



**MEASURING SUSTAINABLE DEVELOPMENT**

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**APPLICATION OF THE GENUINE PROGRESS INDEX TO NOVA SCOTIA**

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THE NOVA SCOTIA GPI  
SOLID WASTE-RESOURCE ACCOUNTS

EXECUTIVE SUMMARY

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## EXECUTIVE SUMMARY

In 1989, Canada's provincial Ministers of the Environment set a target to halve the amount of solid waste being sent to landfills and incinerators by the year 2000.<sup>1</sup> That same year, Nova Scotia sent 641,375 tonnes of waste – 726 kg per person – to landfills and incinerators. The challenge for Nova Scotia, therefore, using 1989 as a base year, was to create a system that would divert half that waste – 320,687 tonnes,<sup>2</sup> or 363 kg per person – from landfills each year.<sup>3</sup> Nova Scotia did succeed in diverting 50% of its waste from landfills for one six-month period in the year 2000 and has since achieved 46% diversion in each year.

The 50% diversion achievement (now at 46%) is the result of a comprehensive Solid Waste-Resource Management Strategy<sup>4</sup> that was developed through government action, citizen involvement, and industry support. The strategy was designed to ensure that the people of Nova Scotia “receive the maximum environmental and economic benefits while minimizing the potential increases in the cost of managing solid waste.”<sup>5</sup> Municipalities have contributed significantly to the capital and operating costs associated with collecting and managing recyclables, organic materials and waste in Nova Scotia. In addition to municipal systems, the Resource Recovery Fund Board (RRFB), a non-profit organization, operates the bottle deposit, tire, and paint recycling systems in the province. The RRFB funnels portions of profits from the recycling programs back to municipalities through diversion credits, based on the rate of diversion for each solid waste-resource management region. The RRFB also funds approved programs, and invests in value-added manufacturing related to the recycling industry.

The new waste-resource management system – which involves recycling, composting and improved landfills – began in 1996. It came with a heavy price tag. Actual implementation of the

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<sup>1</sup> SENES Consultants Limited, August 1995. *Study of The National Solid Waste Inventory 1994*, prepared for the Canadian Council of Ministers of the Environment (CCME) Solid Waste Management Task Group. The Nova Scotia Department of Environment and Labour (NSDEL) uses the official definition of solid waste as defined by the CCME. Solid waste refers to “any material, product, or by-product for which the generator has no further use and which is discarded for management at waste disposal facilities.” This definition excludes wastes that are associated with primary resource extraction or harvesting, conventional air pollutants and liquid effluents that may be discharged from processing or manufacturing sites and soil as a result of contaminated sites clean-up programs.” See **Error! Reference source not found.** for a full list of what this definition includes and excludes.

<sup>2</sup> NSDEL 2001. *Nova Scotia Diversion Calculations (April 1, 1997 to March 31, 2001)*. Note: The original estimate of waste disposed for 1989 was lower than noted here, hence the original projected diversion per capita was also lower. The rate has since been adjusted to the figures presented here as more information became available about the amount of waste actually disposed in 1989. The 1989 population used by NSDEL was 883,435. To calculate diversion rates, the 1989 amount of solid waste disposed in landfills is adjusted to the current population base, based on the per capita rate of disposal in 1989. Thus, the 1989 amount used to calculate diversion rates for 2001 is 688,317.

<sup>3</sup> NSDEL 2001. *Nova Scotia Diversion Calculations (April 1, 2000 to March 31, 2001)*.

<sup>4</sup> As the 1995 Solid Waste-Resource Management Strategy is the official name of the program, it is generally capitalized in this report. When other names are used, such as the solid waste-resource system, they are generally not capitalized in the text.

<sup>5</sup> Nova Scotia Department of Environment (NSDOE). *Solid Waste-Resource Management: A Strategy for Nova Scotia*.

various components of the Solid Waste-Resource Management Strategy led to an increase in operating and amortized costs from \$48.6 million or \$53 per person before the Strategy (represented by fiscal year 1996-97) to \$72.5 million or \$77 per person in the fiscal year 2000-01.<sup>6</sup> [All figures in this report have been adjusted to constant 2000 dollars (\$C2000) using Statistics Canada's Consumer Price Index, unless otherwise stated.]

At first glance, the numbers indicate an increased cost of \$23.9 million (or \$24 per person) for implementing the changes between the fiscal year 1996-97 and the fiscal year 2000-01. The traditional accounting methods used in Table 1, however, fail to consider the full economic, social, and environmental costs and benefits resulting from the major changes in the management of Nova Scotia's solid waste. It should also be noted that 40% of the increase in costs of the new waste-resource management system is due to the front-end processor purchased by Halifax Regional Municipality (HRM), and this processor was not a requirement of the Strategy or of the regulations.<sup>7</sup> However, since some of the benefits of the strategy derive from the functioning of the front-end processor, we have left the costs of the processor in the total operating and amortized capital costs.

**Table 1. Total additional operating and amortized capital costs of Nova Scotia's Solid Waste-Resource Management System (\$C2000)**

<b>Operating and amortized capital costs</b>	<b>Total</b>	<b>Per person</b>
Total cost 1989 (1996-97 fiscal year as proxy)*	\$ 48.6 million	\$ 53
Total cost 2000-01 fiscal year	\$ 72.5 million	\$ 77
Total additional operating and amortized capital costs of 2001 system vs. 1997 system	\$ 23.9 million	\$ 24

\* The closest approximation of 1989 cost data available is financial information for 1996-97.

This report presents a comprehensive, full cost-benefit analysis of Nova Scotia's waste-resource management system. It takes into account benefits such as avoided greenhouse gas emissions and liability costs, and the more efficient use of landfills, and it notes additional benefits like increased employment. It also accounts for increased costs that are not included in the operating costs included in Table 1, like the cost of administering the bottle deposit-refund, tire recycling, and stewardship programs in the new system, and the cost of the extra time needed to sort waste.

From a full cost accounting point of view, GPIAtlantic estimates that the Nova Scotia solid waste-resource system in the fiscal year 2000-01 produced net savings of between \$31.2 million and \$167.7 million, when compared to the system in place in the fiscal year 1996-97 (Table 2). This translates into savings of \$33 to \$178 for each Nova Scotian, rather than a net additional cost of \$24 as suggested when comparing strictly the operating and amortized capital costs of the two systems. In other words, the new system has more than paid for itself from a full cost-benefit perspective, while producing new jobs and substantial environmental benefits.

<sup>6</sup> A fiscal year runs from April 1-March 31. For example, the fiscal year 2001 runs from April 1, 2000-March 31, 2001.

<sup>7</sup> Bob Kenney, Solid Waste-Resource Analyst, NSDEL. Personal communication, May 2004.

**Table 2. Marginal savings of the 2000-01 solid waste-resource management system vs. the pre-Strategy system, showing low, medium, and high estimates of variable costs and benefits (\$C2000)**

<b>Pre-Strategy costs (fiscal year 1996-97, proxy for 1989)</b>			
Operating and amortized capital costs	\$48,600,000		
<b>Cost per capita</b>	<b>\$53</b>		
<b>Post-Strategy costs and benefits (fiscal year 2000-01)</b>			
<b>COSTS</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
Operating and amortized capital costs	\$72,459,311	\$72,459,311	\$72,459,311
Beverage Container Recycling Program (net)	\$14,307,047	\$14,307,047	\$14,307,047
Used Tire Management Program (net)	\$ 2,730,840	\$2,730,840	\$2,730,840
Stewardship programs	\$87,710	\$87,710	\$87,710
RRFB operating and administrative costs	\$1,627,013	\$1,627,013	\$1,627,013
Non-deposit materials	\$25,149	\$25,149	\$25,149
Derelict vehicles	\$16,997	\$16,997	\$16,997
Household Hazardous Waste Program	\$162,534	\$162,534	\$162,534
Nuisance (value of time)	\$218,730	\$911,373	\$1,822,746
Cost to increase participation	\$4,978,487	\$7,112,124	\$9,482,832
<b>Total Costs</b>	<b>\$96,613,818</b>	<b>\$99,440,098</b>	<b>\$102,722,179</b>
<b>Cost Per Capita</b>	<b>\$103</b>	<b>\$106</b>	<b>\$109</b>
Indirect costs total	\$24,154,507	\$26,980,787	\$30,262,868
<b>BENEFITS</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
Employment benefits (direct)*	\$2,830,820	\$3,262,640	\$3,910,370
Employment benefits (indirect)*	\$3,670,470	\$4,246,230	\$5,085,880
Reduction of greenhouse gas emissions	\$3,337,180	\$34,196,000	\$84,343,050
Reduction of air pollutant emissions	\$9,532,790	\$42,643,964	\$67,440,991
Extended landfill life	\$18,848,267	\$18,848,267	\$18,848,267
Avoided siting costs	\$174,732	\$174,732	\$174,732
Avoided compensation	\$1,270,780	\$1,588,475	\$1,906,170
Export revenue	\$1,100,000	\$1,400,000	\$1,650,000
Tourism	\$187,184	\$187,184	\$187,184
Energy savings from recycling	\$28,682,283	\$28,682,283	\$28,682,283
RRFB diversion credits	\$4,979,465	\$4,979,465	\$4,979,465
RRFB approved programs	\$4,374,804	\$4,374,804	\$4,374,804
RRFB investment	\$248,824	\$248,824	\$248,824
<b>Total benefits</b>	<b>\$79,237,599</b>	<b>\$144,832,868</b>	<b>\$221,832,020</b>
<b>Benefits per capita</b>	<b>\$84</b>	<b>\$154</b>	<b>\$236</b>
<b>Net annual cost ( ) or benefit</b>	<b>(\$17,376,219)</b>	<b>\$45,392,770</b>	<b>\$119,109,841</b>
<b>Annual cost ( ) or benefit per capita</b>	<b>(\$18)</b>	<b>\$48</b>	<b>\$127</b>
<b>Net savings compared to pre-Strategy cost</b>	<b>\$31,223,781</b>	<b>\$93,992,770</b>	<b>\$167,709,841</b>
<b>Annual savings per capita</b>	<b>\$33</b>	<b>\$100</b>	<b>\$178</b>

\* Only a portion of new jobs created as a result of the new waste-resource management system is included in the cost-benefit analysis. This is because it cannot be demonstrated that all new waste-resource management jobs were created from the unemployment rolls. Jobs that represent a lateral movement from another industry to the waste-resource management industry cannot properly be shown as providing a *net* social benefit in a cost-benefit analysis, and must therefore be excluded. The assumptions used for estimating direct and indirect employment benefits are explained in Part III of this report.

It is important to note that the waste management costs of the mid-1990s would not have been maintained even with continued reliance on landfills, as several existing landfills, including the Sackville landfill, (serving approximately 35% of Nova Scotia's population), were either at capacity or near capacity. Therefore alternative waste handling strategies needed to be implemented in any case.

GPIAtlantic recognizes that it is difficult to attribute an exact dollar value to goods and services that traditionally do not have a market price. Therefore, assumptions and ranges are clearly outlined for each of the costs and benefits addressed in this analysis. In its final assessment, GPIAtlantic takes a conservative approach and employs low-end estimates in order to err on the side of caution. Because of the limits of monetary valuation, the report also includes a non-monetary evaluation of the Nova Scotia solid waste-resource system. Highlights and key conclusions follow.

### **Benefits**

Total benefits attributed to the 2000-01 solid waste-resource system range from \$79.2 million to \$221.8 million or \$84 to \$236 per person, depending largely on the assumptions used in calculating the benefits of avoided greenhouse gas emissions and air pollutants.

Benefits of the 2000-01 (fiscal year) system include:

- \$6.5 million to \$9 million in increased direct and spin-off employment;
- \$12.8 million to \$151.8 million in reductions of emissions of greenhouse gases and air pollutants;
- \$18.8 million in extended landfill life;
- \$9.6 million in RRFB Municipal Diversion credits, funding for approved programs and investment in value-added manufacturing related to the recycling industry;
- \$1.3 million to \$1.9 million in avoided compensation costs;
- \$1.1 million to \$1.7 million in increased export revenue of environmental goods and services;
- \$187,184 in additional tourism.

### **Costs**

Total costs (including operating and amortized capital costs) attributed to the 2000-01 solid waste-resource system range from \$96.6 million to \$102.7 million, depending on the assumptions employed. Costs of the 2000-01 (fiscal year) system include:

- \$72.5 million in operating and amortized capital costs;
- \$1.6 million in RRFB administrative and operating costs;
- \$218,730 to \$1.8 million in nuisance costs related to handling of organic waste;
- \$4.9 to \$9.5 million in costs to increase participation;
- \$87,710 in costs of stewardship programs to support the strategy.

## Key conclusions

Based on diversion rates (diversion of waste from landfills) and other waste management data, Nova Scotia is a leader both nationally and internationally in waste diversion. At an international level, Nova Scotia's waste diversion rate is among the highest in the world when compared to waste diversion rates in OECD countries.

Within Canada, Nova Scotia is the first province to have achieved the target of 50% diversion of solid waste, according to the criteria established by the Canadian Council of Ministers of the Environment (CCME), which require comparison with 1989 disposal rates. In 2000, on a per capita basis, Nova Scotia disposed of 45% less waste than the Canadian average and between 1994 and 2000 the province increased waste diversion by 43-53% above the average national increase in waste diversion over the same period. In other words, Nova Scotia's improvement in waste diversion was significantly better than improvements in other provinces.

Within Nova Scotia, the HRM and Annapolis Valley regions led the province with 59% and 51% (in 2000-01) waste diversion rates respectively. Several other areas have also attained at least 50% waste diversion, including East Hants, Pictou County, Lunenburg, and Queen's Regional Municipality. HRM, in fact, has the highest waste diversion rate of all Canadian municipalities reporting within the Generally Accepted Principles (GAP) framework – double the average GAP diversion rate. HRM's success can be attributed to many factors including its high level of organic waste diversion, significant construction and demolition diversion to recycling facilities, the high cost of waste disposal, disposal bans, and the pre-processing of waste at its front-end processor before disposal.

Both recycling and composting, the two major tactics embraced by the province to achieve diversion gains, have become more accessible and comprehensive since the inception of the Solid Waste-Resource Management Strategy.

Access to curbside recycling in Nova Scotia increased from less than 5% in 1989 to 99% in 2003, the highest rate in the country. In 2003, 76% of Nova Scotians had access to curbside organics pickup. Before the development of the Solid Waste-Resource Management Strategy, only Lunenburg and Colchester Counties, comprising approximately 10% of the provincial population, had access to curbside organics pickup. By 2001, 51,000 tonnes of organics (dry weight) were being processed in municipal facilities province-wide. This figure is in addition to backyard composting, which is promoted and widely practised throughout the province. While curbside organics collection is effective for urban areas, the benefits of this collection system in rural areas, where backyard composting is easier to practice, may not be as apparent. Backyard composting can reduce the costs and environmental impacts of trucking, but these benefits must be weighed against evidence that diversion rates decline in the absence of curbside pickup. A review of diversion rates and tonnes diverted in both systems, along with a full cost assessment of trucking costs, would therefore provide valuable data to determine long-term policy decisions.

The component of the solid waste-resource system for which least evidence is available is household hazardous waste (HHW). There is currently no monitoring system in place to track reductions in HHW. While the number of HHW depots is expanding throughout the province, it is highly unlikely that the province attained its original goal of reducing HHW by 70% between

1997 and 2000. The recent stewardship agreement with the paint industry to take back leftover paint for recycling will increase the rate of HHW reduction from present levels. Given the potentially adverse environmental impacts of HHW, this is an area that needs to be addressed. RRFB Nova Scotia is currently working with the Nova Scotia Department of Environment and Labour (NSDEL) to adopt a tracking system for HHW and has provided funding for HHW depots and for paint swaps.

Currently, the province also has no strategy to divert construction and demolition (C&D) waste away from landfills, even though C&D waste accounts for 25-30% of the municipal waste stream. In order for municipalities to make further progress and to exceed the 50% waste diversion target, a major effort will be required to divert C&D waste. HRM has developed a progressive C&D waste management strategy that can serve as a potential model for all regions and municipalities in the province.

In summary, the 1995 Solid Waste-Resource Management Strategy has produced a net benefit to Nova Scotians, when assessed both in monetary and non-monetary terms:

- 1) From a full cost-benefit accounting perspective, the solid waste-resource system in the fiscal year 2000-01 provided a net savings of between \$31.2 million and \$167.7 million to Nova Scotians, when compared to the system in place in the fiscal year 1996-97. This was despite the increased operating and amortized capital costs in 2000-01.
- 2) Nova Scotia is a leader both internationally and nationally in solid waste diversion.
- 3) The accessibility, comprehensiveness, and levels of waste being composted and recycled have all improved since the introduction of the Strategy.

The 2000-01 (fiscal year) solid waste resource system is clearly superior to the pre-Strategy system (1996-97 fiscal year as proxy for 1989) in terms of both waste diversion and net benefits to Nova Scotia. However, this study suggests that the current system could in fact be offering even more to Nova Scotians, with a particular focus needed on reduction of HHW and diversion of C&D materials.

Some critics suggest that the current solid waste-resource system fails to accommodate the needs of rural communities and that a community-by-community waste management approach would lead to greater diversion rates at a lower cost.<sup>8</sup> In addition, aspects of the provincial strategy – such as comprehensive stewardship agreements with all packaging and industry sectors – have not been completed, so that producers of some of the most difficult-to-recycle materials have been able to avoid accountability and have in essence been rewarded by staying outside the recycling system. Finally, despite waste diversion achievements, very little has been done to address overall consumption and to reduce waste at its source.

Although Nova Scotia has achieved remarkable success in diverting a substantial portion of municipal waste in a short period, the challenge for the future will be to avoid the complacency that may result from this achievement. To remain a leader in waste diversion requires a continued commitment by citizens, government, and industry to eliminate waste. Opportunities exist to improve the system further by building upon both the lessons that led to Nova Scotia's current achievement and the lessons from other successful initiatives around the world.

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<sup>8</sup> Dittrick, M. *Only in our Backyard: Annapolis Royal and Zero Waste 2005*. See Appendix C of this report.



This study shows that progress toward greater waste diversion rates can be cost-effective. In the Genuine Progress Index, higher rates of waste diversion and waste reduction are counted as signs of genuine progress and sustainable development.

## Report structure

Part I provides an introduction to the report and a brief overview of how both traditional measures of progress and the Genuine Progress Index assess waste generation and disposal.

Part II assesses the Nova Scotia solid waste-resource system in physical terms. It compares the current situation with the results anticipated in the 1995 Solid Waste-Resource Management Strategy in order to assess whether targets have been reached. The success of the program is further evaluated by comparison with international and national waste diversion rates. The components of the province's solid waste-resource system are also examined, with an emphasis on recycling and composting.

Part III presents a full cost accounting analysis to determine the true or full costs of implementing the changes introduced in the Solid Waste-Resource Management Strategy, which led to the 50% diversion of solid waste in Nova Scotia. This section compares the net costs of the pre- and post-Strategy waste management systems. Although 1989 is the base year for comparison, the closest approximation of 1989 cost data is for the fiscal year 1996-97. Although the bottle recycling program began in 1996-97, and the tire recycling program began in 1997, the basic operating costs of the old system would not have changed substantially between 1989 and 1996-97.<sup>9</sup> The 2000-01 fiscal year was selected since it is the most recent year for which a complete data set was available at the beginning of this study. The marginal benefits achieved and costs incurred during these years therefore provide a more comprehensive assessment of the economic implications of the new system, in comparison with the old one, than is possible with conventional accounting methods that consider only operating and capital costs.

One important caveat is necessary here. The marginal cost comparison provided in Part III is based on an implicit assumption that the costs of the old system could have been maintained. However, a continuation of the old system was not an option in 1996-97, because the Solid Waste-Resource Management Strategy required open burning dumps to close, and at least one landfill (Sackville) was at capacity. Viable alternatives to the current system (e.g. second generation landfills or incineration) would have been more costly than the old system. The operating cost differential between the current system and viable alternatives would therefore be considerably narrower than the cost differential with the old system described in Part III and the net benefits therefore correspondingly greater. The estimates of marginal benefits and costs in Part III, based on the 1996-97/2000-01 difference, are therefore correspondingly conservative.

Part IV very briefly reviews options to improve the current system and concludes with a summary of recommended actions that can help ensure that Nova Scotia remains a leader in solid waste-resource management and continues along the path toward zero waste. This section is complemented by Appendix F, a reproduction of *A Citizens' Agenda For Zero Waste*. This

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<sup>9</sup> Bob Kenney, NSDEL. Personal communication, May 2004.

document provides practical examples of communities that have effectively taken control of their waste resources and achieved positive results that have improved their quality of life and contributed to their sustainability. Time and resources did not permit nearly as full an exploration of next steps and ways of improving the current system and increasing diversion rates as would have been desirable. Just as a second volume of the *GPI Forest Accounts* focused on “ways forward” towards more sustainable forestry practices, *GPI Atlantic* strongly recommends that a future, second report expand on Part IV of this analysis.