SEC) deficiencies in collecting and monitoring corporate environmental disclosure data and that the SEC and the Environmental Protection Agency were not coordinating their efforts. One consequence of this push was a FASB Interpretation, FIN 47, to clarify the levels of certainty about the asset retirement obligation needed to trigger the FAS 143 reporting

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<sup>26</sup> Socially Responsible Investing (SRI) has three main SRI approaches: social screening, shareholder advocacy, and community investing, with social screening the dominant approach. Social screening is the practice of including social and/or environmental criteria in evaluating investment portfolios. An SRI fund may simply ensure that it does not invest in companies that engage in business practices that the fund finds objectionable. Alternatively, some funds identify and invest in companies that are leaders in putting into practice actions that the fund supports. A shareholder advocacy approach involves taking an active approach towards the ownership role. SRI funds advocate better practices to corporate managers and try to force better practices through proxy resolutions if advocacy is not successful (Bauer, Rob, Kees Koedijk, and Roger Otten 2002).



requirements. Implemented in early 2006, FIN 47 made it clear that if a reasonable expected present value of the obligation can be estimated, the company must recognise the cost and update the estimates as new information becomes available.

The result of FIN 47 has been that many more companies are recognising asset retirement costs upfront. One informal survey of the early implementation of the interpretation found in March 2006, 43 companies newly recognised asset retirement obligations. The total obligations of these companies totalled approximately \$486 million. Furthermore, the companies that had material asset retirement obligations were not just the obvious industries—mining, chemicals, metals, etc—but also restaurants, banks, and retailers. ([www.accountingobserver.com](http://www.accountingobserver.com), 4/7/2007). For some companies, this had a significant effect on their bottom line. For example, Ford Motor Company recognised \$251 million in additional asset retirement obligations as a result of FIN 47, which translates to \$0.11 earnings reduction per share (ReedSmith, 2006). On the other hand, this rule change will not guarantee that all environmental liabilities are quantified and incorporated into the bottom line: one recent survey found that while all of the respondents disclosed environmental liabilities in footnotes or qualitative discussions, only 14% accrued the liability on their financial statements.

An expected consequence of the new interpretation is that markets will develop to help companies manage both the size and the uncertainty related to their asset retirement obligations. The existence of such markets will aid still better pricing of environmental clean-up costs and will stimulate innovation in clean-up methods and in technologies which incur lower costs to begin with. Because it now affects the current bottom line, the requirements also focus executives' attention on environmental costs.

Because the interpretation has come into effect only recently, its full effects are not yet clear. There are some early signs, however, that it could have significant effects on how seriously companies take long-term environmental liabilities. At least one shareholder suit, *In Re: US Liquids Securities Litigation* 2002 U.S. Lexis 26713 (S.D. Tex. 2002), has alleged that the company misled shareholders about material environmental liabilities. This suit is particularly important, since in February 2004, the U.S. Court of Appeals for the 5<sup>th</sup> Circuit upheld the environmental exclusion in the company's 'Directors and Officer' (D&O) insurance policy, thereby putting the company's directors' and officers' personal assets on the line in the suit (ReedSmith, 2006).

### 3.3 Observations from examples

The examples show that accounting standards can be powerful instruments to encourage companies to internalise environmental costs or indeed to incentivise industry sectors to make specific investments in renewable energy. The example of South Africa also shows that targeting of initiatives is important. In this case, the asset depreciation allowance possibly extends to industries that should not benefit from it. This extension could mitigate the positive impact of the measure. The American example shows the importance of pressure groups in promoting compliance with new standards. This point also underlines the general importance of the enforcement and evaluation of standards by

government. In this example the standard existed but was not enforced until pressure groups took up the cause.

In both cases, there is anecdotal evidence that these standards are having an impact. For instance, in the United States, companies such as Ford Motor Company were forced to add significant costs to their bottom line. However, there is too little evidence to suggest what the specific impacts on business decision-making are or are likely to be in the future, for instance increased investment in renewable energy at the expense of carbon fuels in South Africa or less investment in 'dirty assets' in the United States. Further research on the impact on decision-making is required.

This chapter highlight initiatives taken in the private sector in the countries selected to account for sustainability. Many of these initiatives taken in the private sector have focused on corporate responsibility reporting and the promotion of accounting approaches such as triple bottom accounting, full-cost accounting, and environmental accounting. The examples below taken from South Africa, Brazil, Canada, and Japan will highlight initiatives taken by the private sector. These examples listed below cover how companies measure sustainability, how they report their environmental and social impact, and how they use sustainability measures in their business practices. The final section makes some observations on the impact of these private sector initiatives.

#### 4.1 **Eskom sustainability indices**

Eskom is a state-owned utility company that generates, transmits, and distributes 95 percent of South Africa's electricity (WBCSD, 2005). It began reporting on its environmental performance in 1994 and in 2000 decided to integrate the information into its annual report. Eskom has developed its own sustainability indices-the sustainability performance index and the operational sustainability index-to help to further incorporate environmental, economic, and social sustainability into its performance evaluations.

The sustainability performance index was developed and approved in 2003 and implemented in 2005 after thorough testing. It compares 21 specific measures to certain set parameters to compute a score for the four areas of technical, economic, environmental, and social performance. A score of 3 out of 5 for each sector is considered sustainable and the average of the four is the overall score. The index is considered during executive performance reviews.

Eskom also measures and assesses environmental performance through the environmental component of the operational sustainability index. Four equally-weighted performance indicators comprise the index: particulate emissions, water consumption, customer perception of environmental performance, and legal contraventions.

Besides the internal sustainability indices, Eskom uses local and international guidelines, such as the Global Reporting Initiative (GRI) and the UN Global Compact, to create its annual report. In 2005 the utility benchmarked its sustainability performance against the Socially Responsible Investment (SRI) index of the Johannesburg Securities Exchange (JSE) even though they were not eligible for inclusion in the index (EHL 2005).

## 4.2 **Natura's corporate responsibility matrix**

The Brazilian Corporation Natura Cosméticos S.A. is a leader in corporate responsibility and sustainable development. Two years after its inception in 1999, it became the first Latin American company to follow the Global Reporting Initiative (GRI) guidelines. Natura is now the largest cosmetics company in Latin America (Natura 2005 Annual Report).

Natura developed the Corporate Responsibility Matrix in 2004 as a tool for managers to help plan their actions towards different sectors of society. It breaks down investments related to corporate responsibility into three categories on the y-axis: fundamentals, which include ethics and transparency; socioeconomic, or the promotion of sustainable development; and environmental, or protection of the environment. On the x-axis, each investment is categorised based on the corresponding group of beneficiaries, such as company personnel, suppliers, consumers, government, and society. In its annual report, Natura reports the overall Corporate Responsibility Matrix for the entire company. The matrix is not just a strategy tool for managers and a way to assess performance, but also a reporting tool for the company.

## 4.3 **Suncor**

Suncor is a Canadian energy company whose core business is extracting petroleum from Canadian oil sands. The company is listed on the Dow Jones Sustainability Index since the index's inception in 1999.<sup>27</sup>

One component of Suncor's sustainability practice is a commitment to issuing an annual, externally audited Report on Sustainability. The report is prepared in accordance with the 2002 Global Reporting Initiative (GRI) Sustainability Guidelines, and includes data on social, environmental and economic performance. It received an award for reporting excellence from Ceres-ACCA in 2004.<sup>28</sup>

Even though the company's total emissions and energy consumption increased over the period of 2000-2004, the company's emission intensity and energy intensity—its emissions and energy consumption per cubic meter produced—has consistently declined over the same period, reflecting improved technology and business practices. In addition to reducing environmental impact, the improvements in the intensity metrics have reduced the per-unit cost of production.

According to its 2004 Report on Sustainability, Suncor was the first Canadian energy company to present a cost analysis of the Kyoto Protocol determining that compliance is not likely to have a negative material effect on business. The compliance costs were estimated to come to between \$0.20 and \$0.27 per barrel of oil. In the company's most recent annual report, the company recognised environmental regulation as a major source

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<sup>27</sup> Based on Suncor Sustainability Report 2005; Canadian Business Online, February 22, 2006.

<sup>28</sup> See Ceres, at [http://www.ceres.org/news/news\\_item.php?nid=99](http://www.ceres.org/news/news_item.php?nid=99) (accessed November 2006). Ceres is a national network of investors, environmental organizations and other public interest groups working with companies and investors to address sustainability challenges such as global climate change.

of risk and uncertainty. By taking proactive measures, such as those discussed above, Suncor is reducing the likelihood that future regulation will have a material impact on the company's ability to continue to operate profitably.

#### 4.4 Risk measurement in Konica Minolta

Konica Minolta environmental accounting refers to the converted monetary value of benefits derived from the various environmental measures implemented. Konica's environmental measures is compared and studied quantitatively. This enables rational decision-making so as to ensure implementation of the most effective environmental measures that directly links environmental measures with management strategy.

The Konica Minolta Group has established both standards and assessment methods for risk calculation, as well as for economic and environmental protection benefits. In so doing, they have gained a better understanding of the benefits of risk reduction, which can be expressed in monetary terms as 'assumed benefits' of the environmental impact reduction obtained by implementing certain measures, as compared to the environmental impact that would be experienced without such measures (Konica Minolta 2005).

**Table 2: Risk reduction benefits**

Fiscal 2005: Risk Reduction Benefits		
Stage	Measures to Prevent Global Warming	Minimisation of Chemical Risks
Measures and activities undertaken in fiscal 2005	Worldwide reduction of carbon dioxide (CO2) emissions based on Life Cycle Assessment (LCA) for all products	Reduction of atmospheric emissions of dichloromethane, benzene and methanol
Environmental impact reduction benefits	CO2 emissions: Reduction of 122,307 tons	Atmospheric emissions: Reduction of 37 tons
Risk reduction benefits in monetary units	¥1,223 million	¥30 million

Source: Konica Minolta Activity Environmental Report 2005

#### 4.5 Observations from examples

One of the issues in private sector accounting and reporting of sustainability has been the existence of a possible divergence between reporting and accounting on sustainability and the actual use of sustainability indicators in the day-to-day management, reporting, and performance evaluation, that is organisations might be aggregating information on their environmental and social impact without using it to promote sustainability or mitigate possible negative impacts. It would seem that accounting for sustainability can only have a telling impact if it means companies internalise costs and change business practices. This observation comments to some extent on the possible weakness of voluntary regulation and standards. Companies under voluntary regulation do not necessarily have a cost of non-

compliance or an incentive to comply. Also unilateral inclusion of certain costs could affect the competitiveness of a company.<sup>29</sup>

In most of the examples outlined in this chapter, individual companies use environmental accounting in their strategy formulation and business practices. The main motivations behind this use are the hedging for potential business risks in the future (e.g. regulation), new accounting standards, new business opportunities (e.g. first-mover advantages<sup>30</sup>), the good standing of the company with investors, and a genuine growing sense of accountability within companies for their impacts. In all cases, companies have to some extent internalised their environmental impact and some of the risks associated with this impact. Examples are:

- Eskom and Natura use their environmental impact measurement/matrix during company performance reviews and the determination of company strategy.
- Natura evaluates the sustainability of its supply chain on the basis of its matrix.
- Suncor reviews the risk of future regulation on the basis of environmental accounting.
- Konica Minolta assesses the monetised benefits of its environmental measures and targets its environmental measures accordingly.

It seems clear that sustainability accounting and reporting can have an impact on decision-making within companies. However, the impact of this reporting and accounting on sustainable development is less clear. In the case of Suncor, though the per-unit cost of production has been reduced, the overall level of emissions has risen. In the case of Konica Minolta, it is not clear that its monetised environmental impact is not offset by other costs of its economic activities. Further, it is not clear to what extent environmental accounting affects business decisions in Eskom and Natura. For instance, one could ask whether the accounting of environmental impacts is of material importance in making investment decisions.

The observations above reflect on the general difficulty of the measurement of the impact on sustainable development or the progress towards sustainability.

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<sup>29</sup> This argument is hotly debated and similar to argument surrounding environmental standards and international competitiveness. There are two opposing views of the impact of environmental regulation on international competitiveness. One view suggests that strict environmental regulation can be used as an instrument of industrial policy to force industry to become more efficient and more competitive. Implicitly, there are first-mover advantages associated with industry devising means of operating under strict environmental regulation. The opposite view is that strict environmental regulation can harm the international competitiveness of domestic firms as they lose out to other countries which become pollution havens. This argument calls for a level playing field of environmental standards. For these arguments also see EC 2004, [http://ec.europa.eu/enterprise/enterprise\\_policy/industry/doc/sec\\_769\\_2004.pdf](http://ec.europa.eu/enterprise/enterprise_policy/industry/doc/sec_769_2004.pdf), accessed November 2006.

<sup>30</sup> This term holds that companies can get a competitive advantage by being the first to anticipate changes in the business environment, e.g. stricter environmental regulations or moves towards green procurement.

This chapter outlines some examples on the impact of markets on sustainable development. There are three examples. A first example on Tata steel in India deals with the impact of market regulation and organisation for greenhouse gases. Three further examples on energy labelling in China, forestry certification in Mexico, and socially responsible investors in the United States highlight the importance of information as a market mechanism and how information on sustainable development can be used to change consumer, company, government behaviour.

This chapter does not aim to provide an overview of how markets are organised nor provide an overview of the impact of markets for greenhouse gases, for instance the effect of the allocation system for permits. Rather, this chapter aims to show some examples of how market mechanisms such as market standards for greenhouse gases and the provision of information can shape outcomes, in particular how market mechanisms change the behaviour of decision-makers. The final section makes some concluding observations on the examples.

### 5.1 **Tata Steel and greenhouse gas accounting and reporting<sup>31</sup>**

For Tata Steel, Asia's first and India's largest integrated private sector steel company, reducing its Greenhouse Gas (GHG) emissions through energy efficiency is a key element of its primary business goal: the acceptability of its product in international markets. Each year, in pursuit of this goal, the company launches several energy efficiency projects and introduces less-GHG-intensive processes. The company is also actively pursuing GHG trading markets as a means of further improving its GHG performance. To succeed in these efforts and be eligible for emerging trading schemes, Tata Steel must have an accurate GHG inventory that includes all processes and activities, allows for meaningful benchmarking, measures improvements, and promotes credible reporting.

Tata Steel has developed the capacity to measure its progress in reducing GHG emissions. Tata Steel's managers have access to on-line information on energy usage, material usage, waste and by-product generation. Using this data and the GHG Protocol calculation tools,

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<sup>31</sup> TERI (Tata Energy Research Institute) 2004: Greening the Budget, Case Studies

Tata Steel generates two key long-term, strategic performance indicators: specific energy consumption (Giga calorie / tonne of crude steel) and GHG intensity (tonne of CO<sub>2</sub> equivalent / tonne of crude steel). These indicators are key sustainability metrics in the steel sector worldwide, and help ensure market acceptability and competitiveness.

Since the company adopted the *GHG Protocol Corporate Standard*, tracking performance has become more structured and streamlined. This system allows Tata Steel quick and easy access to its GHG inventory and helps the company maximise process and material flow efficiencies.

## 5.2 Energy labelling in China

Worldwide, 'green labels' help to reduce environmental degradation by helping consumers make more informed choices about the products they buy. Amidst a growing number of green labels in China, one of the most prominent is an energy efficiency green label program managed by the Certification Center for Energy Conservation Products (CECP) (McNeil and Hathaway 2004). The CECP label identifies products with superior energy efficiency. The vast majority of Chinese product manufacturers have voluntarily decided to use the label since it can enhance the attractiveness of their products in the Chinese consumer marketplace.<sup>32</sup>

The environmental impacts of electricity generation are well known, and make a compelling case for energy efficiency labelling. In China and the United States most of the electricity supply is generated by the combustion of fossil fuels, primarily coal. The environmental consequences of coal burning are very serious: each kilowatt-hour produces approximately a kilogram of carbon dioxide, and coal-fired electricity generating facilities also emit substantial amounts of air pollutants.

When developing a recent promotional campaign for CECP-labelled products, CECP hired a Beijing-based advertising firm to conduct market research to better understand the concerns of potential refrigerator purchasers. CECP found that 68 percent of consumers felt that a label indicating 'authoritative (e.g., state) certification' was the most compelling when selecting an energy-efficient product. In another study, the majority (54 percent) of those surveyed indicated that they first looked to an authoritative product label when they made a refrigerator purchasing decision, while personal information from others, product manuals, and evaluations from manufacturer associations ranked lower in importance.

The case of energy labelling in China shows that providing information to consumers can potentially have a large impact on energy savings. However, it also seems clear that more work needs to be done to evaluate potential impacts and to quantify potential and actual savings.

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<sup>32</sup> Sources are Jin Minghong, Li Aixian, China National Institute of Standardization, 2005; Gary McNeil and David Hathaway 2004.



### 5.3 Forest certification in Mexico

Forest certification in Mexico was driven by consumers. Forest certification began in Mexico in 1994—emerging from an alliance between the Mexican Advisory Council for Sustainable Forestry (CCMSS) and the ‘SmartWood’ Program of the Rainforest Alliance. The Rainforest Alliance had just helped to found the Forest Stewardship Council (FSC) in 1993 to promote “environmentally responsible, socially beneficial and economically viable management of the world's forests” (FSC, 2006). The idea behind the FSC was that it would accredit independent auditors who would in turn certify forestry operations according to its principles and criteria of sustainability. Forest certification in northern Mexico was driven by pressure from U.S. and European clients to produce FSC-certified wood (Fonseca, 2004). Beginning in 1999, forest product companies began approaching CCMSS to arrange certification for their raw wood suppliers. Accreditation has been popular. In Mexico, the number of FSC-certified operations has continued to grow since 1994. They now number 41 and cover over 706,000 hectares—roughly 8 percent of Mexico’s forestland with a federal forestry permit. (UNEP-WCMC, WWF, FSC & GTZ, 2006; Fonseca, 2004).

### 5.4 Socially responsible investors

The socially responsible investor (SRI) community is the driving force behind much of the sustainable accounting done in the United States. According to the 2005 Report on Socially Responsible Investing Trends in the United States (Social Investment Forum, 2006), assets managed by entities using socially responsible investment strategies has increased from \$639 billion in 1995 to almost \$2.3 trillion in 2005. This growth is faster than the growth of the overall U.S. markets.

There are three main SRI approaches: social screening, shareholder advocacy, and community investing. Social screening is the dominant approach and consists of the practice of including social and/or environmental criteria in evaluating investment portfolios. An SRI fund may simply ensure that it does not invest in companies that engage in business practices that the fund finds objectionable. Alternatively, some funds identify and invest in companies that are leaders in putting into practice actions that the fund supports. A shareholder advocacy approach involves taking an active approach in the ownership role of a company. SRI funds advocate better practices to corporate managers and try to force better practices through proxy resolutions if advocacy is not successful.

A number of academic studies show that SRI funds do no worse than average (Bauer, Koedijk and Otten, 2002; Stone, Guerard, Gultekin and Adams, 2001; Guerard, 1996; and Hamilton, Jo and Statman, 1993) and some find that companies that meet various SRI criteria outperform those that do not (Guenster, Derwall, Bauer and Koedijk, 2005; Orlitzky, Schmidt and Rynes, 2003; Dowell, Hart and Yeung, 2000; and Repetto and Austin, 2000). This suggests that, at worst, socially responsible business practices are on aggregate economically neutral.

On the advocacy front, SRI shareholder advocacy efforts seem to be increasingly effective, when measured by the number of proxy proposals withdrawn. Proposals are usually withdrawn when management agrees to address concerns without being forced to by a

proxy battle. While proxy proposals that are not supported by management rarely win, sustainability proxy proposals get a relatively large proportion of the vote: 24 to 25%. Even if they fail to enact the specific changes proposed, such votes help draw attention and negative publicity to a corporation's harmful behaviour and may succeed in effecting more gradual change.

The SRI community has also been active in advocating for system-wide improvements in transparency. In addition to agitating for change in accounting rules (see example on asset depreciation in the United States of Section 3.2 of Chapter 3), they were also advocates for the new Securities Exchange Commission rule requiring mutual funds and investment advisors to disclose how they vote on proxy issues.

## 5.5 Observations from examples

The evidence from these examples suggests that market mechanisms can be important contributors to changing the behaviour of company decision-makers. In the example of Tata Steel, compliance with standards on GHG trading shaped how the company measured and reported on its GHG emissions. This raises the question of what extent such international standards are effective and the relationship between trading schemes and progress towards sustainability. This question is too extensive for this study to answer. Nonetheless, some evidence suggests that trading schemes such as the European Trading Scheme have a modest effect on emission reduction. This reduction seems related to the initial market organisation (allocation of permits and how permits can be traded), to how standards on reporting are drawn up, and to the verification and monitoring mechanisms. International standards seem to promote industry standardisation on reporting (e.g. in the steel industry)<sup>33</sup> and can promote the international exchange of technologies to mitigate environmental impacts. (Pewclimate 2004).

Regulating information on the origin of products or the efficiency of products is a direct way to change consumer behaviour. This can have knock-on effect in terms of how products are produced (see forestry certification in Mexico) and the type of products that are being produced (potentially more energy efficient appliances in China) with their associated respective impacts on forest cover and more environmentally friendly production methods in Mexico and energy savings in China.<sup>34</sup> Again, the impact of labelling and certification schemes needs further study. For instance, can we link certain impacts of energy savings to the quality and quantity of labelling? Does labelling also have an effect on production methods, i.e. wider mitigation of environmental impacts? Are there any unintended effects and outcomes associated with labelling or certification (e.g. substitution effects linked to price rises of certified or energy efficient products)? Further, one could ask wider questions on the mechanisms. For instance, one could ask what

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<sup>33</sup> Aside from the cost implications of trading schemes, reputation seems to be an important contributing factor to what type of trading strategy companies choose.

<sup>34</sup> International evidence suggests that labelling produces important energy savings (see for instance case of Australia NAECC Report 2005).

standards produce the most optimal impacts and in what contexts are industry-specific, country-wide or international standards more advisable.

Consumers and investors also influence consumer behaviour through pressure groups. The rise of the SRI community in the United States is having a direct impact on how companies report on corporate responsibility and environmental impacts and as Section 3.2 in Chapter 3 showed this has consequences for how companies have internalised some of the external costs associated with their economic activities.



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## **APPENDICES**

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# Appendix A: Genuine Progress Indicator Accounting Development in the State of Alberta

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## Indicators measured and considered in sustainability indices<sup>35</sup>

### Economy

GDP and its components:

- Personal consumption expenditures
- Government expenditures
- Government investment in fixed capital
- Business investment in fixed capital
- Business investment in inventories
- Trade balance: exports less imports of goods and services
- Expenditures (households, business and government)
- Disposable income
- Debt (households, government, business, farm, student)
- Savings (households, government) and net worth

### Livelihood

- Employment, unemployment, underemployment
- Poverty
- Equity: income and wealth inequality and distribution

### Infrastructure

- Household infrastructure
- Public infrastructure

### Transportation and Trade

- Private and public transportation (commuting)
- Commercial transportation and trade

### Time Use

- Paid work
- Unpaid work time
- Unpaid housework, parenting and eldercare
- Volunteerism
- Leisure time

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<sup>35</sup> Anielska, M, Pembina Institute (2001).

- Commuting time
- Employment, involuntary unemployment, underemployment and overtime

#### **Social Capital**

- Crime and violence
- Family breakdown
- Democracy

#### **Knowledge Capital**

- Educational attainment

#### **Health and Wellness**

- Life expectancy and self-rated health
- Obesity
- Premature mortality
- Disease
- Auto crashes
- Infant mortality and low birth-weight babies
- Teen pregnancy
- Suicide
- Spirituality
- Aboriginal well-being
- Substance abuse (drugs, alcohol, tobacco)
- Gambling

#### **Ecological Footprint**

- Household ecological footprint (food, energy, clothing, transportation)
- Industrial footprint (eco-efficiency, energy efficiency, material flow)

#### **Natural Resource Accounts**

- Non-renewable resources (oil, gas, coal)
- Minerals
- Forests (timber and non-timber resources)
- Wetlands and peatlands
- Agriculture and other soil productivity
- Carbon budget
- Fish and wildlife
- Parks and wilderness
- Ecosystem integrity

#### **Environmental Quality Accounts**

- Air quality and greenhouse gas emissions
- Water quality and flow (surface and ground water)
- Noise pollution
- Toxic waste
- Municipal landfill waste