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WHITE PAPER

TOWARDS A GREEN ECONOMY FOR CANADA

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SUSTAINABLE PROSPERITY WHITE PAPER FINAL DRAFT

ABOUT US

Sustainable Prosperity is a national green economy think tank and policy research network based out of the University of Ottawa. Directed by some of Canada's top economic, environmental, research and business leaders, our mission is to generate smart ideas to build a greener, more competitive Canadian economy.

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Responsibility for the final product and its conclusions is Sustainable Prosperity's alone, and should not be assigned to the Advisory Group or any other external party. Similarly, their association with this initiative should not be interpreted as endorsement of the White Paper.

EXECUTIVE SUMMARY

This White Paper seeks to promote and support a dialogue among decision-makers in both the public and private sectors on what the "green economy" means, and what it could mean for Canada.

In the aftermath of recent global financial and economic crises, an increasing number of jurisdictions are beginning to turn to the concept of a "green economy" to explain how they plan to think about future economic development -- as a way to frame strategies, policies and development plans that address both economic and environmental challenges. But the increased use of this term, and its salience to decision makers in the public and private realm, increases the need for rigour in its definition and measurement, to avoid confusion and uncertainty that could delay or limit action.

To date, a "green economy" has been defined, both in the international and domestic contexts, relatively narrowly, focusing on the production of goods and services that have obvious environmental benefits or that are intended to reduce consumption and environmental impacts. Through this White Paper, Sustainable Prosperity argues for a broader, more inclusive definition of a "green economy" – one that can encompass all sectors in the economy, including Canada's important natural resource sector, and not just those that create environmental goods and services. Moreover, SP wants to underline that this debate is as much about how Canada goes about "greening" its economy than about how "green" the Canadian economy is, or should be. All sectors should aim to improve their relative environmental performance, with a longer term goal to achieve large absolute reductions in environmental impacts and improvements in the productivity of natural resource use.

This vision of a "green economy" is entirely compatible with a strong economic future for Canada, including increased productivity, employment, and innovation. This is particularly true in light of the advantage that resource productivity will represent as we move into an era of increased resource scarcity. Being more productive will make us more competitive, and developing solutions and products that serve to increase resource productivity will find new, ready, and substantial markets internationally.

The analysis and data presented in this White Paper suggest that while the Canadian economy is *greening*, it is currently far from *being green*. A truly green economy would operate within well-understood ecological limits. However, there currently is a lack of data to identify these limits for most ecosystem services and how to manage them on a national, provincial, regional, sectoral or company level.

If Canada is to move towards the realization of a truly "green economy", unique macro- and micro-economic challenges and opportunities must be addressed. The Paper reviews four key challenges:

- increasing resource productivity;
- identifying ecological limits;
- improving competitiveness and innovation; and,
- increasing resilience to climate change and other shocks.

The White Paper concludes by proposing an initial set of practical indicators that could immediately support policy-makers in developing appropriate policy responses, setting priorities and tracking progress towards a green economy. The indicators are intended to be only the start of a more comprehensive set. But, importantly, the data needed to support these indicators are generally accessible now.

INTRODUCTION

Deep structural changes are underway in the global economy. From the reverberations of the 2008-09 financial meltdown to the rise of the BRICs[1] and other emerging economies, the global economic landscape is being fundamentally altered. These changes present both challenges and opportunities for Canada, inasmuch as the future prosperity of Canadians is intimately tied to the evolution and stability of the global economic system.

Precipitated in part by these events, questions are being raised about the sustainability of an economic paradigm based on continual growth. Having seen some of their traditional strengths in manufacturing eroded by the emergence of the BRICs and weakened by the financial crisis, many developed countries are thinking strategically about how to grow their economies. Moreover, they do so knowing that the policy response they have deployed to address the financial crisis and its aftermath has seriously narrowed their fiscal and monetary policy options. Many countries are looking to new initiatives in trade policy, engaging in a race to gain emerging market access and provide new sources of export-led growth. But they are finding that traditional areas of export strength (outside of natural resources) are now dominated by those same economies into which they want to export. And so the challenge has increasingly become about how to create and dominate new markets, while promoting innovation and productivity increases in existing sectors.

Another legacy of 2008-09 (and in fact its one silver lining), is the appreciation it has created for enhanced understanding and management of risk among the business and policy communities. A big part of the risk management agenda, both internationally and nationally, has come through new regulations and institutions meant to address financial and economic risk in a systematic fashion. But it has also begun to open the door to an improved comprehension of how other forms of risk - particularly environmental risk - impact economic prosperity. Environmental trends will create increasing unpredictability in weather patterns, stability of other ecological systems and resource availability, creating challenges for companies and countries that are not prepared.

The other side of the coin, of course, is that the imperative to shift to an economy that is less carbon-, energy- and resource-intensive will create economic opportunities. McKinsey, in its *The Resource Revolution* report, estimates that the global resource productivity agenda represents a $3 trillion opportunity.[2] The global consultancy makes the following observation, which SP would readily endorse: *"In the 20th century, governments and businesses didn't have to worry about resource productivity; they were able to focus on capital and labor instead. Over the next 20 years, resource needs to be put at the heart of public policy and business strategy."*

[1] The BRIC countries are Brazil, Russia, India and China, although there are many other emerging economies, including Indonesia, Vietnam and others.

[2] McKinsey Global Institute, *Resource Revolution: Meeting the world's energy, materials, food, and water needs.* November 2011. Accessed at: http://www.mckinsey.com/Insights/MGI/Research/Natural_Resources/Resource_revolution.

In the aftermath of the global financial and economic crises, the green economy is now a concept that many jurisdictions are using to explain how they plan to think about future economic development, as a way to frame strategies, policies and development plans that address both economic and environmental challenges. As the Managing Director of the International Monetary Fund, Christine Lagarde, said in a recent speech: "*first and foremost, we need to get growth going again—but on a different track than before the crisis*".[3] Inasmuch as the concept of a green economy is used to define and describe economic risks and opportunities, it is also useful as a concept to guide private sector investment and activities.

But the increased use of this term, and its salience to decision-makers in the public and private realm, increases the need for rigour in its definition and measurement, to avoid confusion and uncertainty that could delay or limit action.

The most fundamental of these definitional challenges turns on the difference between *greening the economy* and a *green economy*. It may seem like a distinction more than a difference, but in this case the gerund is significant. "Greening" implies an active and dynamic process of change; while the latter implies an end-state that has been achieved. If, as we discuss later, a green economy is one that exists and grows within defined ecological parameters, then we need to state from the outset that there is no developed economy in the world that can be considered truly "green". But at the same time, any consideration of a relative concept like "greening" only makes sense if it is rooted in a measure that is absolute. It is worth little to think of greening if we do not know what we are greening towards.

So both concepts are of great importance and relevance to a discussion of Canada's economic and environmental future. The true nature and implications of a "green economy", especially in the Canadian context, need to be clearly articulated and understood, inasmuch as ecological limits create the absolute targets against which the environmental sustainability of an economy needs to be measured. This is fundamentally different from understanding the current status of the greening of the economy, which implies the relative measurement of progress over time and against peers. Those are important issues to be identified and further debated. For now, though, SP believes that a focus on greening the Canadian economy is more inclusive, constructive, and tangible, and for that reason it is the focus of this White Paper.

[3] ***Back to Rio—the Road to a Sustainable Economic Future***. Remarks by Christine Lagarde, delivered in Washington DC, June 12, 2012.

OBJECTIVES AND SCOPE OF THE WHITE PAPER

This White Paper seeks to advance the state of knowledge in Canada on the green economy, and to serve as reference document for further engagement and dialogue. The White Paper is intended for decision-makers in both the public and private sectors who are looking to understand the concept of a green economy as it relates to Canada.

The scope of the Paper focuses on the environmental dimension of the green economy, though it acknowledges the importance of the social dimension as well, including moving towards a more equitable distribution of economic benefits. At a minimum, greening the economy must not worsen existing economic disparities. In addition, the Paper does not examine the reasons for the current state of environmental and other interrelated problems, such as a focus on the short-term and the fact that environmental externalities are not, for the most part, valued by the current economic system. The Paper examines the green economy at both the macro- and micro-economic levels, specifically looking at the implications for the trade, fiscal, jobs, growth, and productivity and innovation agendas. While the role of the private sector and individual companies is obviously crucial in moving towards a green economy, the Paper aims to provide a starting point for more in-depth discussions on company and sectoral concerns.

In support of this objective, the Paper addresses the following questions:

- What do the key terms - "greening the Canadian economy", "green economy", "green growth" – mean and which term should be used and why? How does a definition of the green economy in Canada balance the reality of continuing economic growth, particularly in natural resource sectors, with evidence of local and global environmental impacts and thresholds?
- Which indicators can provide information on Canada's progress at a macro-economic, sectoral or firm level?
- What gaps exist in the knowledge and understanding of the green economy in Canada, particularly in terms of data and analysis?
- How can the Canadian economy become more innovative and competitive in the context of global resource scarcity, climate change and emerging clean technologies?

The Paper's overall objective is to provide information and analysis on these questions as the basis for discussion and debate. In addressing these questions, the White Paper begins with an exploration of how the concept of a green economy/greening the economy has been defined internationally and domestically up until now, with a view to informing a more relevant definition that is adapted to the Canadian context. The Paper then examines the best available data to establish the current state of Canada's journey towards a green economy. It then identifies some issues to consider in relation to a definition of the green economy, given the Canadian context, and identifies the indicators that can help measure and track progress towards this goal.

Finally, the Paper relies on ecological footprint and other data to paint a picture of the current state of the Canadian economy with regards to its environmental impact. Other important data to understand the current state are either not currently being collected or not publicly available. So while no single metric tells the entire story, the data gathered here do help establish the starting point for the discussion and reflect what is currently available.

In support of our desire to spur further discussion and research on the green economy in Canada, we will also – through the course of the document – suggest where gaps in information and analysis might be usefully filled.

THE CONCEPT OF A GREEN ECONOMY

3.1 THE ECONOMIC CASE FOR GREENING THE ECONOMY

Fundamentally, the concept of a green economy needs to be rooted in the larger context of economic growth. Traditional economic growth theory[4,5] focused on the interaction of various forms of capital, but crucially omits natural capital, which refers to the ecosystems that sustain the economy and society. With the emergence of environmental economics in the 1970s, natural capital was increasingly integrated into traditional economic growth models. But it was done so largely on a "negative" basis, in the sense that natural capital – or rather the boundaries imposed by limited natural capital – imposed potential constraints on economic growth.

More recent work in environmental economics has investigated the positive relationships that an integration of natural capital into growth theory can create. The focus of this work is on the overlapping economic and environmental benefits of efficiency and productivity. The basis of these co-benefits is a new understanding of the gap that exists between theoretical economic models (which assume perfect efficiency) and real markets (which are anything but). The virtuous relationship between good economic and environmental policy builds on that gap.[6]

The economic benefits of increasing environmental protection and preservation can be summarized as follows:[1]

- increase economic efficiency in the use and management of natural resources and capital;
- create jobs and new economic opportunities through innovation;
- reduce the hidden costs of environmental externalities (e.g. reduce the effects of air pollution on human health and labour productivity); and,
- reduce the negative economic impacts and risks associated with environmental degradation (*e.g.*, soil erosion, price volatility)

In short, natural capital contributes to the economy in fundamental ways, but these contributions are not currently recognized by the conventional economic system.[7] The more natural capital is diminished, the more future economic prosperity is put at risk. So it is important to accelerate the greening of the economy now. It will be more costly to delay the shift to a green economy, as the costs of clean-up are probably higher than the costs of prevention, and some environmental changes may be non-reversible.[8]

[4] Solow, R.M., 1956. A contribution to the theory of economic growth. *Quarterly Journal of Economics*, 70, 55-94 and Arrow, K.J., 1962. The economic implications of learning by doing. *The Review of Economic Studies* 29 (3), 155-173.

[5] Solow extended the traditional economic growth framework to include natural capital in later work.

[6] Hallegatte, S., Heal, G., Fay, M., Treguer, D., 2011. *From Growth to Green Growth: A Framework.* Policy Research Working Paper 5872, Office of the Chief Economist, the World Bank.

[7] Organisation for Economic Cooperation and Development . May 2011. *Towards Green Growth*. http://www.oecd.org/dataoecd/37/34/48224539.pdf.

[8] Hallegatte, S., Heal, G., Fay, M., Treguer, D., 2011. *From Growth to Green Growth: A Framework.* Policy Research Working Paper 5872, Office of the Chief Economist, the World Bank.

3.2 THE CHALLENGE OF DEFINING A GREEN ECONOMY

The term "green economy" has become increasingly common but is, as with many such terms, without a common definition. The term "clean economy" is also being used to refer to the same concept. Some assume that 'green economy' refers only to the environmental goods and services (EGS) sectors (i.e., sectors that produce products or provide services that have obvious environmental benefits, such as renewable energy or water filtration technology). Given that these sectors are only a small subset of the entire economy at present, this narrow definition not only neglects most economic activity, but ignores the true scale of the environmental challenges faced by society. At the same time, some definitions have recognized the fact that these "green" sectors provide goods and services to the rest of the economy, so an expanded perspective that encompasses the entire supply chain would show that many companies are already participating in the green economy by buying products and services with environmental benefits.

A broader definition of the green economy can refer to an economy that minimizes environmental impacts while not sacrificing economic growth and prosperity. This definition tends to favour a service and knowledge-based economy. However, a service-based economy's actual demand on the environment is generally much higher than it appears. In wealthy economies, consumption is generally quite high, but the production of the goods consumed is exported, and therefore so are the associated environmental impacts.

In either case, the narrow EGS or the broader "minimal impact" definition, the assumptions and underlying framework – if applied to Canada – do not capture the full range of activities that could be considered part of a green economy, and so limit the ability to derive lessons and conclusions that will be relevant to Canada's circumstances.

The central challenge to achieving a green economy is how to manage economic growth and development within environmental constraints. The nature and urgency of those constraints are different depending on the particular environmental condition (e.g., air, land, water, waste), and for Canada the constraints may in fact not be apparent or even relevant. But acknowledging and understanding these constraints is the necessary starting point for a discussion of the green economy, as is reflecting them in the choice of definitions, metrics and indicators.

This section will explore the existing definitions that have been proposed, both internationally and in Canada.

INTERNATIONAL DEFINITIONS OF THE GREEN ECONOMY

The most widely used definitions of the green economy have been elaborated by international organizations such as the United Nations Environment Program (UNEP) and the Organisation for Economic Cooperation and Development (OECD). The primary interest of these organizations has been to establish a definition that applies globally to all countries, regardless of national circumstances or differences in economic structures.

The UNEP definition is*: "A green economy can be defined as an economy that results in improved human well-being and reduced inequalities over the long-term, while not*

exposing future generations to significant environmental risks or ecological scarcities". [9]

The OECD defines green growth[10] as "*fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. To do this it must catalyse investment and innovation which will underpin sustained growth and give rise to new economic opportunities*."[11]

There are other international groups advocating for a shift to a greener economy, such as the Green Economy Coalition (GEC)[12]. The GEC is a diverse set of organizations from the private, public and non-profit sectors, which have come together to accelerate the transition to a green economy. The Coalition spent over a year collaboratively developing a definition of a green economy, which has the following guiding pillars:

- greening high impact sectors;
- improving societal wellbeing and investing in people;
- managing natural capital and investing in natural systems;
- driving investment and financial flows; and,
- improving governance and measurement.

When organizations in the United States have defined the green economy, it has been as a subset of the overall economy. The United States Department of Commerce defines the green economy as "*a clean and energy efficient economy*."[13] It estimates that green products and services currently comprise 1-2% of the entire United States economy. The United States Department of Labor uses a two-pronged approach to define the green economy from an employment perspective that encompasses both the production (output) and the process side. The production side includes companies that produce environmental goods and services, while the process side covers making existing processes with a lower environmental impact and fewer resources.[14]

The United States-based Brookings Institution has also examined the green economy, in the context of green jobs. It defines the clean (or green) economy as "*the sector of the economy that produces goods and services with an environmental benefit*."[15]

Some economists, meanwhile, have suggested that a green economy is just correcting market failures, meaning accounting for environmental externalities.[16]

[9] United Nations Environment Programme, 2011. *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication - A Synthesis for Policy Makers*, www.unep.org/greeneconomy.

[10] The OECD uses the term "green growth" as opposed to the "green economy" to refer to the same concept, with a greater focus on integrating environmental and social factors into the concept of economic growth.

[11] Organisation for Economic Cooperation and Development . May 2011. *Towards Green Growth*. http://www.oecd.org/dataoecd/37/34/48224539.pdf.

[12] See: http://greeneconomycoalition.org/.

[13] U.S. Department of Commerce, April 2010. *Measuring the Green Economy*, http://www.esa.doc.gov/sites/default/files/reports/documents/greeneconomyreport_0.pdf.

[14] United States Bureau of Labor Statistics, March 2012. *Employment in green goods and services 2010*, http://www.bls.gov/news.release/pdf/ggqcew.pdf.

[15] Brookings Institution, July 13, 2011. *Sizing the Clean Economy: A National and Regional Green Jobs Assessment*. www.brookings.edu/reports/2011/0713_clean_economy.aspx.

[16] Stavins, Robert, January 12, 2012. *Green Growth and Technological Change (slides)*, http://www.greengrowthknowledge.org/SiteCollectionDocuments/Mexico%20City%20Conference%20Papers%20and%20Presentations/Stavins,%20Robert%20-%20Green%20Growth%20and%20Technological%20Change%20(slides).pdf. Green Growth Knowledge Platform.

CANADIAN DEFINITIONS OF THE GREEN ECONOMY

Attempts at defining the green economy in Canada have been sporadic, and focused either on specific sectors or issues, or on regional economies.

The most advanced project to date at the national level has been carried out by the Environmental Careers Organization (ECO Canada), with a focus on employment in the green economy.[17] The definition used in that report was: *"The aggregate of all activity operating with the primary intention of reducing conventional levels of resource consumption, harmful emissions, and minimizing all forms of environmental impact. The green economy includes the inputs, activities, outputs and outcomes as they relate to the production of green products and services".*

This definition uses a specific formulation around "primary intention" of the economic activity being the reduction of environmental impact. However, this does not address those activities that do not have intention as a primary driver but still might be included. It also focuses on the "production of green products and services", without accounting for consumption, a critical part of economic activity, and without providing a secondary definition of what constitutes a "green product or service". Finally, it sees the green economy as a subset of the Canadian economy as a whole.

One of the issues with this kind of definition is how little it allows sectors that might not be traditionally considered "green" sectors of the economy to contribute to an overall definition of a green economy. There are already many things happening in the "brown" sectors (such as mining and oil and gas) that might logically be considered to be part of the green economy. This leads to an under-appreciation of the contribution that these sectors might make, but it also results in a lack of focus on the policy and investment levers that might promote even more 'greening' of those brown sectors.

The Canadian Institute for Environmental Law and Policy has – in anticipation of the Rio + 20 conference in June 2012, which has as one its two themes the green economy in the context of sustainable development and poverty eradication – carried out a national research project aimed at collecting perspectives on the green economy from a wide range of stakeholders.[18] On the question of definition, however, the project's report could only say that that Canadians are confused about just what "green economy" means, and frustrated by the lack of definitive definition. The report does lay out the principles that would characterize a green economy, including internalizing negative externalities, acting within earth's ecological carrying capacity and ensuring fairness and equity and addressing unjust disparities.

The Canada West Foundation released a report in March 2011, which looked at the opportunities for economic diversification in Western Canada presented by a green economy. The green economy definition used in the report is, "*economic activity that is directly*

[17] Environmental Careers Organization (ECO). 2010. *Defining the Green Economy: Labour Market Research Study,* http://www.eco.ca/pdf/Defining-the-Green-Economy-2010.pdf.

[18] Webb, Carolyn and Esakin, Thomas C., April 2011. *A Green Economy for Canada: Consulting with Canadians*. Canadian Institute for Environmental Law and Policy.

related to improving environmental sustainability."[19]

The Globe Foundation undertook an analysis of the green economy in British Columbia in 2010. According to Globe, "*the green economy is a fast-growing economic development model that focuses on the creation of green jobs, the promotion of real, sustainable economic growth, and the prevention of environmental pollution, global warming, resource depletion and ecological degradation*."[20]

In Canada, then, there is currently a large gap in the knowledge base on the green economy. The Canadian definitions that have been put forward are largely focused on identifying and quantifying environmental goods and services, as opposed to defining it in a way that includes the rest of the economy. This gap is particularly acute on the question of what definition of a green economy makes sense given Canada's national circumstances, and how that green economy might be measured and monitored at both a macro- and micro-economic level.

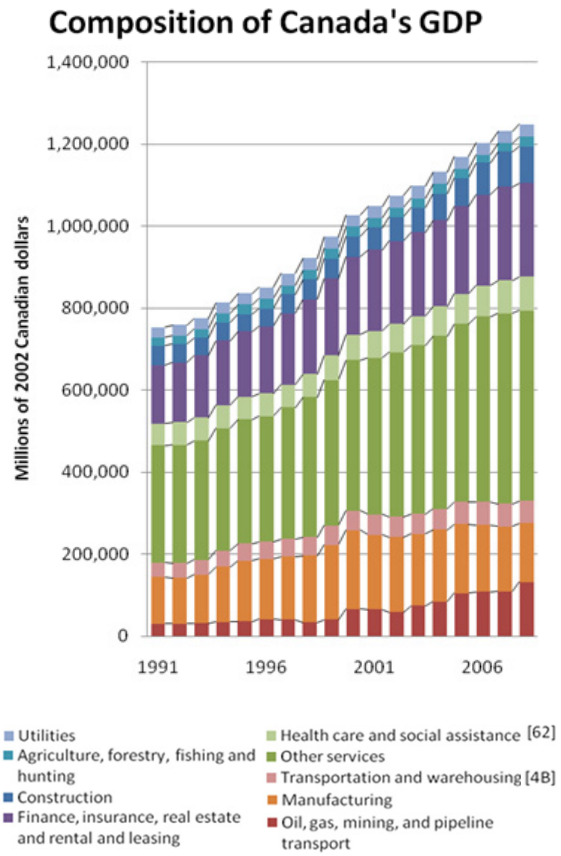
Without such a definition and indicators, decision-makers in both the public and private sectors are not equipped to properly plan and undertake initiatives that contribute to the transformation to a green economy. Moreover, this limited definition creates a false perspective on the role that other sectors of the economy do currently play in the green economy, and limits overall understanding of how the economy as a whole can move onto a more sustainable path.

[19] Roach, Robert and Ritchie, Shawna, March 2011. *The Green Grail: Economic diversification and the green economy in Western Canada*. Canada West Foundation.
[20] Globe Foundation, March 2010. *British Columbia's Green Economy*.

A GREEN ECONOMY: THE CANADIAN CONTEXT

For Canada, the green economy concept highlights a number of issues particular to the national context. Canada's is one of the largest economies in the world, highly dependent on international trade (although skewed towards the all-important bilateral relationship with the United States), with a wide diversity in economic activity – from primary extraction of natural resources to financial services. Its natural resource sector is booming these days, due to the existence of a commodity "super-cycle" driven by surging demand for raw resources from emerging economies. The sector is seen by many as the foundation of the country's economic success – today and into the future. This perspective creates a sometimes distorted view of the Canadian economy as a "tale of two economies". The Canadian green economy, from that perspective, is limited to the manufacturing and services sectors, while the ascendant natural resource sector falls outside of it and in fact challenges Canada's ability to construct a sustainable economy. That perspective tends to ignore the reality of what is happening in the Canadian economy, while leaving outside of this discussion large parts of the economy that are of direct relevance to the discussion. This section will explore the context for understanding the green economy in Canada.

Figure 1: Share of overall GDP by sector (1991-2008)



Source: Statistics Canada, 2008. Table 379-0023 - Gross domestic product (GDP) at basic price in current dollars, System of National Accounts (SNA) benchmark values, by North American Industry Classification System (NAICS).Annual dollars.

4.1 BACKGROUND ON THE CANADIAN ECONOMY

ECONOMIC OVERVIEW

Canada has many economic strengths, including natural resource wealth, a highly educated population, a strong financial sector and macro-economic stability. Canada's Gross Domestic Product (GDP) was approximately CAD $1.4 trillion in 2010: the breakdown by sector over the 1991-2008 time period is shown in Figure 1.[21] The service sectors, including finance, comprise a relatively large share of the economy (67% of GDP),[22] as does

[21] Statistics Canada, 2011. *Gross domestic product (GDP), expenditure-based, annual (Table 380-0017)*, http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=3800017&tabMode=dataTable&srchLan=-1&p1=-1&p2=9.

[22] Statistics Canada, 2011. *Table 379-0024 - Gross domestic product (GDP) at basic price in current dollars, System of National*

manufacturing (12%), whereas oil and gas is somewhat lower (10%).

Small and medium-sized enterprises (SMEs) play a very important role in the Canadian economy. The SME sector accounts for 29% of Canada's GDP (2008), and in 2009 employed 5 million people, 48% of the total labour force in the private sector.[23] These companies also comprise an important component of the supply chain for larger companies. Most SMEs are privately owned, with no obligation to report publicly on their environmental performance, making it difficult to assess the state of environmental management in the SME sector.

DIVERSITY

The Canadian economy varies considerably by province and region, reflecting differences in natural resource endowments, geography, labour force, educational institutions and other factors. Table 1 shows the top three sectors in each province, as measured by share of provincial GDP. In Alberta, Newfoundland, Northwest Territories and Saskatchewan, the mining and oil and gas extraction sector accounts for 25% or more of provincial GDP. In other provinces, the largest sectors are service-based, especially finance, insurance, real estate and rental and leasing and government. These service sectors tend to have lower environmental impacts than extractive sectors such as mining and oil and gas, which, together with each province's electricity mix, explain the differences in environmental impacts by province.

ECONOMIC CHALLENGES AND OPPORTUNITES

A green economy is compatible with a strong economic future for Canada, including increased productivity, employment, and innovation. This section explores Canada's unique macro- and micro-economic challenges and opportunities in the context of shift towards a green economy.

MACRO- ECONOMIC CHALLENGES AND OPPORTUNITIES

Canada faces a host of interrelated macro-economic challenges, including export diversification, changing demographics, a high value currency, unemployment and high government and consumer debt.

Canada's largest trading partner, the United States, is in the midst of the weakest economic recovery since the Great Depression. [24] In fact, most of Canada's exports are to slow-growing advanced economies, as shown in Figure 2.

In contrast to the high concentration of exports in advanced economies, particularly the United States, the goods that Canada exports are better diversified, dominated by industrial goods (23.8%) and energy products (22.5%), followed by machinery and equipment (18.8%),

Accounts (SNA) benchmark values, special industry aggregations based on the North American Industry Classification System (NAICS), http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=3790024&paSer=&pattern=&stByVal=2&p1=-1&p2=-1&tabMode=dataTable&csid=.

[23] Industry Canada, 2010. Key Small Business Statistics, http://www.ic.gc.ca/eic/site/sbrp-rppe.nsf/vwapj/KSBS-PSRPE_July-Juillet2010_eng.pdf/$FILE/KSBS-PSRPE_July-Juillet2010_eng.pdf.

[24] Carney, Mark, April 27, 2012. *Economic Update*, http://www.bankofcanada.ca/wp-content/uploads/2012/04/presentation-270412.pdf.

Table 1: Key sectors in each province, by share of provincial GDP

Province	Key Sectors
Alberta	Mining and oil and gas extraction (28%), finance, insurance, real estate and rental and leasing (13%), construction (10%)
British Columbia	Finance, insurance, real estate and rental and leasing (22%), government sector (13%), manufacturing (9%)
Manitoba	Government sector (18%), finance, insurance, real estate and rental and leasing (17%), manufacturing (14%)
New Brunswick	Government sector (23%), finance, insurance, real estate and rental and leasing (16%), manufacturing (13%)
Newfoundland	Mining and oil and gas extraction (46%), government sector (17%), mining (except oil and gas) (11%)
Northwest Territories	Mining and oil and gas extraction (39%), government sector (20%), construction (12%)
Nova Scotia	Government sector (23%), finance, insurance, real estate and rental and leasing (19%), manufacturing (9%)
Nunavut	Government sector (43%), construction (18%), finance, insurance, real estate and rental and leasing (14%)
Ontario	Finance, insurance, real estate and rental and leasing (21%), manufacturing (16%), government sector (14%)
Quebec	Manufacturing (17%), government sector (17%), finance, insurance, real estate and rental and leasing (16%)
Saskatchewan	Mining and oil and gas extraction (25%), finance, insurance, real estate and rental and leasing (13%), government sector (15%)
Prince Edward Island	Government sector (27%), finance, insurance, real estate and rental and leasing (18%), manufacturing (10%)
Yukon	Government sector (33%), finance, insurance, real estate and rental and leasing (16%), construction (11%)

Source: Statistics Canada, 2007. *Provincial gross domestic product (GDP) at basic prices in current dollars, System of National Accounts (SNA) benchmark values, by sector and North American Industry Classification System (NAICS)*

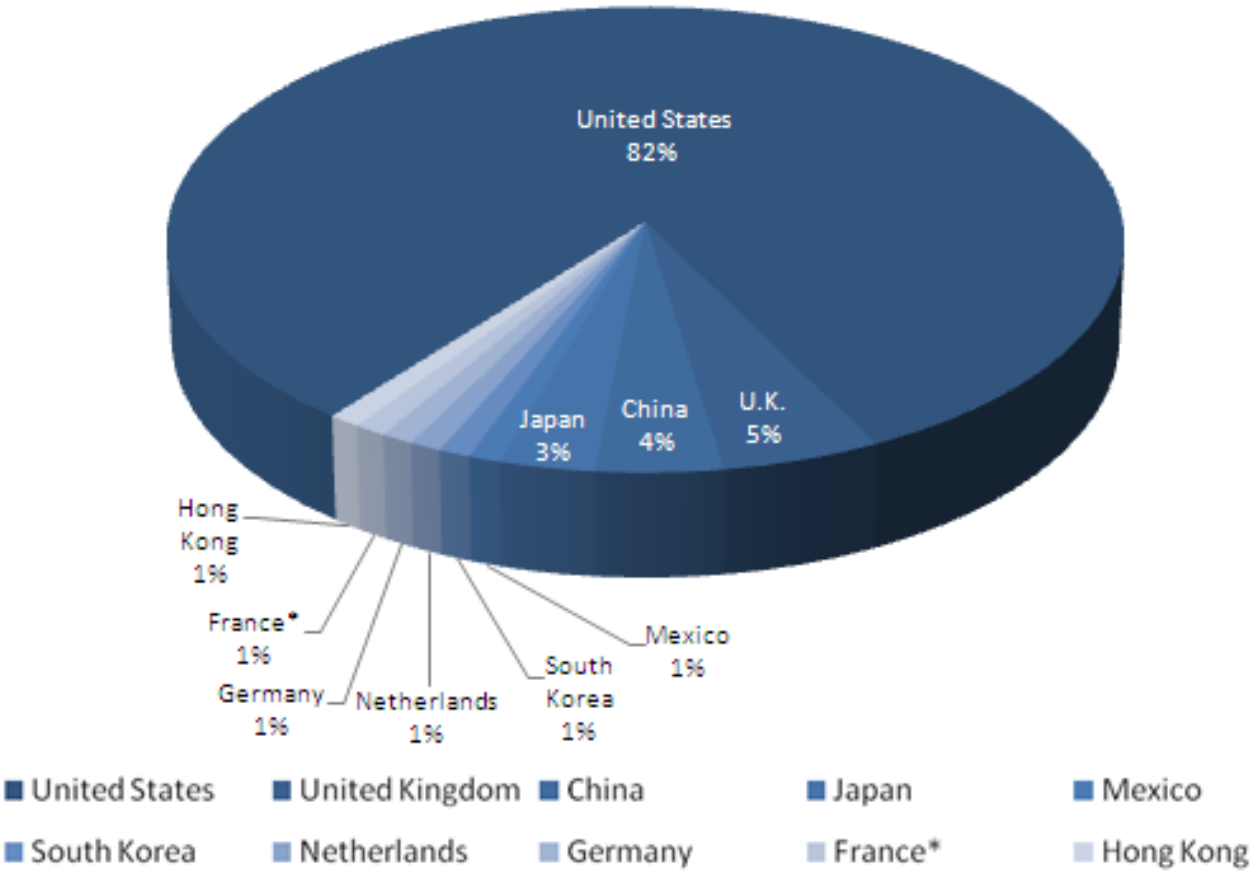
automotive products (14%), and agricultural and fishing products (9.1%).[25] There are concerns, both economic and environmental, that Canadian exports are too heavily weighted in primary resources. On the economic side, the worry is that the focus on resource, specifically energy - exports is hurting other sectors, particularly due to inflationary effect on the Canadian dollar driven by global demand for resources. Canada must continue to develop technology and other important export-oriented sectors, both to lessen the loonie's sensitivity to commodity market fluctuations and to remain economically competitive in emerging resource-efficient and innovative sectors. The development of new green industries, or green goods and services, will translate into different interests on the trade policy front that will need to be considered.

[25] Statistics Canada, 2012. *CANSIM table 228-0043,* http://www5.statcan.gc.ca/cansim/a05?lang=eng&id=2280043.

Canada's official unemployment rate in 2011 stood at 7.4%; though is 10.6% when discouraged searchers, those waiting for replies and involuntary part-timers are included.[26] Of key concern is the loss of manufacturing jobs, particularly in Ontario. Between 2004 and 2010, investment in machinery and equipment and the rise of competition in emerging economies.

Canada can work to retain its knowledge-based manufacturing jobs, even as labour-intensive manufacturing may relocate to cheaper areas. [28]

Figure 2: Canada Canada's Top Export Markets



Source: Industry Canada, 2011. *Trade Data Online*.
*France includes Monaco and French Antilles

Ontario lost more than 300,000 jobs in the manufacturing sector.[27] Various explanations have been put forward, including the high Canadian dollar, productivity issues, lack of

The more competitive Canadian manufacturers are, the more they will be able to cope with a high dollar and other external market forces. The opportunity to play a leading role in sectors where Canada has traditional strengths, such as water management, but which also coincide with global trends towards resource

[26] Statistics Canada, 2011. *Labour force survey estimates (LFS), supplementary unemployment rates by sex and age group (Table 282-0086)*, http://www5.statcan.gc.ca/cansim/a05?lang=eng&id=2820086.
[27] Human Resources and Skills Development Canada, Fall 2011. *Labour Market Bulletin: Ontario*, http://www.hrsdc.gc.ca/eng/workplaceskills/labour_market_information/bulletins/on/on-lmb-2011fall.pdf.

[28] McKinsey Global Institute, May 2012. *Trading myths: Addressing misconceptions about trade, jobs, and competitiveness,* http://www.mckinsey.com/Insights/MGI/Research/Productivity_Competitiveness_and_Growth/Six_myths_about_trade.

management, will help Canada to develop the next generation of manufacturing.

Canada's aging population is likely to place a strain on public finances due to the anticipated higher health costs and other age-related expenditures. Although Canada performs well when compared to many of its peers with regards to government deficits and debt levels, Canadians are more indebted than their counterparts in the United States and the UK.[29] Government debt, particularly at the provincial and municipal level, can restrict the fiscal capacity of governments to invest in education, research and development (R&D), infrastructure and other areas that influence economic performance. High levels of personal indebtedness may inhibit entrepreneurship and lower domestic consumption, which means that boosting exports and investment will be keys to stimulating the economy.

MICRO-ECONOMIC CHALLENGES AND OPPORTUNITIES

To move towards a green economy, Canada must catalyze innovation. Innovation and productivity are linked, and are important determinants of economic competitiveness. High levels of innovation are expected to have a positive impact on productivity.

COMPETITIVENESS, PRODUCTIVITY AND INNOVATION

Despite its economic strengths, Canada's economic competitiveness lags behind that of its peers. Canada's ranking in the World Economic Forum's Global Competitiveness Report 2011–2012 ranking has recently fallen, reflecting weaknesses in outward foreign direct investment, trade barriers, gross national savings, and high government debt levels.[30]

A key source of concern is Canada's poor productivity record, especially the labour productivity gap with the United States. In 2008, for example, the gap was $9 in terms of GDP per hour worked.[31] Canada's multi-factor productivity performance, which measures how efficiently all inputs (such as labour and capital) are used, has not improved since the 1970s. This suggests that Canadian firms are not innovating and becoming more resource efficient.[32] The main causes for this pattern have been much debated, though many agree that a key concern is Canada's low levels of investment in capital equipment.[33] The standard productivity framework excludes environmental inputs into the production process, as well as the impacts on the environment of economic activity. A productivity measure that includes environmental factors would likely tell a different story. For example, when carbon dioxide (CO_2) emissions are taken into account using an experimental methodology to estimate multi-factor productivity, the estimate of productivity growth is about 17% higher than the conventional estimate over the period 1981-1996.[34]

[29] Carney, Mark, April 27, 2012. *Economic Update*, http://www.bankofcanada.ca/wp-content/uploads/2012/04/presentation-270412.pdf.

[30] Conference Board of Canada, 2011. *Treading Water: Canada Is Gradually Losing Its Competitive Edge*, http://www.conferenceboard.ca/e-Library/abstract.aspx?did=4418.

[31] Conference Board of Canada, 2009. *Economy: Labour Productivity Growth*, http://www.conferenceboard.ca/hcp/details/economy/measuring-productivity-canada.aspx#More_important.

[32] TD Economics, June 2010. *The Productivity Puzzle: Why is the Canadian record so poor and what can be done about it?*

[33] Sharpe, Andrew, September 2008. *Three Policies to Increase Productivity Growth in Canada*. Institute for Research on Public Policy, http://www.irpp.org/cpa/briefs/sharpe.pdf.

[34] Harchaoui, Tarek M., Kabrelyan, Dmitry and Smith, Rob, 2002. *Accounting for Greenhouse Gases in the Standard Productivity Framework,* http://publications.gc.ca/Collection/Statcan/11F0027M/11F0027

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Some have attributed Canada's productivity underperformance to structural factors, including its economic dependence on natural resources.[35] There are inherent economic risks associated with Canada's increased resource reliance, including capital lock-in, exposure to volatile commodity prices, and a rising dollar.[36] A resource-based economy engenders high investment in fixed cost infrastructure and capital, which creates path dependency.[37] Capital becomes stranded in costly assets, which makes it difficult to reorient economic activity towards other sectors.

At the same time, some researchers have found that innovation in Canada's natural resource sectors is actually better than it appears when compared to Canadian companies in other sectors, shown by more rapid growth in labour and multi-factor productivity. However, they tend to perform below their international peers.[38] Resource sectors also tend to have higher-than-average labour productivity levels, due to the fact that these sectors are more capital intensive.[39] A tremendous amount of capital is being invested into the oil sands in particular. Whether this capital could be invested elsewhere (e.g., in infrastructure), with potentially greater long-term economic benefits is a matter of debate.

By one estimate, Canada ranks 12th overall (out of 176 countries) in the Sustainable Competitiveness ranking, based on four pillars:[40] Canada ranked 5th on natural capital; 118th on resource intensity and efficiency; 21st on sustainable innovation and competitiveness; and, 16th on social cohesion.

EMERGING INDUSTRIES

Emerging industries, especially those classified as "clean technology" [41] can present significant

MIE2002007.pdf . Statistics Canada Economic Analysis Research Paper Series.

[35] Drache, Daniel, 2009. *Canada's Resource Curse: Too Much of a Good Thing*, http://www.yorku.ca/drache/academic/papers/Drache%20canada's%20resource%20curse%20dec%2018.pdf.

[36] Haley, Brendan, 2011. From Staples Trap to Carbon Trap: Canada's peculiar form of carbon lock-in. *Studies in Political Economy*, 97-132.

[37] Haley, Brendan, 2011. From Staples Trap to Carbon Trap: Canada's peculiar form of carbon lock-in. *Studies in Political Economy*, 97-132.

[38] Sharpe, Andrew and Guilbaud, Olivier, 2005. *Indicators of Innovation in Canadian Natural Resource Industries*, http://www.csls.ca/reports/csls2005-03.pdf. The Centre for the Study of Living Standards.

[39] The Centre for the Study of Living Standards, 2003. *Productivity Trends in Natural Resources Industries in Canada*, http://www.csls.ca/reports/nrcprod.pdf.

[40] SolAbility, 2012. *The Global Sustainable Competitiveness Index*, http://www.solability.com/Global%20Competetiveness%20Report.pdf.

[41] The term "clean technology" (or "clean tech") is defined as "...new technology and related business models that offer competitive returns for investors and customers while providing

economic opportunities for Canada. Clean technology is expected to be the third largest global industrial sector by 2020, worth $3 trillion.[42] Clean technology encompasses nine broad subsectors: biofuels and biochemicals; power generation; energy infrastructure; energy efficiency; industrial process efficiency and abatement; recycling and waste; remediation; transportation; and, water and wastewater.[43]

There have been several international attempts to rank countries' competitive positioning for a low-carbon economy. Canada ranks fairly well in all of them. Among the G20, Canada ranked 6th (2012) and 7th (2009), based on its strengths in education, low-carbon electricity and use of clean energy.[44,45] However, Canada needs to improve its carbon productivity (CO_2 emissions/GDP), and continue to lower energy consumption and car ownership. Another ranking put Canada near the bottom of the G8 (6th), again with high marks for skills, and better-than-average points for innovation and investment, and a low rating for carbon emissions and the policy and institutional environment.[46]

Canadian companies currently account for about 1% of overall global clean tech market share, with strong performance in transportation (2.5% of global market share) and recycling and recovery (4.7% of global market share).[47] The province of Ontario is home to a world-leading cluster for water technology companies.[48] It is also looking to become a leader in smart grid and energy storage technology.[49]Across Canada, there are nearly 700 clean technology companies, operating in a variety of sectors.[50] The clean tech investment category is booming: it grew 47% between 2007 and 2009, during the recession.[51] However, most Canadian clean tech companies are still small (less than $5 million in annual revenue). The adoption of clean tech technologies by other sectors is slower in Canada than in other countries, which is likely why clean tech companies are far more likely to export than companies in typical sectors.[52]

Venture capital investments in Canada totalled just over CAD $1 billion in 2010, with the majority concentrated in the information technology sector, while just over 15% were in

solutions to global challenges" according to Cleantech Group LLC (www.cleantech.com).

[42] Analytica Advisors, 2011. *The 2011 Canadian Clean Technology Industry Report: Selected Facts*, http://www.analytica-advisors.com/sites/default/files/CTR_2011Report%20SelectedFacts.pdf.

[43] Canadian Clean Technology Coalition, 2011. *Federal Research and Development Review Submission*, http://www.canadiancleantechnologycoalition.ca/media/docs/Cleantech_RD_Submission.pdf.

[44] The Climate Institute and E3G, 2009. *G20 low carbon competitiveness*, http://www.e3g.org/images/uploads/G20_Low_Carbon_Competitiveness_Report.pdf.

[45] Vivid Economics, 2012. *G20 low carbon competitiveness index: 2012 update*, http://www.climateinstitute.org.au/images/reports/vivideconomics_lccireportupdate_march2012.pdf.

[46] The National Roundtable on the Environment and the Economy, 2010. *Measuring Up: Benchmarking Canada's Competitiveness in a Low-Carbon World,* http://nrtee-trnee.ca/wp-content/uploads/2011/08/benchmarking-eng.pdf.

[47] Ibid.

[48] MaRS Discovery District, 2011. *Clean Water for Life: Ontario's water asset map*, http://www.marsdd.com/news-insights/files/2011/03/MaRSReport-Ontario-AssetMap-Water.pdf.

[49] Ontario Ministry of Energy, 2012. *Ontario's Feed-in-Tariff Program: Two Year Review Report*, http://www.energy.gov.on.ca/en/fit-and-microfit-program/2-year-fit-review/.

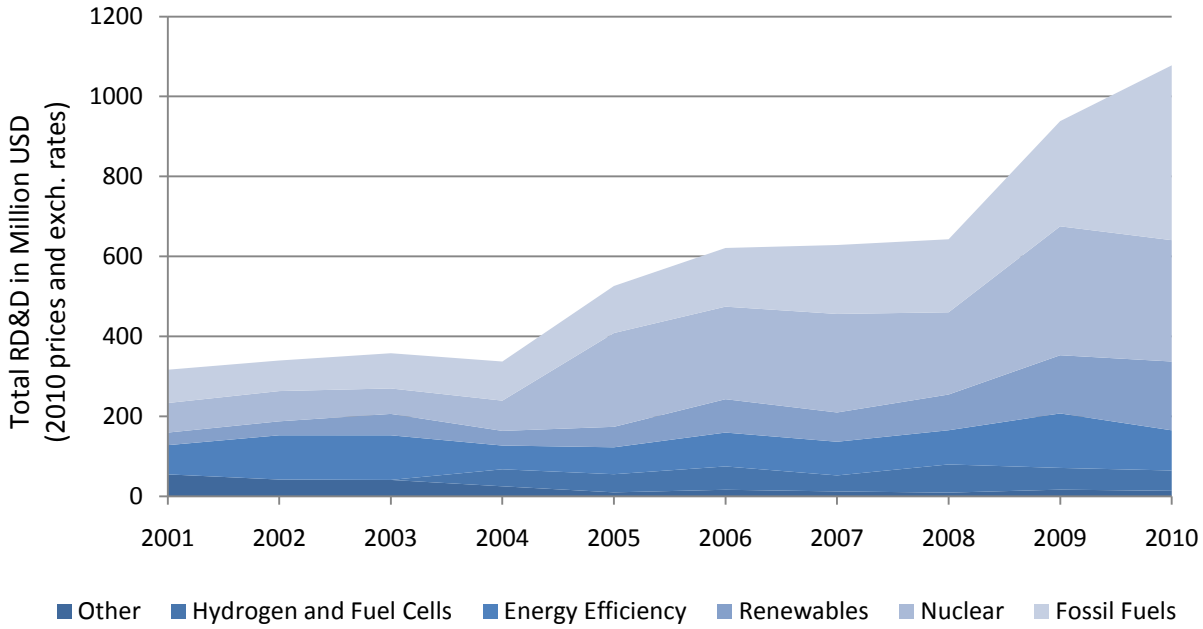
[50] Analytica Advisors, 2011. *The 2011 Canadian Clean Technology Industry Report: Selected Facts*, http://www.analytica-advisors.com/sites/default/files/CTR_2011Report%20SelectedFacts.pdf.

[51] Russell Mitchell Group, 2010. *2010 SDTC Cleantech Growth and Go-To-Market Report*, http://www.sdtc.ca/uploads/documents/en/CLEANTECH%20REPORT.pdf.

[52] Canadian Clean Technology Coalition, 2011. *Federal Research and Development Review Submission*, http://www.canadiancleantechnologycoalition.ca/media/docs/Cleantech_RD_Submission.pdf.

the environmental and energy sectors.[53] In terms of R&D spending, the majority of Canada's R&D dollars are oriented towards fossil fuels and nuclear power (Figure 3).

Figure 3: Total R&D spending by technology in Canada (2001-2010)



Source: International Energy Agency (IEA)

These investments make sense given Canada's fossil fuel resource base and electricity mix, which is dependent on nuclear and hydropower in several provinces. These investments can contribute to improved environmental outcomes in these sectors. However, over the medium- to longer-term, greater investment in renewable and other emerging technologies is required to move away from fossil fuels. Currently Canada ranks 11th in the G20 in terms of clean energy investment in terms of dollars invested, but 6th in terms of investment intensity (investment/GDP), and 5th on venture capital/private equity financing.[54]

GREEN JOBS

As with the green economy in general, there are varying definitions of what constitutes a green job, and consequently, how to measure the number of green jobs. ECO Canada has done a great deal of useful work in this area.[55] This White Paper, therefore, will not repeat this work, but rather highlight a few key points.

There are two main ways to look at green jobs. The first is to examine work that has direct environmental benefits (whether in sectors that

[53] Canada's Venture Capital & Private Equity Association via Thomson Reuters, 2010. *Total VC Investment Activity by Sector*, http://www.cvca.ca/files/Downloads/2010_CVCA_Investment_Activity_by_Sector.pdf.

[54] Pew Charitable Trusts, 2012. *Who's Winning the Clean Energy Race?,* http://www.pewenvironment.org/uploadedFiles/PEG/Publications/Report/FINAL_forweb_WhoIsWinningTheCleanEnergyRace-REPORT-2012.pdf.

[55] See: http://www.eco.ca/publications/Defining-the-Green-Economy-(2010)/5/Green-Jobs-&-Emerging-Areas/.

provide environmental products and services or not). In this vein, ECO Canada defines a green job as one that works directly with information, technologies, or materials that minimize environmental impact, and that also requires specialized skills, knowledge, training, or experience related to these areas.[56] By this definition, there are currently 682,000 Canadians who perform environmental work for 50% or more of their time.[57] In 2010, the clean tech sector directly employed almost 45,000 Canadians.[58] In the United States, in 2010 there were 3.1 million jobs associated with the production of green goods and services (2.4% of total employment).[59] The United States numbers do not include jobs that involve greening production processes (the numbers for this type of green job will be published later in 2012). Some definitions that have been put forward are even broader, and include any employment engaged in producing goods or services that have a lower environmental impact than existing close substitutes.[60] It is also worth noting that in the OECD countries, jobs in high carbon industries account for a relatively low share of total employment (between 10 and 30%, depending on the country).[61]

The second, and less studied, aspect of green jobs is understanding the overall net employment effects of the transition to a green economy over the short-, medium- and long-term. These include the indirect macroeconomic effects of policies and actions to transition to a green economy, including induced job creation/destruction from the impacts on labour supply and productivity, wages, taxation, energy prices, and the overall price level.[62] For example, job creation could result from shifting taxes to increase taxes on environmental pollution and reducing labour taxes.

In looking at the role that jobs play in the green economy, the important consideration is which skills are required for the green economy, how existing skill sets can be transitioned, adapted or reallocated towards green companies, sectors and activities, and how new skill sets can be developed. Green jobs are extremely diverse, and a range of skill sets across different functions, sectors and levels will be required.

4.2 CANADA'S NATURAL RESOURCES

OVERVIEW

Even as the Canadian economy has evolved and expanded to become more service-oriented, its base remains firmly rooted in its natural resource riches. Canada's natural resource sectors represent about one-fifth of Canada's

[56] ECO Canada, 2010. *Canadian Environmental Sector Trends: Labour Market Study*, http://www.eco.ca/pdf/Canadian-Environmental-Sector-Trends-2010.pdf.
[57] Eco Canada, 2010. *Profile of Canadian Environmental Employment: Labour Market Study,* http://www.eco.ca/pdf/Profile-Of-Canadian-Environmental-Employment-ECO-Canada-2010.pdf.
[58] Analytica Advisors, 2011. *The 2011 Canadian Clean Technology Industry Report: Selected Facts*, http://www.analytica-advisors.com/sites/default/files/CTR_2011Report%20SelectedFacts.pdf.
[59] Bureau of Labor Statistics, March 2012. *Employment in green goods and services 2010*, http://www.bls.gov/news.release/pdf/ggqcew.pdf.
[60] Bowen, Alex, March 2012. *'Green' growth, 'green' jobs and labour markets*, http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2012/03/07/000158349_20120307084323/Rendered/PDF/WPS5990.pdf. World Bank Policy Research Working Paper 5990.
[61] Swaim, Paul, October 2011. *The Jobs Potential of a Shift Towards a Low-Carbon Economy*. OECD Employment, Labour and Social Affairs Committee.
[62] Bowen, Alex, March 2012. *'Green' growth, 'green' jobs and labour markets*, http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2012/03/07/000158349_20120307084323/Rendered/PDF/WPS5990.pdf. World Bank Policy Research Working Paper 5990.

GDP, with the finance, trade, business services and transportation sectors also tied to resource industries.[63] Natural resources comprise the majority of Canadian exports, though account for only about 7% of total jobs, because these sectors tend to be capital-intensive.[64]

Canada is in a different position compared to many other countries, in that it has an abundance of natural resources, including, land, water, forests and energy, and a relatively small population. As a result, it has for the most part, not yet encountered any meaningful resource scarcity.[67] At the same time, its economic ambitions, particularly when it comes to the development of its natural resource and energy resources, have international environmental implications.

Statistics Canada estimates Canada's natural capital value at CAD $89,000 per capita.[68] Canada ranks first in the world in natural capital per person, third in forest area and renewable

Box 1: Decoupling

A useful concept to consider in the Canadian context is "decoupling". Decoupling is an economic term that refers to the separation that can occur between two related economic factors. There are two types of decoupling that are relevant to the green economy: decoupling resource use from GDP ("resource decoupling") and decoupling resource use from environmental impacts ("impact decoupling"). There is also relative versus absolute decoupling. Relative decoupling refers to a change in the growth rate, where absolute decoupling occurs only when the growth rate of resource productivity exceeds the growth rate of the economy, which is rare. [65]

Ideally, achieving a green economy means that a country has been able to achieve relative and absolute decoupling in both resource and impact, meaning that it has figured out a way to both reduce the impact of its economic activity to levels that are sustainable (within an ecological regenerative capacity); and also to achieve economic growth that respects absolute environmental thresholds.[66] This is an ideal that no country has been able to achieve, or is really on track to achieve, though Canada has made some progress which will be discussed in more detail later in the report. But it is a framework that should be kept in mind as the specifics of Canada's transition to a green economy are considered.

[63] Statistics Canada, 2008. *Study:The role of natural resources in Canada's economy*, http://www.statcan.gc.ca/daily-quotidien/081113/dq081113b-eng.htm#cont.
[64] Statistics Canada, 2008. *Study:The role of natural resources in Canada's economy*, http://www.statcan.gc.ca/daily-quotidien/081113/dq081113b-eng.htm#cont.
[65] Fischer-Kowalski, M., Swilling, M., von Weizsäcker, E.U., Ren, Y., Moriguchi, Y., Crane, W., Krausmann, F., Eisenmenger, N., Giljum, S., Hennicke, P., Romero Lankao, P., Siriban Manalang, A., and Sewerin, S., 2011. *Decoupling natural resource use and environmental impacts from economic growth*, http://www.unep.org/resourcepanel/decoupling/files/pdf/decoupling_report_english.pdf. United Nations Environment Program and International Resource Panel. Page 5
[66] Fischer-Kowalski, M., Swilling, M., von Weizsäcker, E.U., Ren, Y., Moriguchi, Y., Crane, W., Krausmann, F., Eisenmenger, N., Giljum, S., Hennicke, P., Romero Lankao, P., Siriban Manalang, A., and Sewerin, S., 2011. *Decoupling natural resource use and environmental impacts from economic growth*, http://www.unep.org/resourcepanel/decoupling/files/pdf/decoupling_report_english.pdf. United Nations Environment Program and International Resource Panel. Page xiii.

[67] The most famous example of resource mismanagement in Canada is the collapse of the Grand Banks cod fishery in Newfoundland in the 1990s due to overfishing.
[68] Statistics Canada, 2011. *Human Activity and the Environment: Economy and the environment*, http://www.statcan.gc.ca/pub/16-201-x/16-201-x2011000-eng.pdf

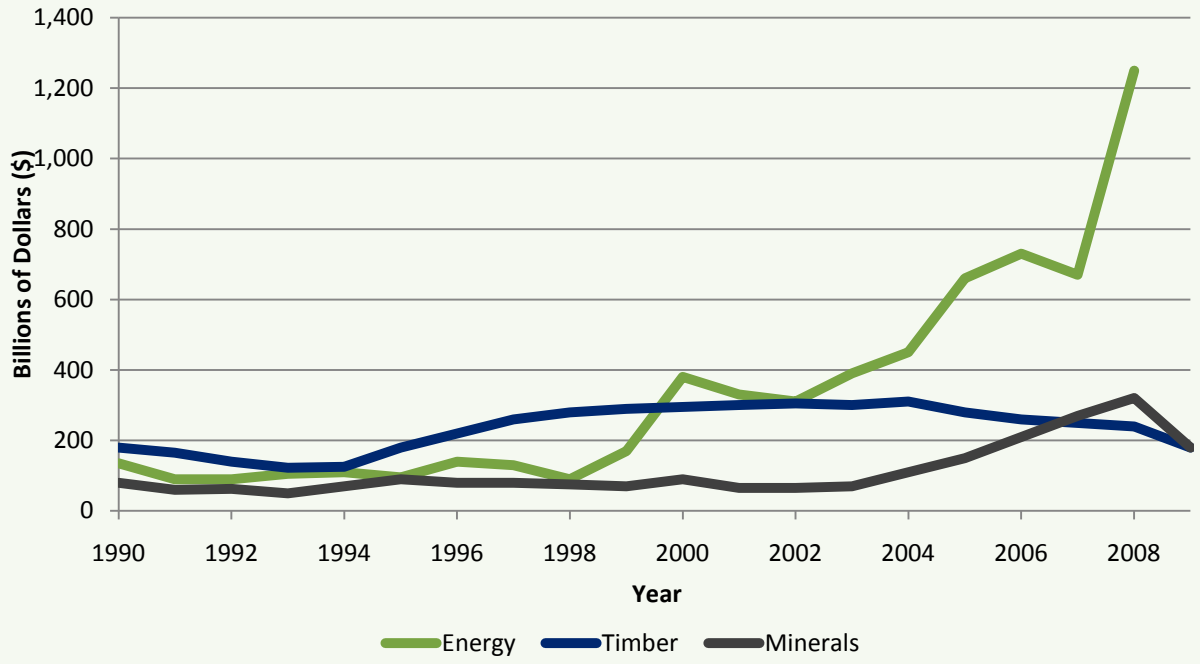
fresh water supply, and seventh in arable land area. [69] Figure 4 shows the market value of Canada's energy, timber and mineral wealth since 1990. Canada's oil sands were valued at CAD $441 billion in 2009, more than the value of coal, conventional crude oil and natural gas combined.[70] Technological improvements and higher oil prices raise the amount of oil sands deposits that are considered to be extractable.

urban areas, water availability is already an issue, as shown in Figure 5.

RESOURCE PRODUCTIVITY

The global economy cannot continue to use natural resources at the same rate and scale into the future, as some resources will become increasingly scarce in certain regions, prohibitively expensive, or socially unacceptable

Figure 4: Wealth from energy, timber and minerals (1990-2011)



Source: Statistics Canada, 2011. *Human Activity and the Environment: Economy and the environment*, http://www.statcan.gc.ca/pub/16-201-x/16-201-x2011000-eng.pdf

Clearly, by global standards, Canada has immense natural resources. However, overall resource richness does not mean that those resources are infinite, nor are they always available at the time, quantity and price required. For example, in the prairies and in

to extract. The world is entering an era of increasingly high and volatile resource prices, driven largely by soaring demand and decreased availability of easily accessible resources.[71] It is estimated that a continuation of "business as usual" would require 140 billion tons (140 Gt) of resources globally per year, which may or may not be available at the time, price and quantity

[69] Statistics Canada, 2011. *Natural capital endowments, for selected countries*, http://www.statcan.gc.ca/pub/16-201-x/2011000/t233-eng.htm.

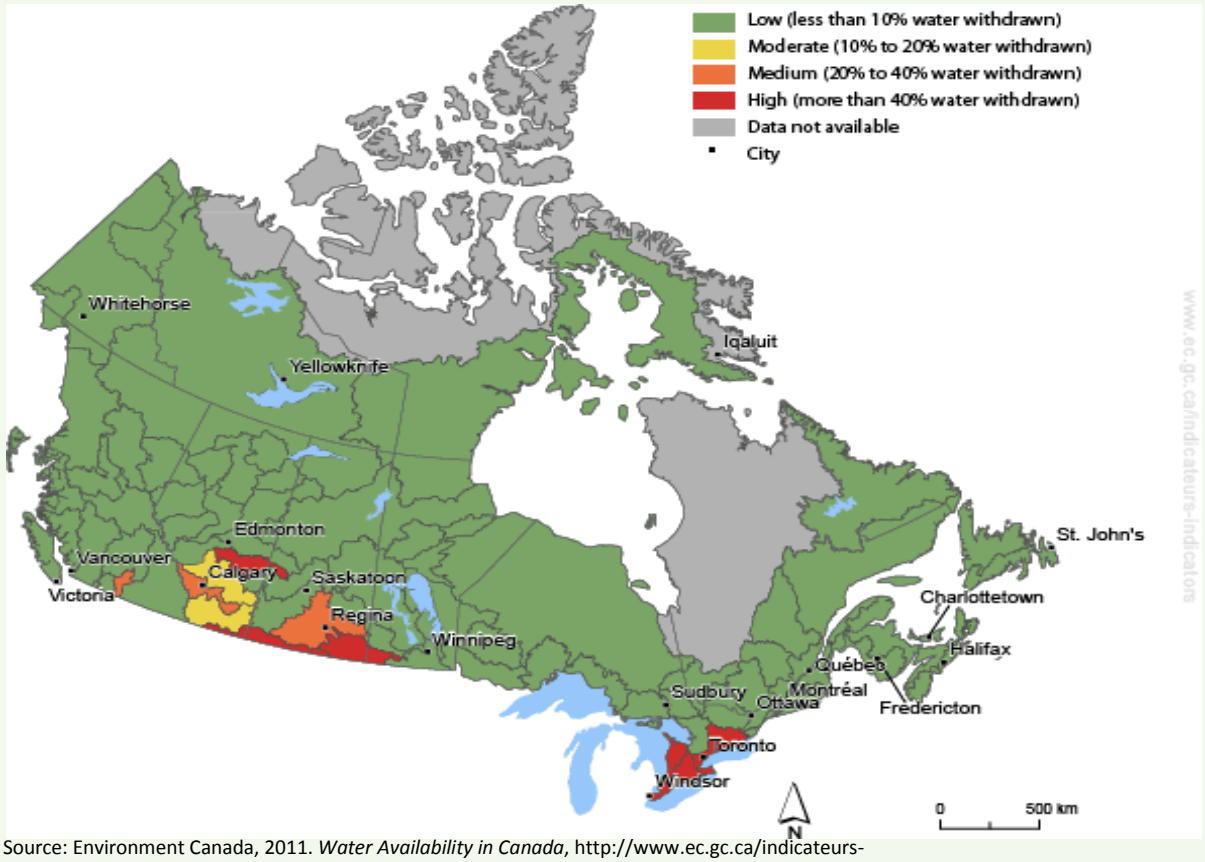
[70] Statistics Canada, 2011. *Human Activity and the Environment: Economy and the environment*, http://www.statcan.gc.ca/pub/16-201-x/16-201-x2011000-eng.pdf

[71] McKinsey Global Institute, 2011. *Resource revolution: Meeting the world's energy, materials, food, and water needs*, http://www.mckinsey.com/Insights/MGI/Research/Natural_Resources/Resource_revolution.

required.[72] Besides the obvious reliance on resources of the natural resource sectors, all sectors rely on resources (energy, land, water and materials) as key inputs for production processes. In order to reduce the resource intensity of production, there are basically two options for industry: substituting the existing resource input with less environmentally harmful or scarce resources; or increasing resource efficiency.[73]

OECD data show that Canada is the highest resource consumer per capita in the G8. According to the OECD, Canada is one of the worst in the world in terms of emissions (carbon monoxide, volatile organic compound, sulphur emissions and nitrogen), although it is slowly improving.[74] Canada has made significant improvements in the productivity of

Figure 5: Threats to water availability in Canada (2007)



Source: Environment Canada, 2011. *Water Availability in Canada*, http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=1B1433B4-1.

[72] Fischer-Kowalski, M., Swilling, M., von Weizsäcker, E.U., Ren, Y., Moriguchi, Y., Crane, W., Krausmann, F., Eisenmenger, N., Giljum, S., Hennicke, P., Romero Lankao, P., Siriban Manalang, A., and Sewerin, S., 2011. *Decoupling natural resource use and environmental impacts from economic growth*, http://www.unep.org/resourcepanel/decoupling/files/pdf/decoupling_report_english.pdf. United Nations Environment Program and International Resource Panel. Page 28.

[73] Fischer-Kowalski, M., Swilling, M., von Weizsäcker, E.U., Ren, Y., Moriguchi, Y., Crane, W., Krausmann, F., Eisenmenger, N., Giljum, S., Hennicke, P., Romero Lankao, P., Siriban Manalang, A., and Sewerin, S., 2011. *Decoupling natural resource use and environmental impacts from economic growth*, http://www.unep.org/resourcepanel/decoupling/files/pdf/decoupling_report_english.pdf. United Nations Environment Program and International Resource Panel. Page 18.

[74] OECD, 2007. *OECD Environment Data: Air*, http://www.oecd.org/dataoecd/60/11/38105116.xls.

consumption of construction materials, industrial materials, metals and fossil fuels over the last 30 years, as shown in Table 2. Statistics Canada data show increases in fossil fuel use productivity, while there were significant increases in absolute fossil fuel consumption.[75]

Analysis of the OECD multi-factor productivity database, as shown in Table 3, demonstrates that while the economy as a whole has experienced an improvement in resource use productivity, the material use productivity of many of Canada's business sectors actually increased between 1961 and 2007 (*i.e.*, negative productivity growth). In the resource-intensive sectors, only petroleum and coal manufacturing and wood manufacturing showed any gains in material-use productivity. Outside of manufacturing only the financial sector, information and cultural industries, and trade sectors showed any appreciable productivity gains.

Box 2: National and Natural Capital

For a resource-rich country such as Canada, it is vital to recognize the need to transform natural resource wealth (natural capital) into other forms of capital, which include human, social, financial and produced capital to maintain economic prosperity over time. The concept of national capital refers to the sum of all forms of capital, as a measure of a country's total wealth. When tracked over time, national capital can show whether capital stocks are going up or down, and which types of capital are growing or are being depleted. Natural capital calculations give an indication of how well a country's natural resource wealth is being managed, and whether a country's economic structure is producing sustainable wealth. Wealth from non-renewable resources should be invested in other forms of capital in order to maintain the total wealth, or national capital, of a country.[76] At the same time, other forms of capital cannot be transformed into non-renewable natural capital, which is why natural capital must be properly managed.

For further information on the National Capital concept, please access Sustainable Prosperity's Policy Summary on the subject at: http://www.sustainableprosperity.ca/article2651

According to the OECD, Canada has achieved absolute decoupling of material consumption from economic growth.[77] Canada, like all G8 countries, has also achieved some relative decoupling for certain material groups, such as wood, construction minerals, industrial minerals and metals. [78]

[75] Statistics Canada, 2011. *Supply and demand of primary and secondary energy in terajoules, annually*. CANSIM 128-0009.
[76] World Bank. *Where is the Wealth of Nations? Measuring Capital for the 21st Century*. World Bank: Washington DC, http://siteresources.worldbank.org/INTEEI/214578-1110886258964/20748034/All.pdf (2006).
[77] OECD, 2011. *Resource Productivity in the G8 and the OECD: A Report in the Framework of the Kobe 3R Action Plan*, http://www.oecd.org/dataoecd/18/20/47944428.pdf.
[78] OECD, 2011. *Resource Productivity in the G8 and the OECD: A Report in the Framework of the Kobe 3R Action Plan*, http://www.oecd.org/dataoecd/18/20/47944428.pdf.

Other studies have looked at resource productivity in Canada's natural resource sectors. One study found that in the period 1961-2000, natural resource sectors had higher labour and total factor (accounting for all inputs) productivity growth than most industrial sectors, mostly due to these sectors' high reliance on capital (versus labour).[80]

Table 2: Canada's domestic material consumption[79]

	Domestic Material Consumption (DMC) (1000 tonnes)				*DMC per capita (tonne/person)*			
	1980	**1990**	**2000**	**2005**	**1980**	**1990**	**2000**	**2005**
Food	71	83	90	101	2.9	3.0	2.9	3.1
Wood	87	40	99	101	3.6	1.4	3.2	3.1
Construction minerals	390	377	375	371	15.9	13.6	12.2	11.5
Industrial minerals	23	23	28	10	0.9	0.8	0.9	0.3
Metals	180	190	159	143	7.4	6.9	5.2	4.4
Fossil Fuels	186	194	232	178	7.6	7.0	7.5	5.5
Total	937	907	982	903	38.2	32.7	32.0	28.0

Source: OECD, 2008. *OECD Environment Data: Material resources,* http://www.oecd.org/dataoecd/22/37/41878272.xls.

[79] Domestic material consumption measures the mass (weight) of the materials that are physically used in the consumption activities of the domestic economic system (i.e., the direct apparent consumption of materials, excluding indirect flows).
[80] The Centre for the Study of Living Standards, 2003. *Productivity Trends in Natural Resources Industries in Canada*, http://www.csls.ca/reports/nrcprod.pdf.

Table 3: Energy and materials use productivity, multi-factor productivity database (1961-2007)

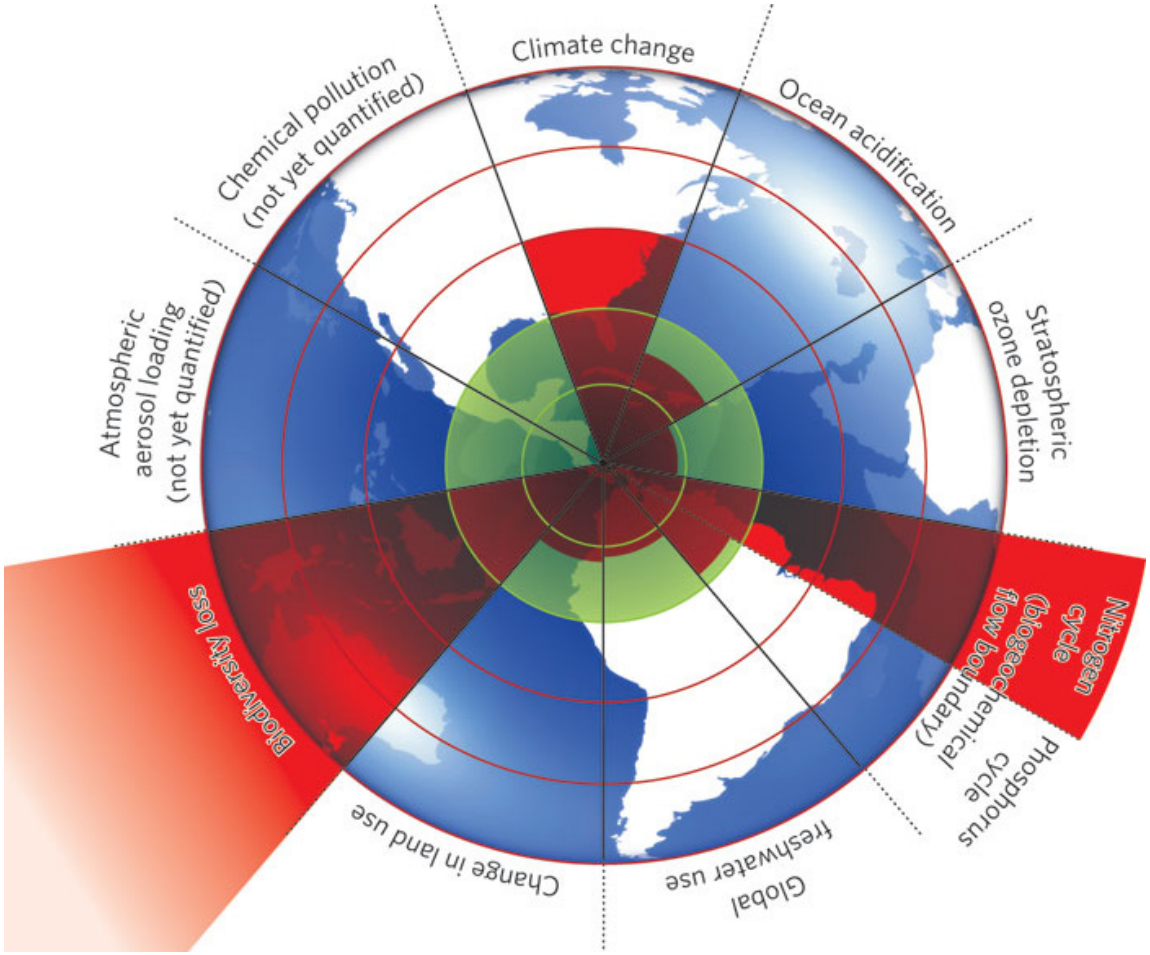
	Real Gross Output growth 1961-2007 (%)	Energy productivity Index 2007 (1961=100) (EP)	EP change 1961-2007(%)	Materials productivity Index 2007 (1961=100) (MP)	MP change 1961-2007(%)
Crop and animal production	409.2	28.5	-71.5	59.9	-40.1
Forestry and logging	220.8	273.1	173.1	72.7	-27.3
Fishing, hunting and trapping	139.8	71.1	-28.9	27.1	-72.9
Oil and gas extraction	690.0	70.7	-29.3	18.6	-81.4
Mining (except oil and gas)	265.5	173.7	73.7	65.4	-34.6
Manufacturing	464.1	188.3	88.3	99.9	-0.1
Food manufacturing	287.0	227.5	127.5	100.4	0.4
Machinery manufacturing	695.2	294.3	194.3	91.3	-8.7
Petroleum and coal products manufacturing	292.0	22.8	-77.2	117.5	17.5
Paper manufacturing	258.4	172.9	72.9	94.5	-5.5
Transportation equipment manufacturing	1362.8	642.5	542.5	100.9	0.9
Wood product manufacturing	500.0	177.5	77.5	109.3	9.3
Construction	378.6	392.6	292.6	104.0	4.0
Utilities	741.3	72.1	-27.9	42.4	-57.6
Accommodation and food services	377.1	99.0	-1.0	95.0	-5.0
Arts, entertainment and recreation	1512.5	316.2	216.2	56.6	-43.4
Finance, insurance, real estate and renting and leasing	768.2	108.4	8.4	158.8	58.8
Health care and social assistance (except hospitals)	931.7	105.3	5.3	66.6	-33.4
Information and cultural industries	1693.1	493.1	393.1	168.0	68.0
Professional, scientific and technical services	2029.0	207.6	107.6	43.3	-56.7
Retail trade	764.1	219.6	119.6	322.2	222.2
Transportation and warehousing	561.1	317.9	217.9	96.6	-3.4
Wholesale trade	1165.8	337.5	237.5	249.1	149.1

Source: Statistics Canada, 2011. *Multifactor productivity, gross output, value-added, capital, labour and intermediate inputs at a detailed industry level, by North American Industry Classification System (NAICS), annually*. CANSIM 383-0021.

4.3 CANADA'S ENVIRONMENTAL PERFORMANCE

Canada's overall environmental performance is mixed. While it has made resource productivity gains in some sectors, the Canadian economy is still highly resource-intensive and environmental protection could be strengthened. A recent study found that Canada ranked 24th out of 25 countries when examining factors such as energy and water consumption and intensity, pollution control and waste.[81] The Conference Board of Canada's recent "How Canada Performs" research found that Canada has made improvements in air quality and sustainable forestry, and has reduced its energy intensity, while greenhouse gas (GHG) emissions, freshwater resource use and waste generation could be improved.[82]

Figure 6: Nine planetary boundaries



Source: Rockström, Johan et al., 2009. A safe operating space for humanity, *Nature* 461, 472-475, http://www.nature.com/nature/journal/v461/n7263/fig_tab/461472a_F1.html.

[81] Gunton, Thomas and Calbeck, K.S., June 2010. *The Maple Leafs in the OECD: Canada's Environmental Performance*, http://www.davidsuzuki.org/publications/downloads/2010/OECD_Report_Final.pdf. David Suzuki Foundation.

[82] Conference Board of Canada, 2011. *How Canada Performs: Environment*, http://www.conferenceboard.ca/hcp/Details/Environment.aspx.

ECOLOGICAL LIMITS

At the planetary level, scientists have identified nine "planetary boundaries" that humanity must not surpass if the conditions vital to sustain life on earth are to be maintained (Figure 6).[83] Scientists have quantified these boundaries, for example, in terms of the species extinction rate, atmospheric CO_2 concentration, and percentage of land converted to cropland.

As shown in Figure 6, global society has already surpassed the boundaries for biodiversity loss and the nitrogen cycle. Moreover, the planet is on course to overshoot the thresholds on some of the other factors. The authors of the study attribute this pattern to humanity's reliance on fossil fuels and the rise of industrial agriculture.[84]

At the national or sub-national levels in Canada, there are limited scientific data about ecological limits. From an economic perspective, ecological limits can be understood in terms of ecosystem services. The economy is dependent on ecosystem services, and depleting resources or disrupting natural processes will have economic consequences. Ecosystem services can be categorized into four categories, as shown in Table 4.

Table 4: Ecosystem services

Type	Examples
Provisioning	▪ food (including seafood and game), crops, wild foods, and spices ▪ water ▪ minerals ▪ pharmaceuticals, biochemicals, and industrial products ▪ energy
Regulating	▪ carbon sequestration and climate regulation ▪ waste decomposition and detoxification ▪ purification of water and air ▪ crop pollination ▪ pest and disease control
Supporting	▪ nutrient dispersal and cycling ▪ seed dispersal ▪ primary production ▪ soil formation
Cultural	▪ cultural, intellectual and spiritual inspiration ▪ recreational experiences (including ecotourism) ▪ scientific discovery

Source: Millennium Ecosystem Assessment[85]

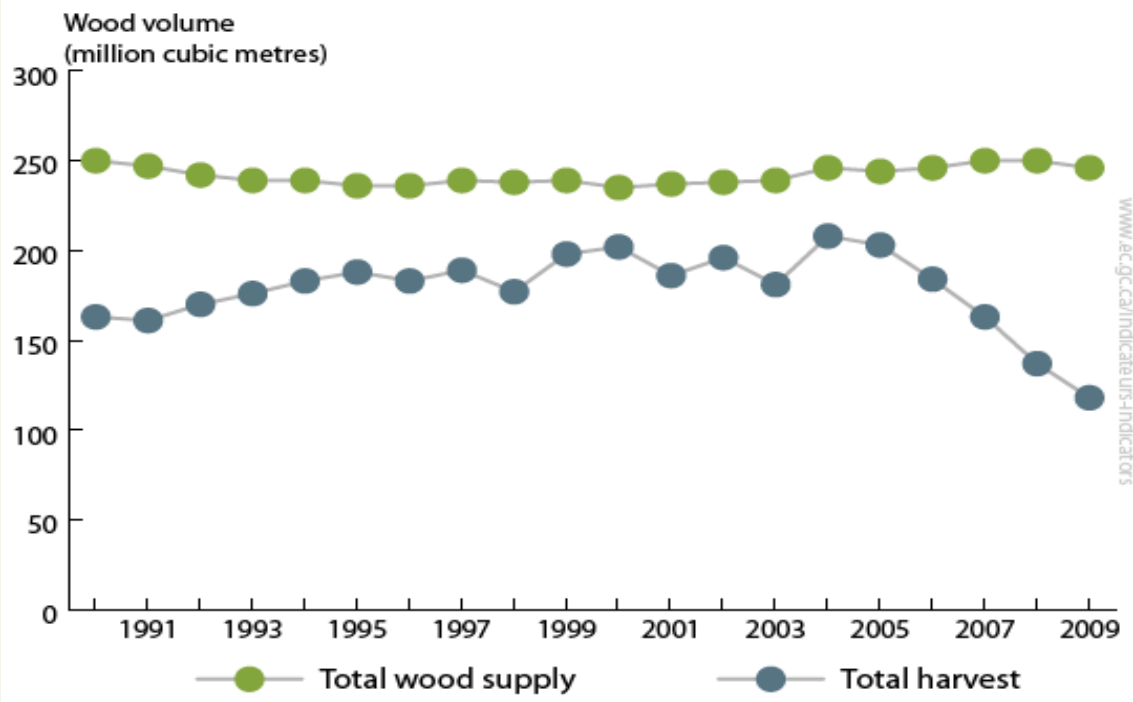
[83] The authors (Rockström, Johan et al.) recognize that these are rough first estimates and significant knowledge gaps remain, though it remains a useful concept for understanding whether humanity is living within ecological limits.

[84] Rockström, Johan et al., 2009. A safe operating space for humanity, *Nature* 461, 472-475, http://www.nature.com/nature/journal/v461/n7263/pdf/461472a.pdf.

[85] Millennium Ecosystem Assessment, 2005. *Ecosystems and Their Services,* http://www.maweb.org/documents/document.300.aspx.pdf.

Provisioning services encompass natural resources, such as timber, fish, minerals, water, and oil and gas, which can be categorized as renewable and non-renewable. With proper management (i.e., harvest rates do not exceed the renewal capacity), renewable resources can theoretically be harvested indefinitely. The environment also provides humans with important regulating services, such as climate stability, waste decomposition, and water filtration, support services such as pollination and cultural services such as spiritual inspiration.

Figure 7: Wood supply deemed sustainable for harvest and total harvest in Canada (1990-2009)



Source: Environment Canada, 2012. *Sustainability of Timber Harvest*, http://ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=A132BB91-1.

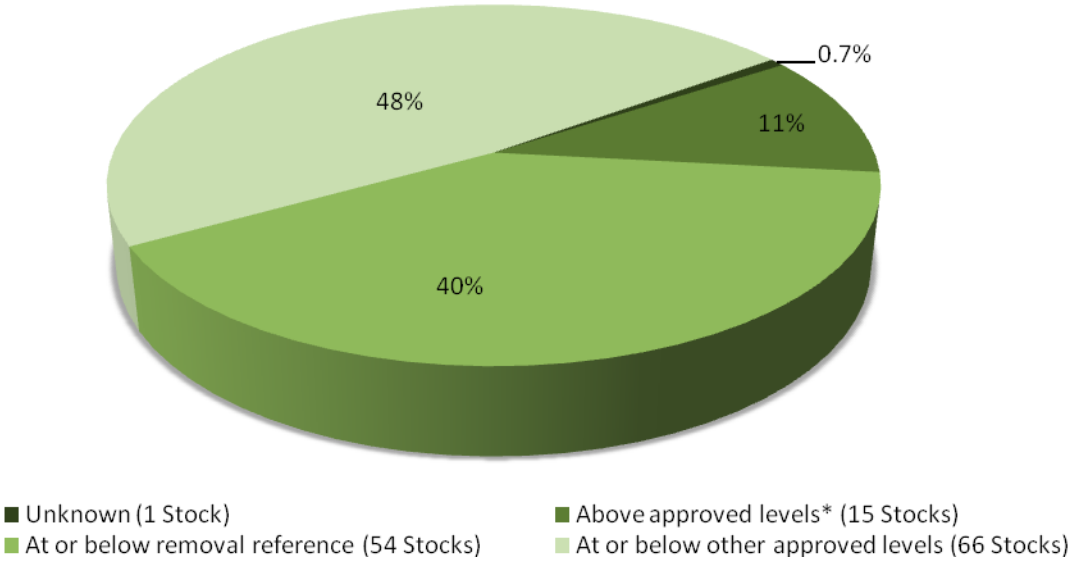
Understanding the ecological limits, in terms of stocks (e.g. provisioning services) and assimilative capacity (e.g. regulating services) is difficult without data. Limits can be understood in terms of a scientific or regulatory limit. For example, in the case of GHG emissions (which are placing increasing demands on the earth's climate regulation service), there is both a regulatory limit (17% below 2005 levels by 2020 at the Federal level in Canada, as well as a science-based target (limiting the planet to 2 degrees C of warming, which can be expressed in a megatonne target and broken down for each country either by population or GDP). In the case of air pollution, there are regulatory limits on particulate matter , volatile organic compounds and others that have been established based on their harm to human health above certain levels. Limits have been established in certain sectors in terms of harvest rates for renewable resources. For example, the forest products sector must respect an allowable annual cut, based on the sustainable growth rate of the forest area, set

out by the province or territory.[86] Environment Canada also tracks the sustainability of the annual harvest (Figure 7).

For Canada's fisheries, Fisheries and Oceans Canada develops Integrated Fisheries Management Plans that set Total Allowable Catches and quotas to try to manage fish stocks.[87] Environment Canada also tracks the status of major fish stocks, and the sustainability of the annual fish harvest (Figure 8).

Where certain stocks such as water are concerned, the data are not available at a sufficiently granular (local) level as to be meaningful. For example, on an aggregate level the national economy withdraws only 1.4% of the available water annually (100,000 cubic metres per capita), which suggests that Canada has more than enough water to sustain its economy.[89] However, in water-scarce regions, it is a different story. Water quantity fluctuates year-over-year and is not easily predictable. For example, in 2009, some local water monitoring stations reported lower-than-normal water quantity, while some reported higher-than-normal water quantity.[90]

Figure 8: Number of major fish stocks harvested relative to approved levels in Canada (2010)[88]



Source: Environment Canada, 2012. *Sustainable Fish Harvest*, http://ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=893AB9F4-1.

[86] Natural Resources Canada, 2011. *The State of Canada's Forests: Annual Report 2011*, http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/32683.pdf.

[87] Fisheries and Oceans Canada, 2012. *Integrated Fisheries Management Plans,* http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/ifmp-gmp/index-eng.htm.

[88] The removal reference is the maximum acceptable removal rate for the stock and is scientifically determined using information on the biology and condition of the stock, including monitoring and other data sources.

[89] Statistics Canada, 2009. EnviroStats: *Measuring renewable water assets in Canada: Initial results and research agenda*, http://www.statcan.gc.ca/pub/16-002-x/2009002/article/10889-eng.htm.

[90] Environment Canada, 2012. *Regional Water Quantity in Canadian Rivers*, http://ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=9ECBCE1D-1.

Beyond understanding the limits of the extraction and exploitation of ecosystem services, there must also be recognition of the value of intact ecosystems. Where their economic value has been estimated, it is extremely high. For example, in British Columbia's lower mainland, the yearly value of climate regulation services (e.g., carbon storage by forests) has been estimated at $1.7 billion.[91] Ontario's Greenbelt, a protected area of over 1.8 million acres, provides an estimated $2.6 billion annually of non-market ecosystem services, including water regulation and filtration and recreation.[92] These services can be monetized, through payments for ecosystem services. In Canada there are currently few examples of where such payments are being used, though there is vast potential. For example, the non-market value of Canada's boreal forests, covering almost 60% of the country's land mass, was estimated to exceed its market (extraction) value by more than $55 billion in 2002.[93]

CANADA'S ECOLOGICAL FOOTPRINT

The concept of an ecological footprint, expressed in hectares of land person, is a useful way to understand the resources necessary to support a country's standard of living. It helps to illustrate whether an economy is operating within ecological limits. It is not a perfect measure, and complaints about it include that it oversimplifies a complex topic by aggregating data into a single number. The ideal would be to have more localized data about the demand being placed on the resources available within a given region, though the national-level data provide a useful indication of the overall picture. In the absence of a better indicator, though, the overall concept does provide a useful metric for discussion of the green economy. Some researchers have defined a green economy as one with a low ecological footprint, and a high inequality-adjusted human development index[94] score.[95]

Table 5: Canada's ecological footprint

Population (millions)	Ecological Footprint of Production (gha per Person)	Ecological Footprint of Imports (gha per Person)	Ecological Footprint of Exports (gha per Person)	Ecological Footprint of Consumption (gha per Person)	Biocapacity (gha per Person)	Ecological Deficit (-) or Reserve (gha per Person)
32.27	12.13	4.80	9.86	7.07	20.05	12.98

Source: Global Footprint Network, *The Ecological Footprint Atlas 2008*.
Note: gha refers to global hectares

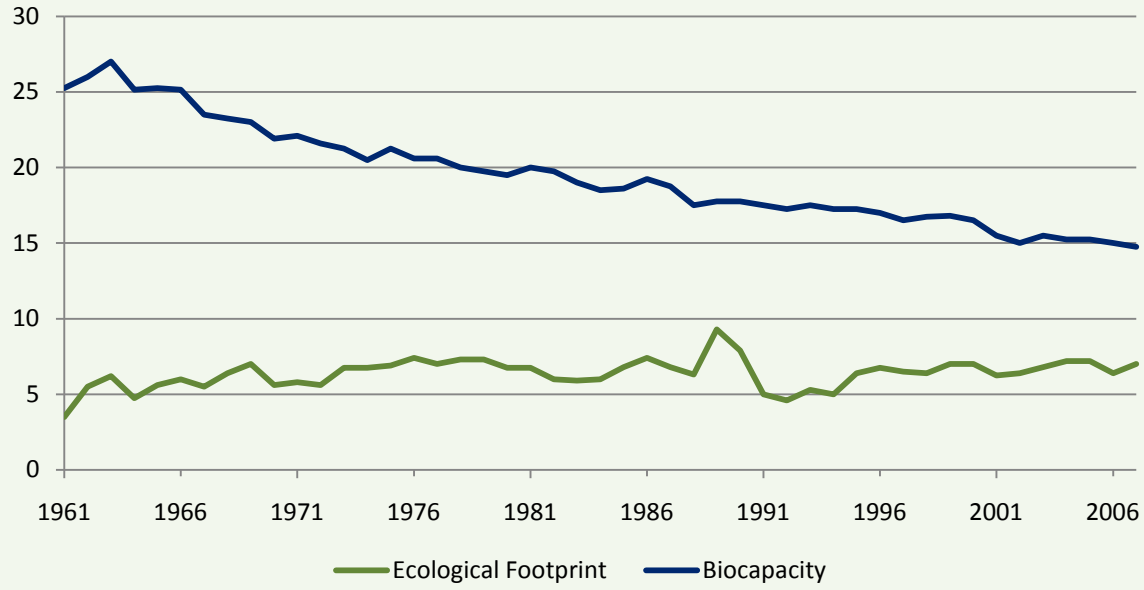
[91] Wilson, Sara J., 2010. *Natural Capital in BC's Lower Mainland: Valuing the benefits from nature*, http://www.davidsuzuki.org/publications/downloads/2010/DSF_lower_mainland_natural_capital.pdf. The David Suzuki Foundation.
[92] Wilson, Sara J., 2008. *Ontario's Wealth, Canada's Future: Appreciating the Value of the Greenbelt's Eco-Services*, http://www.davidsuzuki.org/publications/downloads/2008/DSF-Greenbelt-web.pdf. The David Suzuki Foundation.
[93] Anielski, Mark and Wilson, Sara, 2005. *Counting Canada's Natural Capital: Assessing the Real Value of Canada's Boreal Ecosystems, http://www.pembina.org/pub/204.* Pembina Institute.

[94] The Inequality-adjusted HDI (IHDI) accounts for inequality in each of the three dimensions of the HDI – education, life expectancy and income per capita – by "discounting" the average value of each one according to its level of inequality.
[95] World Wildlife Fund (WWF), 2012. *Living Planet Report 2012*, http://awsassets.wwf.ca/downloads/lpr_2012_1.pdf.

An ecological footprint is a function of three factors: population size; the amount of resources each person consumes; and, the average resource intensity of goods and services consumed. There are different types of footprints that can be calculated, including the footprint of imports, exports, production and consumption (Table 5). The footprint of production (and exports) within Canada is higher than the footprint of imports. Imported goods are said to include "embedded" (or embodied, virtual or hidden) carbon, water and other resources, meaning that when goods are imported, the environmental impacts from the production of those goods are taken into account. Some of these imported impacts are reflected in the footprint of consumption.

It is important to distinguish between the role of consumers and producers (companies) in the economy and the role they play in Canada's environmental footprint. The spotlight is usually on producers, but available data establishes that Canadian lifestyles are more energy- and resource-intensive than those in many other countries, including countries with similar levels of income and economic development. Compared to most countries, including other high income countries, Canada's overall ecological footprint is very high. In fact, Canada has the 8th highest per capita ecological footprint in the world (3.5 times the global average), behind, *inter* alia, the United Arab Emirates, the United States and Finland.[96]

Figure 9: Canada's ecological footprint and biocapacity (1960-2007)



Source: Global Footprint Network, 2010. *Country Trends: Canada*, http://www.footprintnetwork.org/en/index.php/GFN/page/trends/canada/

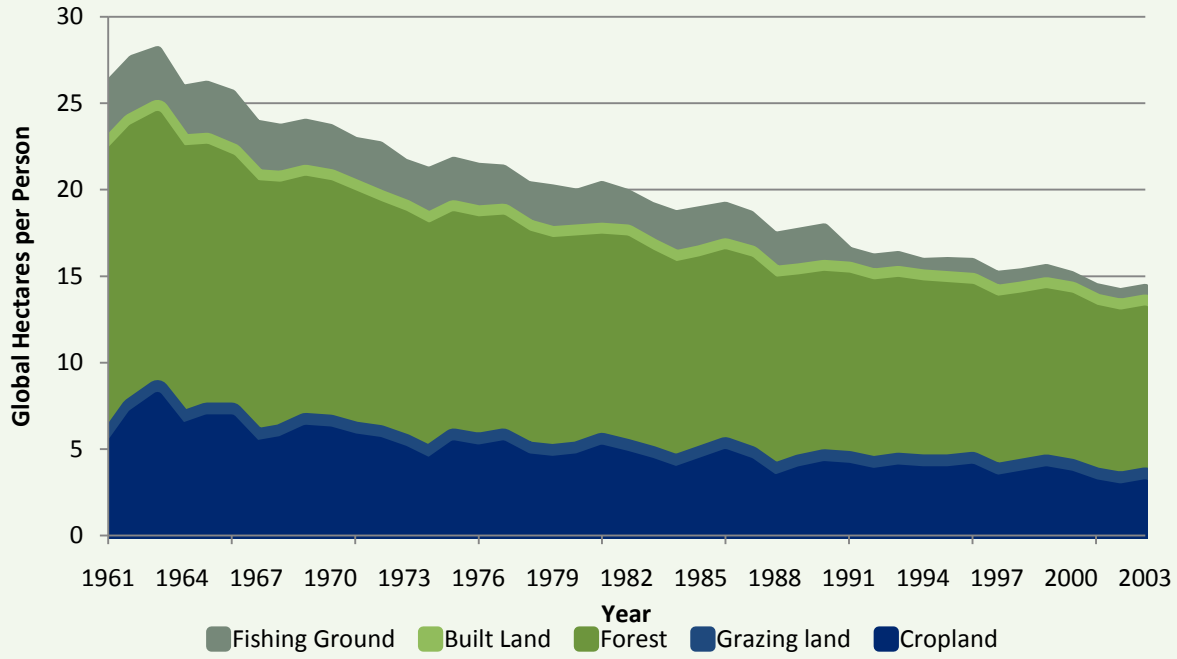
Canada's ecological footprint varies somewhat across the country, but the all provincial values are higher than the suggested "sustainable" global ecological footprint of 1.9 hectares per person. There is a high correlation between resource use and income and population

[96] World Wildlife Fund (WWF) Canada, 2012. *Living Planet Report 2012*, http://www.wwf.ca/newsroom/reports/living_planet_report_2012.cfm.

density.[97] Canada has one of the world's lowest population density rates, at 3.5 persons per square kilometre, which helps to explain its relatively high resource use per capita.[98]

its footprint, mostly due to its vast forest area, as shown in Figure 10.

Figure 10: Canada's biocapacity, by component (1961-2001)



Source: City of Calgary, 2007. *Toward a Preferred Future: Understanding Calgary's Ecological Footprint*, http://www.footprintnetwork.org/images/uploads/Calgary_Ecological_Footprint_Report.pdf.

Unlike many countries, Canada is fortunate to have such an abundance of natural resources that ecological scarcities have not historically been much of a concern. As shown in Figure 9, Canada's biocapacity[99] is currently larger than

However, the trend line in Figure 9 shows that Canada's biocapacity is falling, while its ecological footprint is rising. If current trends continue, it is expected that , by 2050 Canada's per capita ecological footprint will exceed its biocapacity[100] – and likely before that in certain regions and for certain ecosystem services. For example, although Canada may have an abundance of biocapacity in terms of forest land, that biocapacity can only be used for certain functions. In addition, the ecological

[97] Fischer-Kowalski, M., Swilling, M., von Weizsäcker, E.U., Ren, Y., Moriguchi, Y., Crane, W., Krausmann, F., Eisenmenger, N., Giljum, S., Hennicke, P., Romero Lankao, P., Siriban Manalang, A., and Sewerin, S., 2011. *Decoupling natural resource use and environmental impacts from economic growth*, http://www.unep.org/resourcepanel/decoupling/files/pdf/decoupling_report_english.pdf. United Nations Environment Program and International Resource Panel. Page 16.

[98] Natural Resources Canada, 2006. The Atlas of Canada, http://atlas.nrcan.gc.ca/site/english/maps/peopleandsociety/population/population2006/popden2006/1.

[99] Biocapacity represents the bulk of the biosphere's regenerative capacity. It is an aggregate of the production of various ecosystems in a certain area (e.g., of arable land, pasture, forest, productive sea). See: European Commission, 2006. *Ecological Footprint and Biocapacity: The world's ability to regenerate resources and absorb waste in a limited time period,* http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-AU-06-001/EN/KS-AU-06-001-EN.PDF.

[100] Stechbart, Meredith and Wilson, Jeffrey, 2010. *Province of Ontario Ecological Footprint and Biocapacity Analysis*, http://www.footprintnetwork.org/images/uploads/Ontario_Ecological_Footprint_and_biocapacity_TECHNICAL_report.pdf. Global Footprint Network.

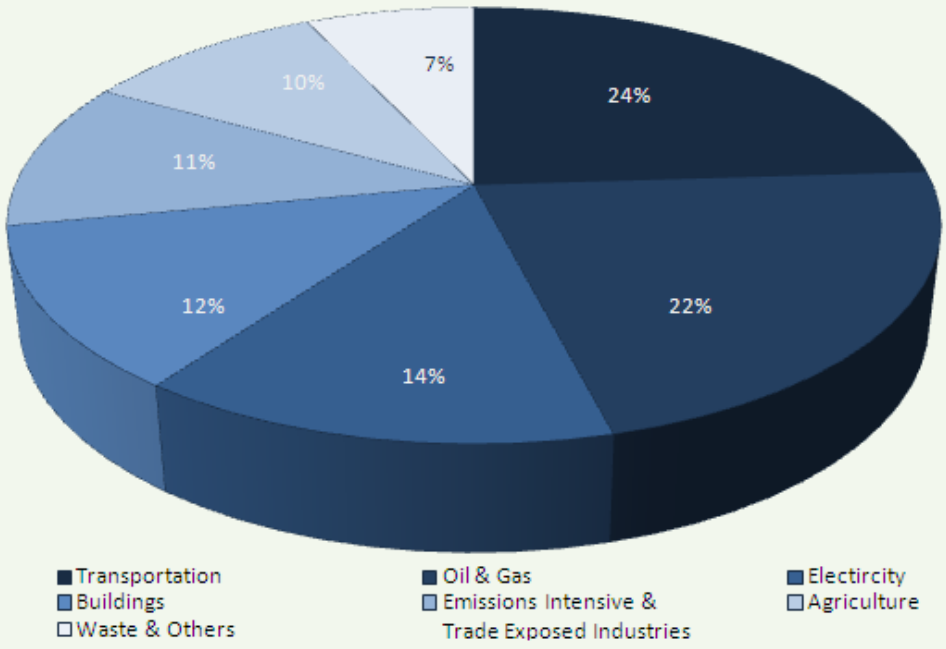
footprint does not take into account the likely impacts of climate change, which may further diminish biocapacity.

Canada's large ecological footprint is largely a function of its high demand for oil and gas. When its footprint is broken down into its main components, by far the largest contributor (more than 50%) is energy, related to fossil fuels consumed for transportation, electricity, household heat and hot water, and industrial activities.[101]

Canada's emissions profile

Canada's GHG emissions increased steadily between 1990 and 2005, though have recently stabilized.[102] Between 1990 and 2008, the GHG-intensity of Canada's GDP declined by almost 23%, due to efficiency increases and technology, and the growth of the service sectors of the economy, which are less GHG-intensive than heavy industry.[103]

Figure 11: Canada's emissions breakdown (1990-2010), by economic sector (2012)



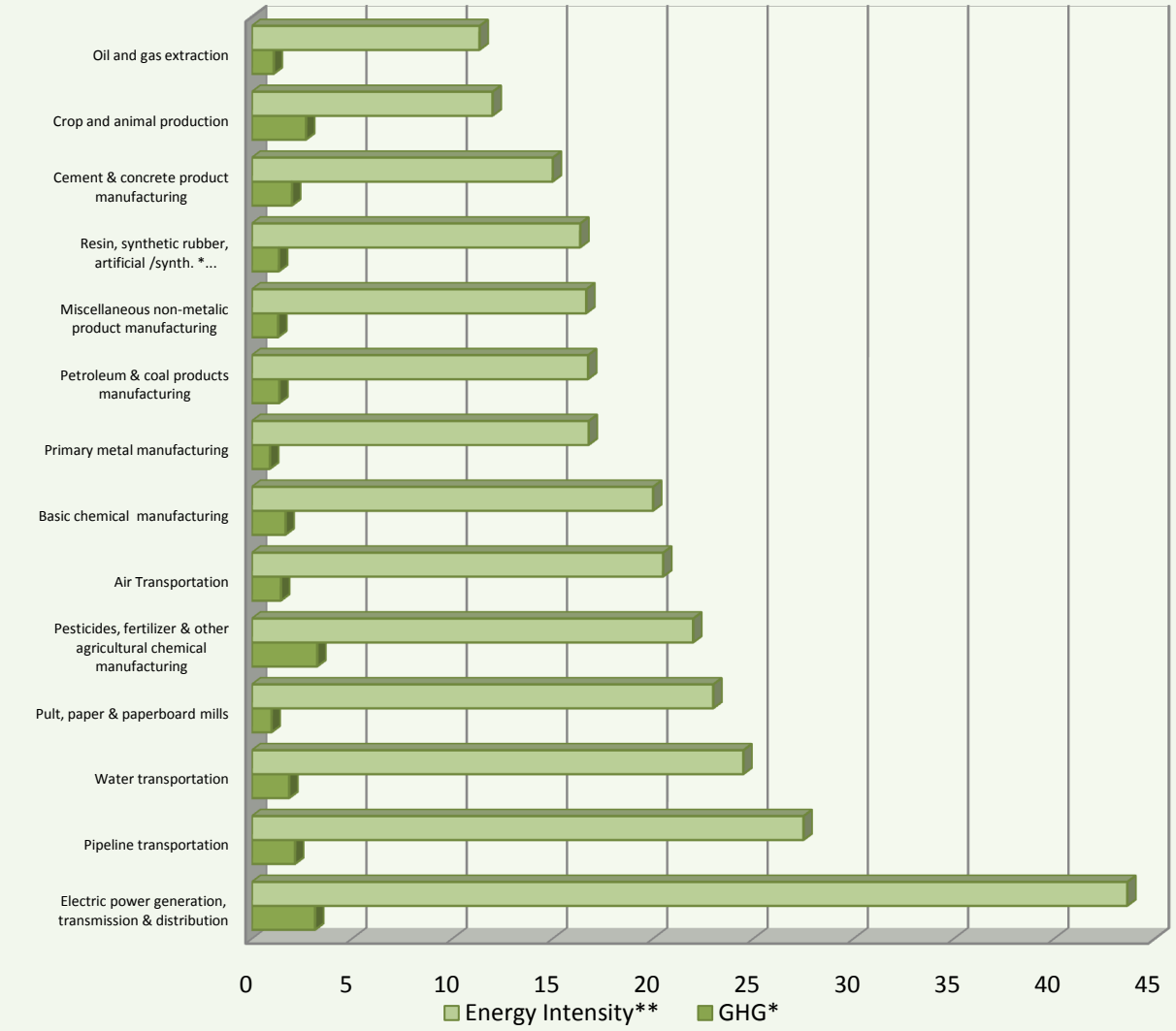
Source: Environment Canada, 2012. *National Inventory Report 1990-2010: Executive Summary: Overview of Source and Sink Category Emissions and Trends*, http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=AC8F85A5#es3.

[101] World Wildlife Fund (WWF) Canada, 2007. Canadian Living Planet Report, http://assets.wwf.ca/downloads/canadianlivingplanetreport2007.pdf.

[102] Environment Canada, 2012. *National Inventory Report 1990-2010: Executive Summary: Summary of National GHG Emissions and Trends*, http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=8BAF9C6D-1#es2.

[103] Environment Canada, 2010. *A Summary of Trends: 1990-2008: Short-term trends and comparisons: 2003-2008*, http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=0590640B-1.

Figure 12: Highest energy- and GHG-intensive sectors in Canada



*Resin, synthetic rubber, artificial /synthetic fibres, & filaments manufacturing
** Energy Intensity in gigajoules per thousand current dollars of production
*** GHG Intensity in tonnes per thousand current dollars of production
Source: Statistics Canada, 2007. *Table 153-0033 - Direct plus indirect GHG emissions intensity, by industry and Table 153-0031 - Direct plus indirect energy intensity, by industry*.

Canada's per capita GHG emissions vary substantially by province, due to factors such as electricity generation source and lifestyle. Canadian lifestyles are very GHG-intensive, partially because of the cold climate and vast distances. Every Canadian emitted about 22 tonnes of GHGs per capita in 2008, three times higher than per capita emissions in Sweden.[104]

A global emissions cut of 50% below 1990 levels by 2050 means that roughly each person is limited to 2.5 Mt CO_2e annually,[105] which Canadians now exceed by a factor of between 4 to 30, depending on where they live. About 75% of Canada's carbon footprint is

[104] Conference Board of Canada, 2011. *Environment: GHG Emissions Per Capita*, http://www.conferenceboard.ca/hcp/Details/Environment/greenhouse-gas-emissions.aspx.

[105] Yale University, 2010. *Environmental Performance Index: Greenhouse gas emissions*, http://www.epi2010.yale.edu/Metrics/GreenhouseGasEmissionsPerCapita.

domestically generated, while the balance is from imported goods.[106]

Some economically significant Canadian sectors are also quite energy- and GHG-intensive, as shown in Figure 12. Electricity generation and pipeline and water transportation are the most energy-intensive, whereas pesticide manufacturing, electricity generation and crop and animal production are the most GHG-intensive.

Canadian industrial GHG-intensity is double (72.4) the global target suggested by researchers of 36.3 tonnes CO_2 per $1,000,000 (consistent with 50% reductions in 1990 levels of emissions by 2050).[107] About 45% of Canada's industrial emissions are emitted during the creation of exports. [108]

Expected climate change impacts

Canada is predicted to be heavily impacted by climate change. Canada's ecological sensitivity to climate change is very high compared to many other countries, especially in the northern region of the country. Canada has already experienced a greater average temperature increase (1.3C since 1950) than the global average (0.78C since 1850), with greater changes in western and northern regions.[109] Some of the physical impacts of climate change include melting of glaciers, rising sea levels, earlier springs, milder winters and increasingly volatile weather.[110] In the Prairies, climate change could force a northward shift of plants and animals.[111] Undoubtedly, these climatic changes will impact the Canadian economy, which relies on natural resource-based sectors, including forestry, tourism and agriculture. Changes in growing conditions, increasingly unpredictability of weather and the migration of plants and animals, among other climate change-related impacts, will present major challenges for these sectors.

It is important to build resilience in the sectors that provide directly for the daily needs of Canadians, including food, energy, and housing. The National Roundtable on the Environment and the Economy (NRTEE) has estimated that climate change will cost Canada CAD $5 billion per year by 2020, escalating to between CAD $21 billion and CAD $43 billion per year by the 2050s.[112] The Global Adaptation Institute evaluates a country's readiness for and vulnerability to climate change, which is rolled into a single score and then ranked against other countries. Canada is currently ranked 19th in the world, with a relatively low vulnerability and high readiness ranking.[113] The climate change trends are clear, and demand both mitigation and adaptation action.

[106] Hertwich, Edgar G. and Peters, Glen P., 2009. Carbon Footprint of Nations: A Global, Trade-Linked Analysis, *Environmental Science and Technology*, 43 (16), pp 6414–6420.
[107] Yale University, 2010. *Environmental Performance Index: Greenhouse gas emissions intensity*, http://www.epi2010.yale.edu/Metrics/IndustrialGreenhouseGasEmissionsIntensity.
[108] Statistics Canada, 2011. *Human Activity and the Environment: Economy and the environment*, http://www.statcan.gc.ca/pub/16-201-x/16-201-x2011000-eng.pdf
[109] National Roundtable on the Environment and the Economy, 2010. *Degrees of Change: Climate Warming and the Stakes for Canada*, http://nrtee-trnee.ca/wp-content/uploads/2011/08/degrees-of-change-report-eng.pdf.
[110] Ibid
[111] Bergengren, Jon C., Waliser, Duane E. and Yuk L. Yung, July 22, 2011. Ecological sensitivity: a biospheric view of climate change, *Climatic Change* (2011) 107:433–457.
[112] National Roundtable on the Environment and the Economy, 2011. *Paying the Price: The Economic Impacts of Climate Change for Canada*, http://nrtee-trnee.ca/wp-content/uploads/2011/09/paying-the-price.pdf.
[113] Global Adaptation Institute, 2010. *Global Adaptation Index: Country Rankings*, http://gain.globalai.org/ranking.

GUIDING PRINCIPLES FOR A GREEN ECONOMY

Table 6 outlines the proposed framework for a green economy, with a focus on the main principles and associated criteria. The framework is guided by four key principles:

- governance and accountability;
- environmental sustainability;
- natural resource productivity and efficiency; and,
- competitiveness.

For each of these principles, it is important to integrate a long-term perspective into planning and policies. The green economy is about transforming the economy by doing things differently, including increasing cross-sectoral collaboration and adaptive decision making that incorporates feedback.

Sustainable Prosperity has developed this framework based on existing information and analysis. But we recognize that this is a critical component in the ongoing discussion of the green economy, and so we would suggest that it is an area that needs more research, analysis, and dialogue.

Table 6: Framework: guiding principles for a green economy

Principles	Governance and Accountability	Environmental Sustainability	Natural Resource Productivity and Efficiency	Competitiveness
Criteria	▪ Effective government market oversight ▪ New measures of wealth and capital accounting ▪ Coherence of corporate reporting with environmental and economic risks	▪ Reduced environmental impacts of all sectors and lifestyles ▪ Management of natural resource endowments ▪ Recognition of planetary boundaries and ecological limits	▪ Incremental (short-term) and large (medium to long-term) improvement in natural resource productivity and energy efficiency	▪ Growth of sectors producing environmentally sustainable goods and services (in a sustainable way) and green employment ▪ Management of economic reliance on natural resources and economic diversification ▪ Innovation
Enablers	▪ Policies (e.g. carbon pricing, regulation) ▪ Financing (e.g. green bonds) ▪ Institutions ▪ National plans (e.g. on sustainable development, green growth) ▪ United Nations conventions (e.g. UNFCCC, UNCCD, UNCBD) and other international environmental conventions (e.g. the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES))			

Source: Sustainable Prosperity, developed in collaboration with the International Institute for Environment and Development (IIED) and the Green Economy

TOWARDS A GREEN ECONOMY FOR CANADA: PROSPECTS AND REQUIREMENTS

6.1 THE CURRENT STATE OF THE GREEN ECONOMY IN CANADA

The analysis and data presented in this White Paper suggest that although the Canadian economy is *greening*, it is currently far from *being green*. A truly green economy would operate within well-understood ecological limits. But one of the most significant gaps we see in relation to understanding how to green our economy is in the definition and measurement of ecological limits; and how to manage them on a national, provincial, regional, sectoral or company level.[114] And so there is a pressing need for further research on how ecological conditions (at all relevant levels) are affected by economic activity.

Table 7 summarizes the current state of the green economy in Canada, in the context of the four principles of the green economy outlined in section 5.

Canada is making some progress towards greening its economy, but still has a ways to go. The following section will examine the key challenges Canada is facing. This conclusion, we acknowledge, is a very high level one. More work is needed to drill down into the specifics of these issues to arrive at a level of granularity that is useful to public and private sector decision-makers.

Table 7: Summary of the current state of the green economy in Canada

Principle	Status
Governance and Accountability	• Corporate environmental disclosure is voluntary • Alternative measures of wealth and accounting have been put forward but have not been formally adopted by governments
Environmental Sustainability	• Canadian lifestyles are among the most resource-intensive in the world • Canadian sectors are greening, but more needs to be done • Canada's biocapacity is decreasing • Limited data on ecological limits for Canada
Natural Resource Productivity and Efficiency	• Canada has made big improvements in natural resource (material) productivity overall, though these improvements are concentrated in relatively view sectors
Competitiveness	• Canada is leading in some emerging sectors, and can be competitive in the global low-carbon, resource-efficient economy • Canadian exports are becoming increasingly concentrated in natural resources • Canada could improve its performance on innovation

Source: Sustainable Prosperity

[114] The United Nations is trying to establish a standard for national environmental accounting, see: http://unstats.un.org/unsd/envaccounting/seea.asp.

6.2 PRIORITY CHALLENGES FOR CANADA

INCREASING RESOURCE PRODUCTIVITY

As a resource-based economy, Canada's transition to the green economy rests on its ability to dramatically reduce the natural resource intensity of GDP, production and consumption. As noted in section 4.2, this is known as *decoupling* . However, even if Canada achieves absolute decoupling at the macro-economic level, it does not mean that the economy, or particular sectors, are operating within ecological limits. While relative performance, against past results and peers, both at the economic, sectoral and company levels, is an important measure of progress, it provides no ecological context for performance. Large improvements in natural resource productivity are still necessary, as Canada's starting point is as a high resource consumer, even if improvements have been achieved in some sectors and with regards to some materials.

While Canada's resource abundance makes resource-intensity less of a immediate problem, it will present long-term challenges as natural capital is depleted. It also has important implications for Canada's international reputation and competitive positioning in an increasingly resource-scarce world, especially with regards to GHGs given their global impact.

IDENTIFYING ECOLOGICAL LIMITS

Many scientists fear that humans already have surpassed, at a planetary level, some key ecological thresholds . The problem is that, with the exception of GHGs and air pollution, there are no accepted ecological thresholds for water, energy use and other environmental impacts that can be broken down to the national, sectoral, or company level to enable more sustainable resource management. With the right data, Canada could establish targets for resource intensity given the available resources in a region, and the rate of consumption that would enable a sustainable renewal rate.

Sustainable Prosperity considers the development of metrics that provide sectoral and regional/provincial insights into the greening of the economy to be a high priority. We will be developing a work program in this area, and are keen to engage with interested partners.

IMPROVING COMPETITIVENESS AND INNOVATION

Canada has a long history of being a commodity supplier and a technology adopter.[115] Given its resource riches, it will continue to be a commodity supplier, but Canada should look for ways to use its resource wealth to complement industrial strategies in other areas, or to quell booms and busts.[116] Put another way, Canada should convert its natural capital into other forms of wealth, such as produced

[115] Council of Canadian Academies: Expert Panel on Business Innovation in Canada, 2009. *Innovation and Business Strategy: Why Canada Falls Short*, http://www.scienceadvice.ca/en/assessments/completed/innovation.aspx.

[116] Haley, Brendan, 2011. From Staples Trap to Carbon Trap: Canada's peculiar form of carbon lock-in. *Studies in Political Economy*, 97-132.

(infrastructure) and human (an educated and healthy workforce) capital, to ensure its long-term economic prosperity. This means continuing to invest in research and development (education, and supporting entrepreneurship and research commercialization. Canada needs to build on its strengths in certain emerging clean technology and science sectors, such as waste and recycling, to become a leading technology provider, rather than continuing to be an adopter.

Canada should seek out collaborative opportunities where possible. For example, British Columbia is collaborating with the states of California, Oregon and Washington to build a green economy in the West Coast region, with economic gains expected from increased intra-regional trade, harmonized codes and standards and infrastructure development.[117]

INCREASING RESILIENCE TO CLIMATE CHANGE AND OTHER SHOCKS

Canada is expected to be highly impacted by climate change, yet few Canadian companies are taking a systematic approach to incorporating climate risk and adaptation into their operations.[118] Canada needs to continue to improve the resilience of individuals, communities, companies, sectors, infrastructure and natural resources to extreme weather, temperature increases and other predicted impacts. Canadian priorities should include promoting long-term planning that incorporates climate change in the public and private sectors, increasing awareness, and making climate data and information more tailored to the needs of specific audiences.[119]

6.3 DEFINING A "GREEN ECONOMY" FOR CANADA

Given the gaps in knowledge and information that we have identified throughout the document, Sustainable Prosperity feels it is premature, at this point, to offer a definition for a green economy in Canada. What we can point to are necessary elements of such a definition.

A useful starting point and important requirement would be the acknowledgment that an inclusive definition is required. In this inclusive view, the green economy in Canada includes all sectors in the economy, not just those that create environmental goods and services. All sectors should aim to improve their relative environmental performance, with a longer term goal to achieve large absolute reductions in environmental impacts (e.g., waste, pollution), increase the productivity of natural resource use and protect the ecosystems they depend on. Canada needs to improve stewardship of its natural capital, and aim to reinvest the proceeds of its resource riches into innovation and sectors that directly contribute to a low-carbon, resource-efficient and climate-resilient future.

Our definition also needs to integrate both a dynamic view (i.e. the "greening" of the economy) and the reality of local, regional, or global ecological thresholds within our economy.

[117] Globe Advisors and the Centre for Climate Strategies, 2012. *The West Coast Clean Economy: Opportunities for Investment and Accelerated Job Creation*, http://globeadvisors.ca/media/3322/wcce_report_web_final.pdf.

[118] National Round Table on the Environment and the Economy, 2012. *Facing the Elements: Building Business Resilience in a Changing Climate (Advisory Report)*, http://nrtee-trnee.ca/wp-content/uploads/2012/04/cp5-advisory-report.pdf.

[119] National Round Table on the Environment and the Economy, 2010. *Degrees of Change: Climate Warming and the Stakes for Canada*, http://nrtee-trnee.ca/wp-content/uploads/2011/08/degrees-of-change-report-eng.pdf.

It should also stress the opportunity that exists around a resource productivity agenda, and how that would serve Canada's economic and environmental interests.

And finally, it should both align with and inform choices related to indicators and metrics that help us understand both how green we are, and how much we are greening.

6.4 MEASURING PROGRESS: INDICATORS FOR A GREEN ECONOMY

This section outlines a proposed set of indicators that could support policy makers in developing appropriate policy responses, setting priorities and tracking progress towards a green economy. Table 8 summarizes the indicators. The set is largely based on the indicators identified in the OECD report, *Towards Green Growth: Monitoring Progress - OECD Indicators* [120] and chosen based on policy relevance and utility for the users, analytical soundness, and measurability of underlying data.[121] The OECD work on indicators is a useful framework because it allows for comparisons across countries.[122] Moreover, the data needed to support the indicators are generally accessible -- many are already being collected by Statistics Canada, Environment Canada or the OECD. The indicators do not include company-level sustainability metrics, such as percentage of materials used that are recycled input materials or direct energy consumption by primary energy source.

This White Paper does not suggest targets for any of the proposed indicators. Rather, the indicators focus on environmental status and performance, with several solely economic-oriented indicators in the subsection on competitiveness.

This set of indicators is meant to be a subset of the larger number of indicators that a country may collect data about regarding its environmental, economic and social performance. These indicators were chosen based on the authors' judgement as the most relevant to the measurement of a green economy, as described in this report. It is important to note that no single indicator tells the whole story on its own, and that the indicators cannot be understood separate from their context in terms of resource availability and ecological limits. Unfortunately, as previously noted, much of the contextual data is either lacking or is at an insufficiently granular level.

RELATIVE VERSUS ABSOLUTE PERFORMANCE

When it comes to evaluating the environmental performance of a country, sector or company, present performance can be compared to past performance (time), peers (relative) or against a target (absolute). It is easier to measure relative performance – over time and against peers. Absolute performance improvements, especially against environmental thresholds, are the hardest to measure, for the simple reason that environmental thresholds are difficult or impossible to define.

Over the past 10 years, there has been a rapid expansion in corporate reporting and benchmarking on a variety of environmental issues. This provides a useful baseline from which to assess the relative performance of Canadian companies. It has become increasingly easy to understand how companies

[120] OECD, 2011. *Towards Green Growth: Monitoring Progress - OECD Indicators*, http://www.oecd.org/dataoecd/37/33/48224574.pdf.
[121] OECD, 2004. *Quality Framework for OECD Statistical Activities*, http://www.unescap.org/stat/apex/2/APEX2_S.4_OECD.pdf.
[122] Though there are some data limitations, it is filling a gap in enabling country-level comparisons.

perform in relation to their peers, which is useful information to policy makers, investors, and others. However, relative performance only tells part of the story. For example, a company may out-perform its peers on the productivity of its water use, but that is not the same thing as understanding how it performs in relation to an *absolute* threshold of productivity (e.g. relative to the regenerative capacity of the watershed in which it operates). Similarly, an absolute measure of sustainability may be known for for a country's GHG emissions (based, presumably, on what a national government has set as its target), but there is no current mechanism for understanding or allocating a corporation's "share" of that target.

Table 8: Recommended indicators

Indicator/Tool	Data	Source
Principles		
Governance and Accountability		
National Green Economy Plan?		
Inclusion of natural capital into national capital accounts (i.e., national monetary balance sheets including estimates of the value of land)		**Sources: Statistics Canada, 2011. *Natural resource wealth, 2010* in EnviroStats. Catalogue no. 16-002-X. Vol. 5, no. 3. http://www.statcan.gc.ca/pub/16-002-x/2011003/part-partie4-eng.htm and http://www.statcan.gc.ca/pub/16-201-x/16-201-x2011000-eng.pdf. See also: Environment Canada, 2012. *Nature Indicators: Biological Resources*: http://ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=DC4B459E-1. The United Nations is also advancing work on this topic: http://unstats.un.org/unsd/envaccounting/seea.asp.**
Environmental Sustainability		
Water use and water efficiency by industry, household water use per capita	▪ Freshwater abstractions per capita: 1131.2 m^3/cap (latest year available) ▪ Renewable freshwater resources per capita: 104,430 m^3/cap ▪ Statistics Canada has water intake by North American Industry Classification System (NAICS) code.	**OECD Environmental Data Statistics Canada (Table Table 153-0047) See also: Statistics Canada, *Human Activity and the Environment: Freshwater supply and demand in Canada*: (http://www.statcan.gc.ca/pub/16-201-x/16-201-x2010000-eng.htm) and Environment Canada, Water Indicators (http://ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=13307B2E-1).**
GHG emissions per person, unit of production, $ GDP (production-based CO_2 intensity), per sector Real income per unit/GHG emissions (demand-based CO_2 intensity)[123]	▪ 20.3 per capita (2010) ▪ StatsCan has GHG intensity by NAICS ▪ StatsCan has GHG emissions by NAICS ▪ Environment Canada has GHG emissions by economic sector and by large facilities ▪ StatsCan has direct and indirect GHG emissions by household	**Statistics Canada, 2010. *Environment and natural resources indicators*, http://www.statcan.gc.ca/pub/16-002-x/2011003/t011-eng.htm. Statistics Canada, Table 153-0033. Statistics Canada, Table 153-0034. Environment Canada, 2012. *Air and Climate Indicators: Greenhouse Gases*, http://ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=03603FB3-1. Statistics Canada, 2011. *Human Activity and the Environment: Economy and the environment,* http://www.statcan.gc.ca/pub/16-201-x/16-201-x2011000-eng.pdf**
Share of renewable energy in TPES, in electricity production	▪ 60.9% (2009)	**IEA Statistics, 2011. *Energy Balances of OECD Countries*.**
Fossil fuel subsidies	▪ $1,446 million (2002)	**Pembina Institute, 2005. *Government Spending on Canada's Oil and Gas Industry: Undermining Canada's Kyoto Commitment*, http://www.pembina.org/pub/181. OECD also has more recent figures but need to be added up by energy source.**
Risk assessment of specific geographic regions and specific sectors		**See NRTEE Climate Prosperity series.**

[123] Current data available from Statistics Canada is for direct and indirect household GHG emissions, which isn't exactly the same indicator. Work is underway at Environment Canada to develop more robust and transparent demand-based CO_2 data.

Natural Resource Productivity and Efficiency		
Energy productivity (GDP per unit of CO_2 emitted, GDP per unit of TPES, in USD/1000 toe)	▪ 1.87 (2000), 2.17 (2008) ▪ 0.2925 (TPES/GDP, 2010)	**OECD, 2011. *Towards Green Growth: Monitoring Progress OECD Indicators*.** **http://dx.doi.org/** **http://dx.doi.org/10.1787/888932425346** **IEA Statistics, 2011. *Energy Balances of OECD Countries*.**
Energy intensity by sector (manufacturing, transport, households, services)	▪ StatsCan has energy intensity by NAICS	**Statistics Canada, Table 153-0031.**
Demand based material productivity	▪ Need a subscription	**OECD Material Flows Analysis database**
Domestic material productivity (GDP/DMC)	▪ 1.77 (2007)	**OECD Material Flows Analysis database**
Waste generation intensities and recovery ratios (By sector, per unit of GDP or VA, per capita)	▪ Need a subscription	**OECD, 2011. *Towards Green Growth: Monitoring Progress OECD Indicators*.**
Nutrient balances in agriculture (per agricultural land area and change in agricultural output)	▪ Phosphorus balance per ha: 1 (2006/08) ▪ Nitrogen balance per ha: 30 (2006/08)	**OECD Agri-environmental indicators**
Value-Added per unit of water consumed, by sector (for agriculture: irrigation water per hectare irrigated)	▪ Need a subscription ▪ Could probably be calculated from StatsCan data	**OECD, 2011. *Towards Green Growth: Monitoring Progress OECD Indicators*.**
Multi-factor productivity reflecting environmental services	▪ Under development	**OECD, 2011. *Towards Green Growth: Monitoring Progress OECD Indicators*.**
Value-added (profit per unit) productivity of natural resource sectors	▪ Multi-factor productivity: -0.2% (2000-2009) ▪ Need a subscription	**OECD Productivity Database** **OECD, 2011. *Towards Green Growth: Monitoring Progress OECD Indicators*.**
Energy efficiency of building stock	▪ Office of Energy Efficiency has energy use by building type	**Natural Resources Canada (Office of Energy Efficiency): http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tablestrends2/res_ca_8_e_3.cfm?attr=0.**
Competitiveness		
Global competitiveness ranking	▪ 12/142 (2011-2012)	**World Economic Forum, 2012. *The Global Competitiveness Report 2011–2012*, http://www3.weforum.org/docs/WEF_GCR_Report_2011-12.pdf.**
Size and growth of the small and medium sized sector	▪ 2.4 million establishments (2009) ▪ 29% of GDP (less than 50 employees – 2008)	**Industry Canada, 2010. *Key Small Business Statistics*, http://www.ic.gc.ca/eic/site/sbrp-rppe.nsf/vwapj/KSBS-PSRPE_July-Juillet2010_eng.pdf/$FILE/KSBS-PSRPE_July-Juillet2010_eng.pdf.**
Value of EGS produced in the economy (and share of global market) **Imports and exports of EGS**	Not available	**See: ECO Canada, 2010. *Canadian Environmental Sector Trends: Labour Market Study*, http://www.eco.ca/pdf/Canadian-Environmental-Sector-Trends-2010.pdf.**
Environmental technologies (in % of total R&D, by type)	▪ $337 million (energy-related only) (2010) ▪ 4.38% (% R&D expenditure of importance to green growth)	**IEA database** **OECD Science and Technology Dataset**

Environmentally-related patents	▪ 0.34% (Patents in energy and climate change mitigation technologies) ▪ 0.72% (Patents in pollution abatement and waste management technologies)	**OECD Patent Database (2003-2008 data)**
Direct employment in the EGS sector (in % of total employment)	Not available	**See: ECO Canada, 2010. *Canadian Environmental Sector Trends: Labour Market Study*, http://www.eco.ca/pdf/Canadian-Environmental-Sector-Trends-2010.pdf.**
Revenues from environmentally-related taxes	▪ 4% (% of total tax revenues) (2009)	**OECD/EEA database on instruments used for environmental policy and natural resource management**
$ (public and private sector) investment in targeted areas; e.g., renewable energy, environmental technologies, green job skill development	▪ $3 billion in green stimulus spending (2009)	**HSBC, 2009. *A Climate for Recovery: The colour of stimulus goes green.***

Source: Sustainable Prosperity, based on various, see footnote

CONCLUSION AND NEXT STEPS

Canada, like all developed countries, has a long way to go before its economy could be considered truly green. However, a lot of progress has been made in recent years, and there is tremendous potential for Canada to become a leader in greening the economy. SP believes that the payoff, will be substantial and that it will serve both our economic and environmental interests.

Sustainable Prosperity aims to continue to play a role in facilitating the Canadian dialogue on a green economy. This White Paper is something we view as a research and development exercise of sorts, insofar as it identifies new avenues of policy research and engagement. From the outset, we anticipated that the development of this paper would uncover some important gaps in information. We have highlighted some of these throughout the document, but would summarize them as such:

- First and foremost, the framework by which we can define and measure the green economy is one that will need a great deal more discussion and analysis. We consider the one presented in this paper to be very good, but not the last word on the subject.
- The data needs required to populate that framework are substantial. And without slighting in any way the substantial work done by StatsCan to date, it is clear that more will be needed to help us understand how Canada is performing on various measures of resource productivity.
- Similarly, our understanding on the specifics of ecological limits could use further refinement, particularly at the sectoral and regional levels.
- And finally, the search for an ultimate definition of green economy needs to be carried out in a way that reflects the reality of our economic and environmental circumstances, and of the data and metrics to which we have access.

We declare no ownership of the analysis and ideas contain in the document, and in fact hope that it will be used by other interested parties as the basis for further dialogue and research.

We invite public and private organizations with an interest in this issue to contact us. We will be, over the coming weeks and months, defining our own priorities and welcome the chance to work with others on issues of common interest.

SUSTAINABLE PROSPERITY