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# Environmental-Economic Accounting in Canada

## Regional Seminar on the System of Environmental-Economic Accounts (SEEA) Central Framework in the Caribbean

February 6-7, 2014

Castries, Saint Lucia

**Joe St. Lawrence**

**Statistics Canada**



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# Integrating the Environment and the Economy at Statistics Canada



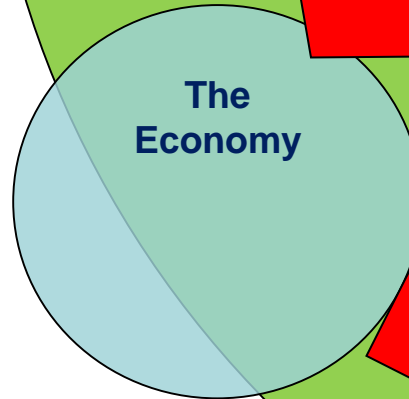
- 1978 First edition of *Human Activity and the Environment*
- 1989 *Waste Management Industry Survey*
- 1994 *Survey of Environmental Protection Expenditures*
- 1995 *Environment Industry Survey*
- 1997 *Canadian System of Environment and Resource Accounts (CSERA)*
- 2003 *Environment and Sustainable Development Indicators*
- 2005 *Agricultural Water Use Survey*
- 2007 *Survey of Industrial Water Use*
- 2009 *Survey of Drinking water Treatment Plants*
- 2013 *Measuring Ecosystem Goods and Services* project results published in *Human Activity and the Environment*.

# The Economy and The Environment

Stocks

Flows

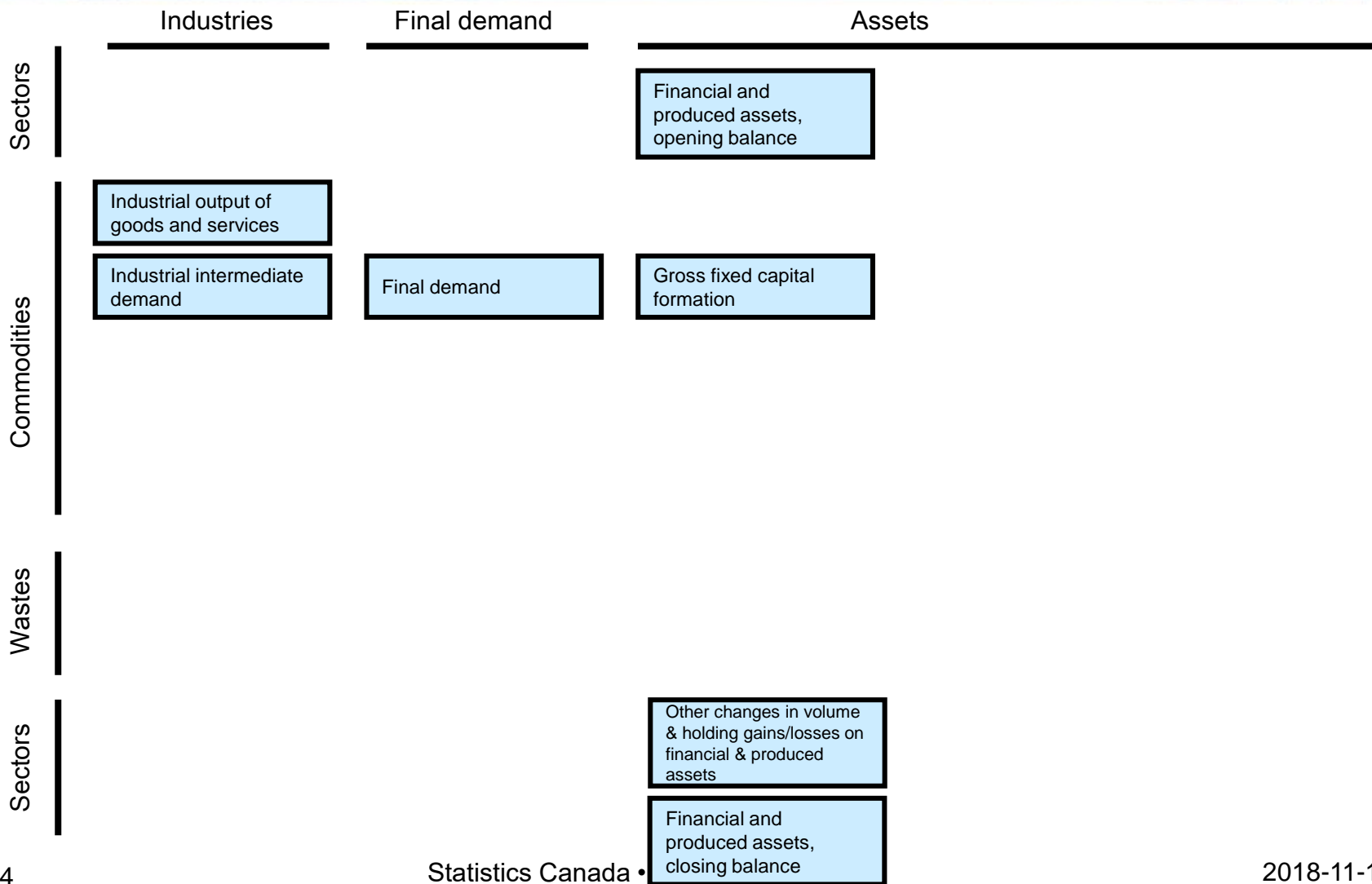
Expenditures



- Natural Resources
- Ecosystem Services

-Residuals

# SNA view

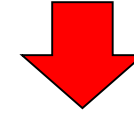


# SEEA view

	Industries	Final demand	Assets		
Sectors			Financial and produced assets, opening balance	Natural resource assets, opening balance	Natural resource assets, opening balance
Commodities	Industrial output of goods and services				
	Industrial intermediate demand Environmental protection expenditures	Final demand Environmental protection expenditures	Gross fixed capital formation Capital expenditures for environmental protection		
	Resource production by industries Resource use by industries	Resource production by households/gov't Resource use by households/gov't			
Wastes	Waste consumption by industries Waste output by industries	Waste consumption by households/gov't Waste output by households/gov't			
Sectors			Other changes in volume & holding gains/losses on financial & produced assets	Changes in and holding gains/losses on natural resource assets	Changes in natural resource assets
			Financial and produced assets, closing balance	Natural resource assets, closing balance	Natural resource assets, closing balance

# Flow Accounting

Table 3.2.1 General physical supply and use table



Supply table		Production; Generation of residuals		Accumulation	Flows from the rest of the world	Flows from the environment	Total
	Production; Generation of residuals by industries (incl. household production on own account) - classified by ISIC	Generation of residuals by households	Industries - classified by ISIC				
Natural inputs						A. Flows from the environment (incl. natural resource residuals)	Total Supply of Natural Inputs (TSNI)
Products	C. Output (incl. sale of recycled and reused products)				D. Imports of products		Total Supply of Products (TSP)
Residuals	I1. Residuals generated by industry (incl. natural resource residuals) I2. Residuals generated following treatment	J. Residuals generated by household final consumption	K1. Residuals from scrapping and demolition of produced K2. Emissions from controlled landfill sites	L. Residuals received from rest of the world		M. Residuals recovered from the environment	Total Supply of Residuals (TSR)
Total supply							
Use table		Intermediate consumption of products; Use of natural inputs; Collection of residuals	Final consumption*	Accumulation	Flows to the rest of the world	Flows to the environment	Total
	Industries - classified by ISIC	Households	Industries - classified by ISIC				
Natural inputs	B. Extraction of natural inputs B1. Extraction used in production B2. Natural resource residuals						Total Use of Natural Inputs (TUNI)
Products	E. Intermediate consumption (incl. purchase of recycled and reused products)	F. Household final consumption (incl. purchase of recycled and reused products)	G. Gross Capital Formation (incl. fixed assets and inventories)	H. Exports of products			Total Use of Products (TUP)
Residuals	N. Collection and treatment of residuals (excl. accumulation in controlled landfill sites)		O. Accumulation of waste in controlled landfill sites	P. Residuals sent to the rest of the world		Q. Residual flows to the environment Q1. Direct from industry and households (incl. natural resource residuals & landfill emissions) Q2. Following treatment	Total Use of Residuals (TUR)
Total use							

\*No entries for government final consumption are recorded in physical terms. All government intermediate consumption, production and generation of residuals is recorded against the relevant industry in the first column of the PSUT.



# Energy Flow Accounting

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**Table 153-0032** <sup>1, 2, 3</sup>  
**Energy use, by sector**  
 annual (terajoules)

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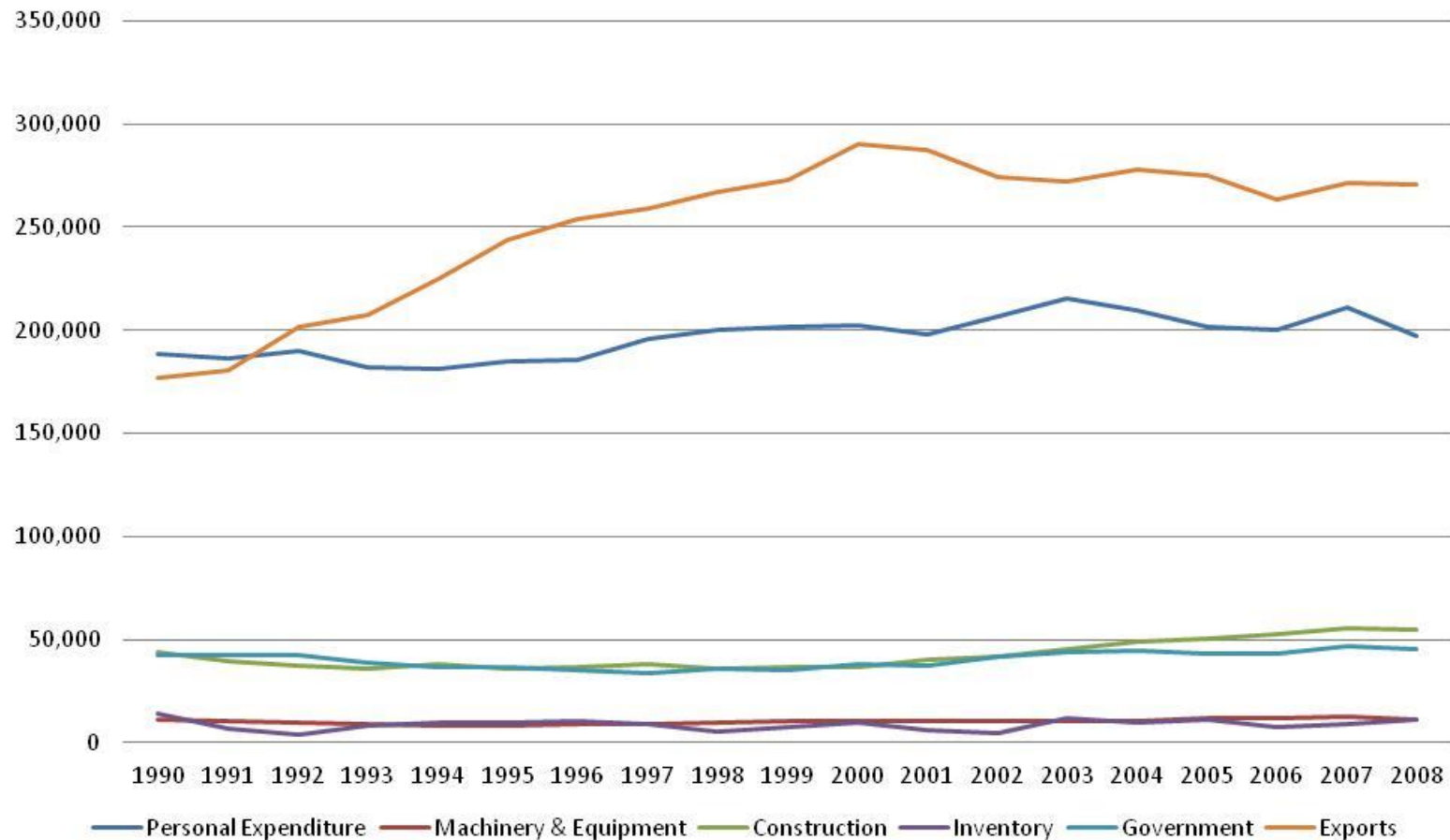
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Geography = Canada

Sector	2004	2005	2006	2007	2008
<b>Total, all sectors</b>	10,498,742	10,470,903	10,226,701	10,840,945	10,612,484
<b>Business sector</b>	7,658,424	7,632,322	7,442,237	7,851,631	7,649,385
Crop and animal production	177,363	169,023	162,585	177,368	174,849
Forestry and logging	41,144	44,839	38,362	31,051	30,369
Fishing, hunting and trapping	16,950	13,492	11,351	11,196	11,118
Support activities for agriculture and forestry	13,468	15,955	14,049	15,295	15,837
Oil and gas extraction	1,074,476	1,112,942	1,052,099	1,104,403	1,096,012
Coal mining	17,916	14,919	12,498	14,162	17,921
Metal ore mining	70,269	74,533	74,584	70,172	82,056
Non-metallic mineral mining and quarrying	55,270	53,045	58,387	58,604	58,858
Support activities for mining and oil and gas extraction	54,195	61,830	68,896	63,791	61,170
Electric power generation, transmission and distribution	1,611,069	1,623,420	1,515,911	1,666,580	1,657,178

# Residuals Flow Accounting

## Industrial emissions by final demand category





# Asset Accounting

**Table 5.5.3 Physical asset account for mineral and energy resources (physical units\*)**

	Type of mineral and energy resource (Class A: Commercially recoverable resources)				
	Oil resources (‘000 barrels)	Natural gas resources (m3)	Coal & peat resources (‘000 tonnes)	Non-metallic minerals (tonnes)	Metallic minerals (‘000 tonnes)
<b>Opening stock of mineral and energy resources</b>	800	1 200	600	150	60
<b>Additions to stock</b>					
Discoveries					20
Upwards reappraisals		200		40	
Reclassifications					
<i>Total additions to stock</i>		200		40	20
<b>Reductions in stock</b>					
Extractions	40	50	60	10	4
Catastrophic losses					
Downwards reappraisals			60		
Reclassifications					
<i>Total reductions in stock</i>	40	50	120	10	4
<b>Closing stock of mineral and energy resources</b>	760	1 350	480	180	76

\* Different physical units (e.g. tonnes, cubic metres, barrels) will be used for different types of resources.

# Asset Accounting



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## Table 378-0005<sup>3</sup>

Natural resource assets and produced assets  
annual (dollars x 1,000,000)

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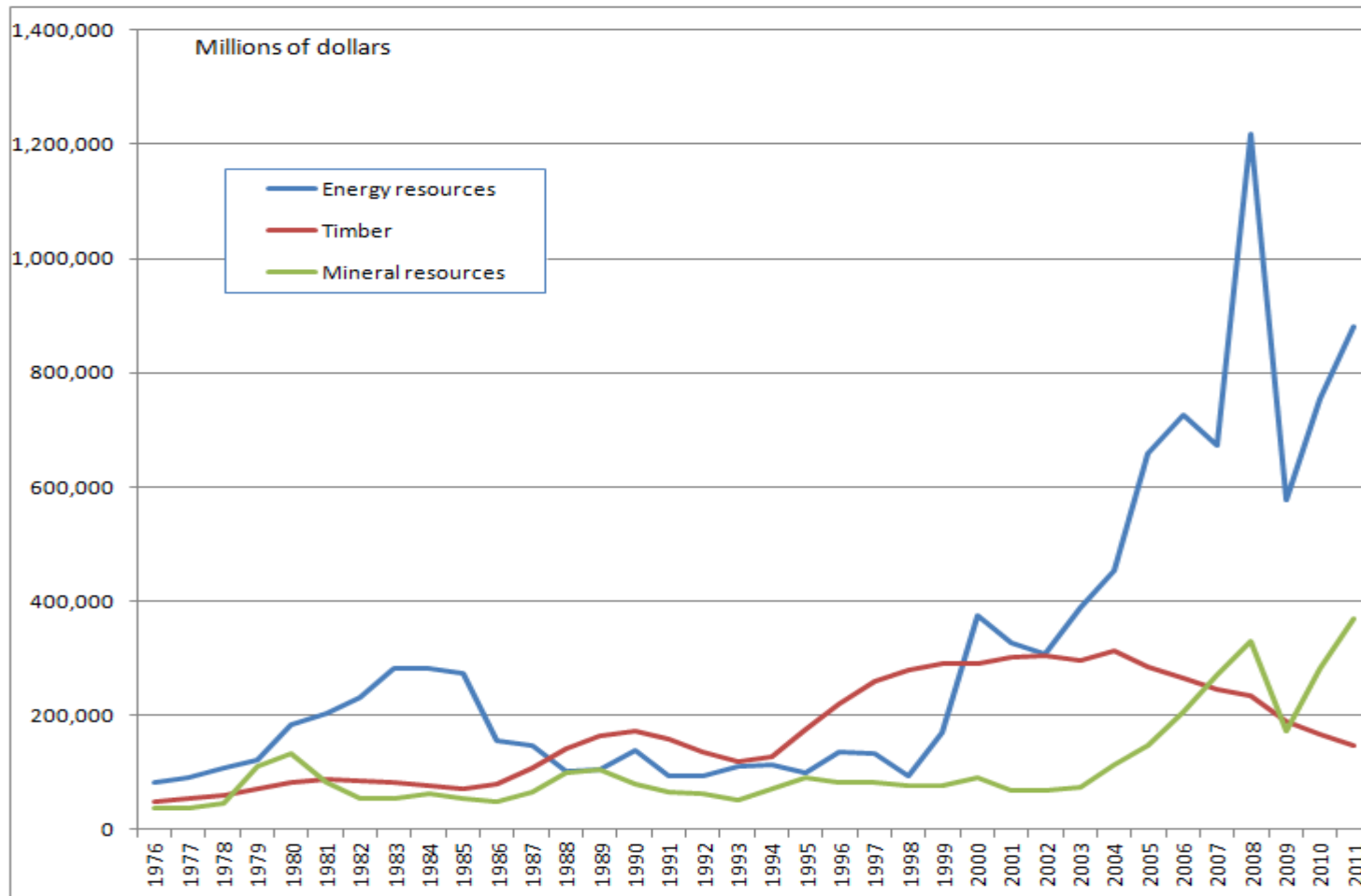
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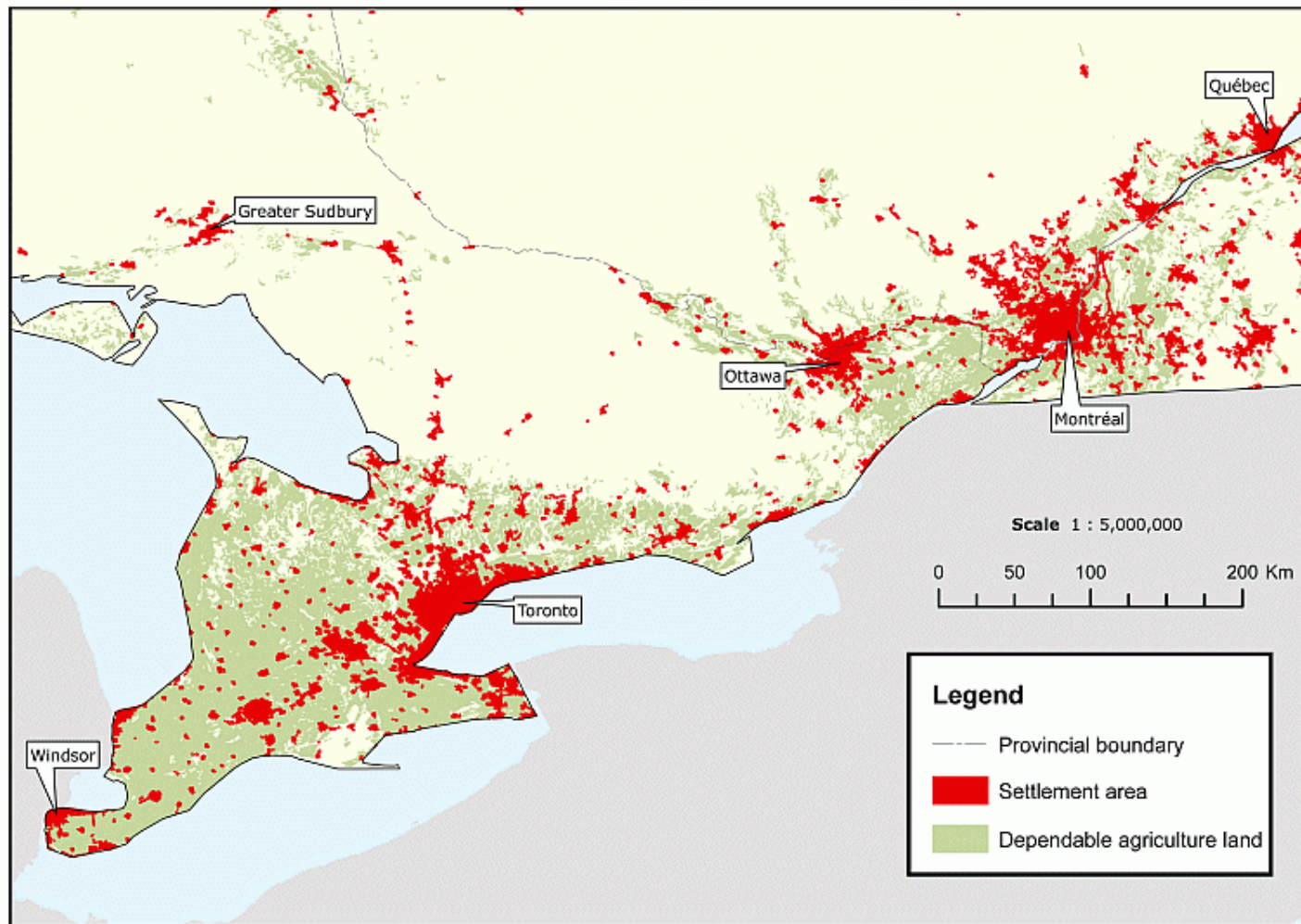
Geography = Canada

Categories	2008	2009	2010	2011	2012
<b>Non-financial assets</b>	7,416,200	6,629,425	7,313,829	7,960,934	8,041,096
<b>Produced non-financial assets</b>	4,187,815	4,246,166	4,408,493	4,639,292	4,895,157
Residential structures	1,654,058	1,687,356	1,778,316	1,871,006	1,980,938
Non-residential structures	1,319,709	1,328,319	1,393,163	1,489,886	1,588,777
Machinery and equipment	311,551	324,913	304,853	307,726	325,358
Consumer durable goods	465,860	476,435	495,912	513,720	525,196
Inventories	244,505	233,382	236,050	249,915	259,899
<b>Non-produced non-financial assets</b>	3,228,385	2,383,259	2,905,336	3,321,642	3,145,939
Land	1,805,153	1,931,790	2,037,456	2,202,114	2,360,816
Timber	131,789	71,567	122,276	120,499	113,133
Subsoil resource stocks	1,291,443	379,902	745,604	999,029	671,990
Selected energy resources <sup>1</sup>	987,017	256,900	516,642	679,642	441,628
Selected mineral resources <sup>2</sup>	304,426	123,002	228,962	319,387	230,362

# Canada's Natural Resource Wealth

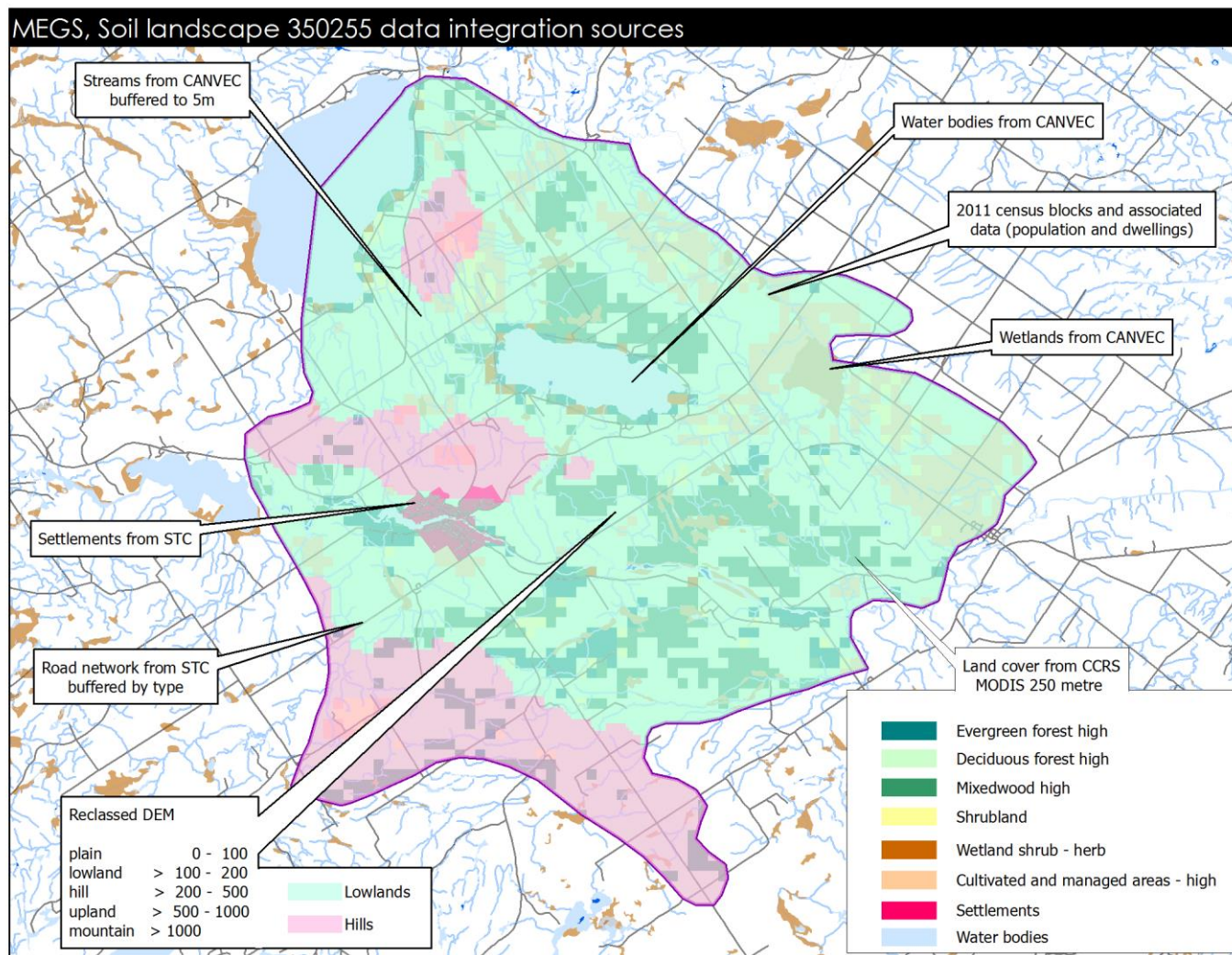


# Settlements and Dependable Agricultural Land, 2006



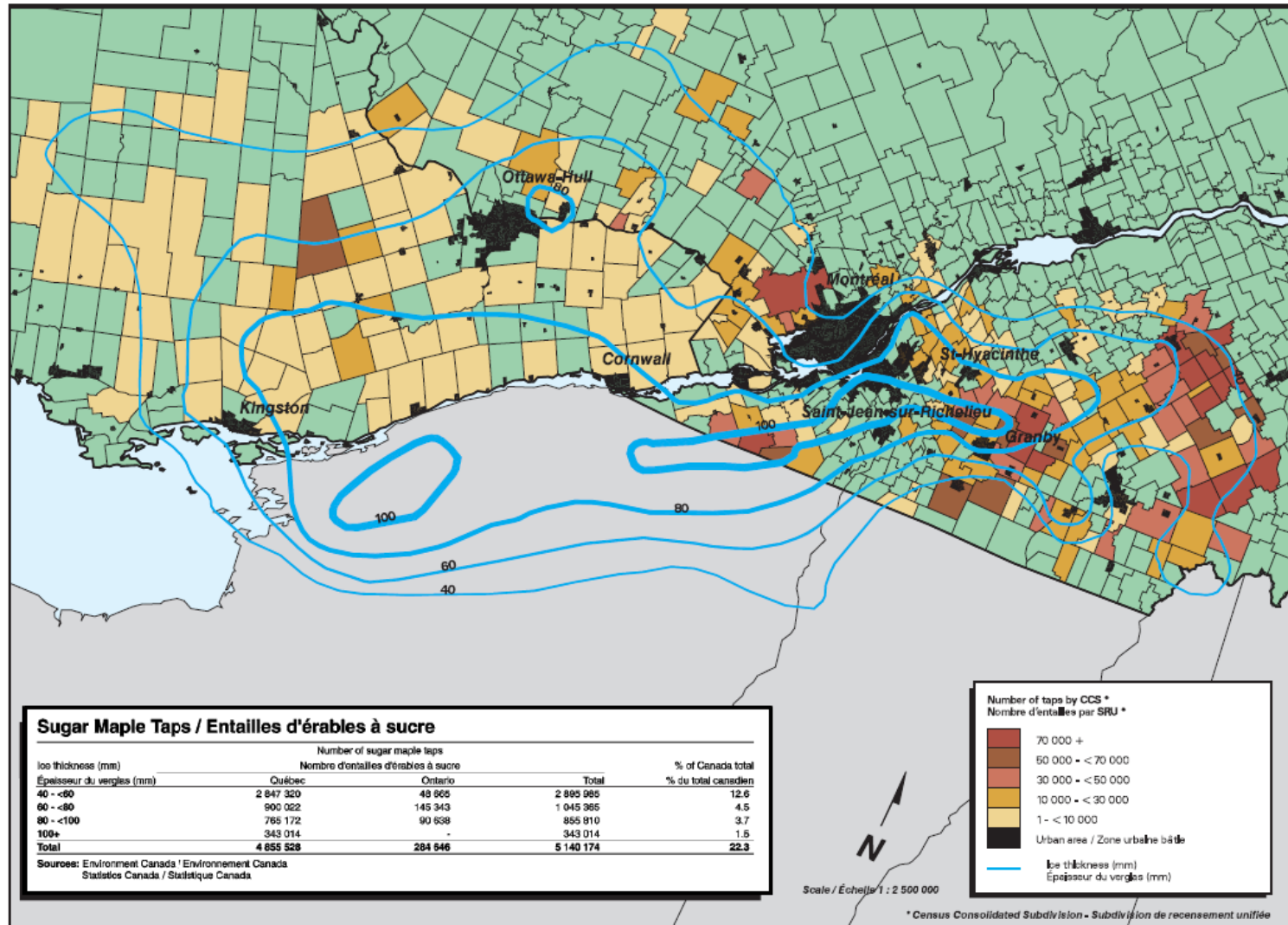


# Measuring Ecosystem Goods and Services

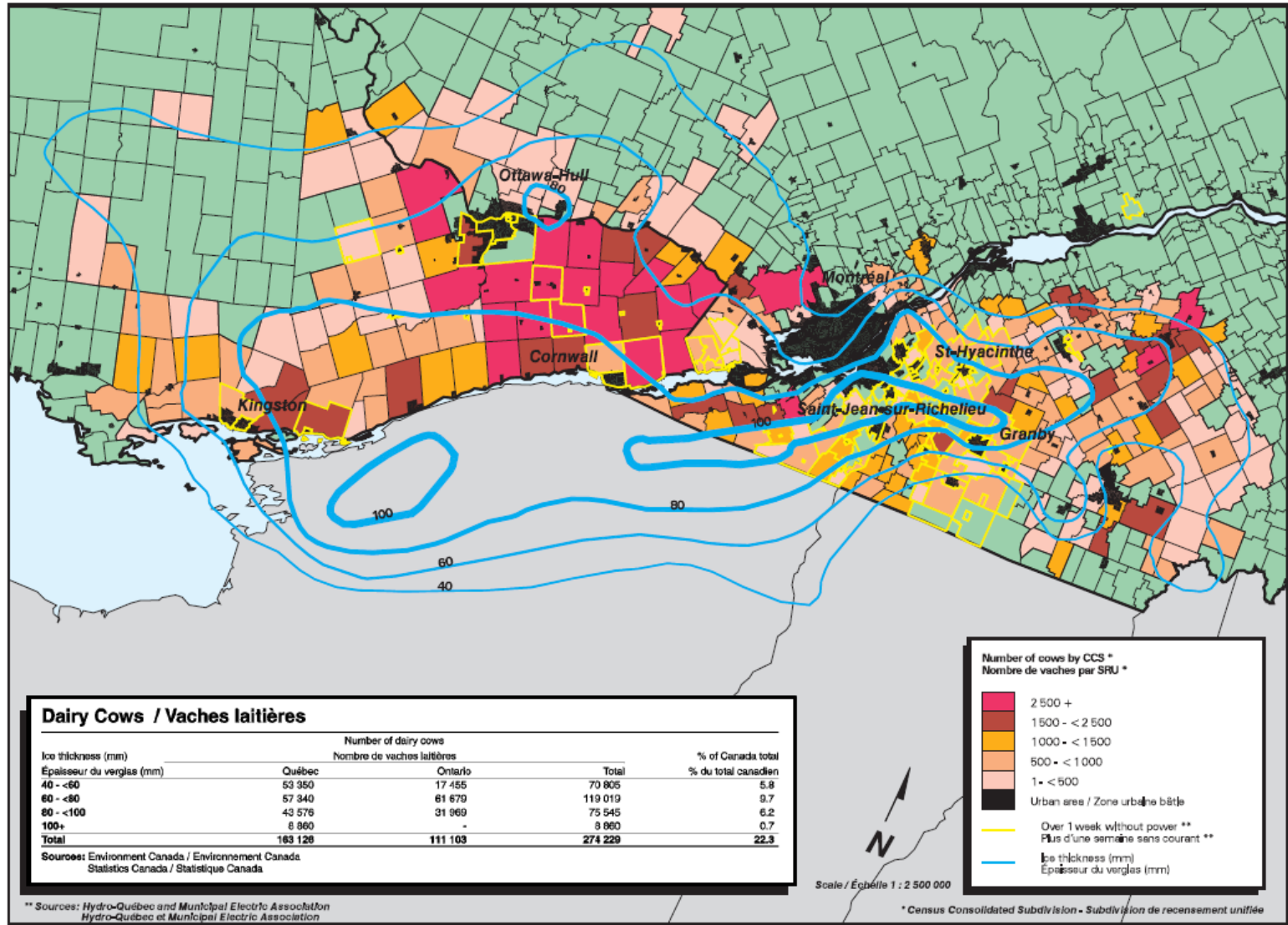


# Sugar Maple Taps

# Entailles d'érables à sucre







**Dairy Cows / Vaches laitières**

Ice thickness (mm) Épaisseur du verglas (mm)	Number of dairy cows Nombre de vaches laitières			% of Canada total % du total canadien
	Québec	Ontario	Total	
40 - <60	53 350	17 455	70 805	5.8
60 - <80	57 340	61 679	119 019	9.7
80 - <100	43 575	31 969	75 545	6.2
100+	8 860	-	8 860	0.7
<b>Total</b>	<b>163 126</b>	<b>111 103</b>	<b>274 229</b>	<b>22.3</b>

Sources: Environment Canada / Environnement Canada  
Statistics Canada / Statistique Canada

\*\* Sources: Hydro-Québec and Municipal Electric Association  
Hydro-Québec et Municipal Electric Association

Scale / Échelle 1 : 2 500 000

\* Census Consolidated Subdivision - Subdivision de recensement unifiée

# Accounting for Environmental Transactions

**Table 4.2.1 Classification of Environmental Activities - Overview of groups and classes**

Group	Classes
I: Environmental Protection (EP)	1 Protection of ambient air and climate
	2 Wastewater management
	3 Waste management
	4 Protection and remediation of soil, groundwater and surface water
	5 Noise and vibration abatement (excluding workplace protection)
	6 Protection of biodiversity and landscapes
	7 Protection against radiation (excluding external safety)
	8 Research and development for environmental protection
	9 Other environmental protection activities
II: Resource Management (RM)	10 Management of mineral and energy resources
	11 Management of timber resources
	12 Management of aquatic resources
	13 Management of other biological resources (excl. timber and aquatic resources)
	14 Management of water resources
	15 Research and development activities for resource management
	16 Other resource management activities

United Nations, 2012, *System of Environmental-Economic Accounting: Central Framework (white cover draft)*, New York. [http://unstats.un.org/unsd/envaccounting/White\\_cover.pdf](http://unstats.un.org/unsd/envaccounting/White_cover.pdf)

# Accounting for Environmental Transactions



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## Table 153-0052 <sup>1, 2</sup>

Capital and operating expenditures on environmental protection, by North American Industry Classification System (NAICS) and type of activity, Canada  
every 2 years (dollars x 1,000,000)

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Geography = Canada <sup>3</sup>

North American Industry Classification System (NAICS) = Total, all industries <sup>5</sup>

Expenditures	Type of activity	2006	2008	2010
Capital expenditures <sup>4</sup>	Total, all activities	3,909.5 <sup>f</sup>	3,789.9 <sup>f</sup>	4,175.4
	Environmental monitoring	174.2 <sup>f</sup>	44.2 <sup>f</sup>	55.4
	Environmental assessments and audits	142.3 <sup>f</sup>	105.5 <sup>f</sup>	198.8
	Reclamation and decommissioning	429.1 <sup>f</sup>	496.6 <sup>f</sup>	608.3
	Wildlife and habitat protection	156.8 <sup>f</sup>	90.3 <sup>f</sup>	178.8
	Waste management and sewerage services	523.6 <sup>f</sup>	396.4 <sup>f</sup>	534.9
	Pollution abatement and control processes (end-of-pipe)	916.5 <sup>f</sup>	1,640.2 <sup>f</sup>	1,464.3
	Pollution prevention processes	1,566.9 <sup>f</sup>	964.7 <sup>f</sup>	1,070.9
	Other types of environmental protection <sup>4</sup>	..	52.1 <sup>f</sup>	63.9
	Total, all activities	4,851.2 <sup>f</sup>	4,943.0 <sup>f</sup>	5,346.8
	Environmental monitoring	245.8 <sup>f</sup>	213.5 <sup>f</sup>	249.1

# **Current and future work at Statistics Canada related to SEEA**

**Continue role as chair of the London Group**

**SEEA implementation**

**SEEA research agenda**

**Encourage coordination of efforts in this domain**

**Participate in the Steering Committee for the SEEA  
Central Framework Research Agenda**

**Expand environmental accounts based on data gaps  
identified in the new Framework for Environment  
Statistics.**

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# “Beyond GDP”

*“What we measure affects what we do; and if our measurements are flawed, decisions may be distorted. Choices between promoting GDP and protecting the environment may be false choices, once environmental degradation is appropriately included in our measurement of economic performance. So too, we often draw inferences about what are good policies by looking at what policies have promoted economic growth; but if our metrics of performance are flawed, so too may be the inferences that we draw.”*

Stiglitz, J.E., A. Sen, and J-P. Fitoussi, (2009), Report by the Commission on the Measurement of Economic Performance and Social Progress, p.7

[www.stiglitz-sen-fitoussi.fr/documents/rapport\\_anglais.pdf](http://www.stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf)