climate change
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MNR's Carbon Footprint: An Assessment for Three Business Areas

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Introduction

Initiatives are underway to reduce greenhouse gas (GHG) emissions from government operations to help mitigate the effects of climate change. Initiatives include procuring lower emission-producing products and services, implementing lower emission-producing operational and workplace practices, and improving the energy efficiency of buildings and vehicle fleets. Ontario's Action Plan on Climate Change (Government of Ontario 2007) establishes efforts to "lead by example - to demonstrate to the public and to business leaders that sustainability is not only achievable, but economically desirable." In support of the plan, the Ministry of Natural Resources (MNR) initiated a pilot project to determine its organizational carbon footprint and support potential GHG emission reduction strategies.

This note summarizes initial results of the carbon footprint assessments for three business areas: Aviation and Forest Fire Management Branch (AFFMB), Enforcement Branch, and Hearst District in MNR's Northeast Region.

Methods

A third party with experience in carbon footprint assessments was engaged to apply the internationally accepted method used by *The Climate Registry* (2008) for the reporting of GHG emissions to activities in select MNR business areas. In step one, emissions sources[3] were defined and measured for each of the three business areas. The accepted methods define approaches and data requirements to quantify three *scopes* of emissions (Figure 1) that account for direct and indirect emissions separately and to improve transparency. Scope 1 includes all direct GHG emissions, such as an organization's fleet and any fuel combusted (with the exception of direct CO_2 emissions from biomass combustion). Scope 2 includes indirect GHG emissions from the consumption of purchased or acquired electricity, steam, and direct heating/cooling. Scope 3[4] includes all other indirect emissions such as those resulting from the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned by the reporting entity, use of sold products and services, outsourced activities, recycling of used products, and waste disposal.

The MNR assessments were based on emissions data for the 2006 calendar year for the three business areas studied for:

- Fossil fuels consumed (stationary combustion) in the facilities they occupy (Scope 1 emissions)
- Electricity consumed (indirect emissions) in the facilities they occupy (Scope 2 emissions)[5]
- Fuels used (mobile combustion) in their vehicle fleet (on-road vehicles) (Scope 1 emissions)
- Fuels used (mobile combustion) in their off-road mobile sources, including equipment such as aircraft, boats, ATVs, and chainsaws (Scope 1 emissions)
- Business air-travel (Scope 3 emissions)

Data from the emission source categories were obtained from centralized records, program area databases, and directly from program staff. For buildings operated by Ontario Realty Corporation (ORC), data on fuel and electricity consumption were collected directly. For facilities not managed by ORC for which data were not readily available, estimates of energy use performance (kWh per square foot for electricity and m^3 of natural gas per square foot for stationary combustion) were applied. For vehicles, fuel consumption logs maintained by MNR's fleet management team provided information about the

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[3] Due to data limitations, for the purposes of this study, preliminary inventory included only the carbon dioxide (CO_2) component of emissions from sources noted. Given the type and scope of MNR's operations, it is anticipated that CO_2 would be the most significant GHG contributor. This aligns with the climate registry's general reporting protocol that allows organizations committed to formal reporting to limit it to CO_2 emissions during the first two years (The Climate Registry 2008).

[4] Scope 3 emissions are not mandatory in formal reporting assessments. For the purposes of this study, business air travel was assessed in Scope 3 emissions.

[5] Emissions from electricity are carbon equivalent emissions for carbon dioxide (CO_2), nitrous oxide (N_20), and methane (CH_4).

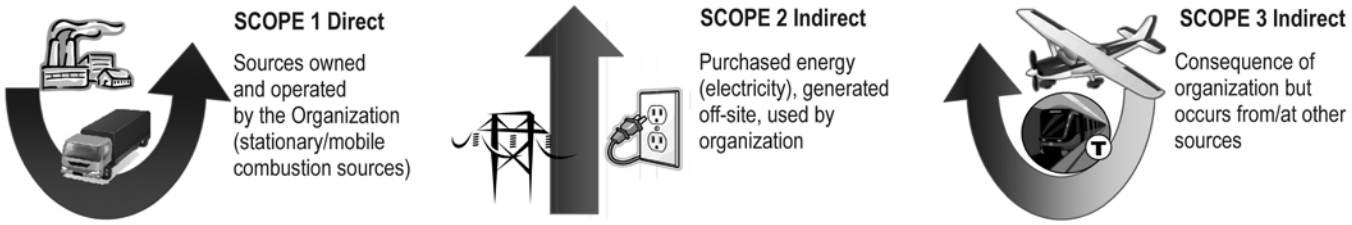

Figure 1. Types of emissions included in carbon footprint assessments as defined by The Climate Registry for the Reporting of Greenhouse Gas Emissions (modified from World Resources Institute 2004).

model and age of each vehicle and the type and volume of fuel consumed. For mobile off-road equipment, fuel consumption estimates were provided by program area staff. To estimate total use, existing inventories of equipment were combined with estimates of annual use by model type and multiplied by appropriate emissions factors. Centralized data, including information on distance travelled for business-related flights, were obtained from the corporate travel booking agent, Hogg Robinson Group Travel (HRG), to provide a base for estimating emissions from air travel. Appropriate conversion factors for emissions from each fuel source, as provided in the protocol (The Climate Registry 2008), were used to estimate carbon footprints for the three business areas.

Results

Carbon footprint results

Managing natural resources can be an emissions intensive business but intensity varies significantly by types of activities. In AFFMB, for example, 83% of emissions are from off-road vehicles such as aircraft that are critical to fire management activities, including fire detection and suppression (Table 1). In the Enforcement Branch, off-road vehicles such as snow machines, ATVs, and boats account for 46% of total emissions. These off-road emissions are equal to emissions from the branch's on-road vehicle fleet. Hearst District's emissions are likely more representative of general government and office-type organizations: emissions are primarily from building energy sources followed by fleet sources. What these findings demonstrate is that diverse circumstances and a range of activities that produce various types of emissions all contribute to MNR's overall carbon footprint.

Detailed analyses were completed for each category (Table 1). Off-road mobile vehicles emissions were assessed by machine type (e.g., fixed-wing aircraft, helicopters, boats, ATVs). Wherever possible, categories were further subdivided by analyzing model and/or engine type. Similarly, for the vehicle fleet, emissions were estimated by vehicle type (e.g., truck, minivan, sport-utility). Figure 2 illustrates this detailed analysis using the emissions intensity per hour of use for each model of fixed-wing aircraft operated by AFFMB. This type of assessment may support efforts to make informed choices when selecting equipment for specific tasks.

Similarly, emissions from various vehicle types in Enforcement Branch's vehicle fleet were assessed. Figure 3 shows the proportion of various vehicle types in the fleet and the relative contributions of CO_2 emissions related to vehicle use by the program area in 2006.

Table 1. Estimated CO_2 emissions (tCO_2/yr) for 2006 calendar year by business area and emissions category.

Business unit[a]	Emissions Categories								Total CO_2 emissions	Equivalent cars on road[b]
	Buildings		Vehicle fleet		Off-road mobile sources		Business air travel			
	tCO_2/yr	% of CO_2	tCO_2/yr	% of CO_2	tCO_2/yr	% of CO_2	tCO_2/yr	% of CO_2	tCO_2/yr	Number
AFFMB	4,140	14	761	3	23,867	83	83	0.3	28,850	5,246
ENFORCE-MENT	124	8	696	46	691	46	8	0.5	1,518	276
HEARST	232	83	42	15	7	2	0.4	0.1	281	51

[a] The CO_2 emissions total presented for each business area are not comparable among business areas given their unique operational contexts; they are presented to illustrate the varying operational environments and scales.

[b] Source of equivalent measurement for car emissions from US EPA (2005).

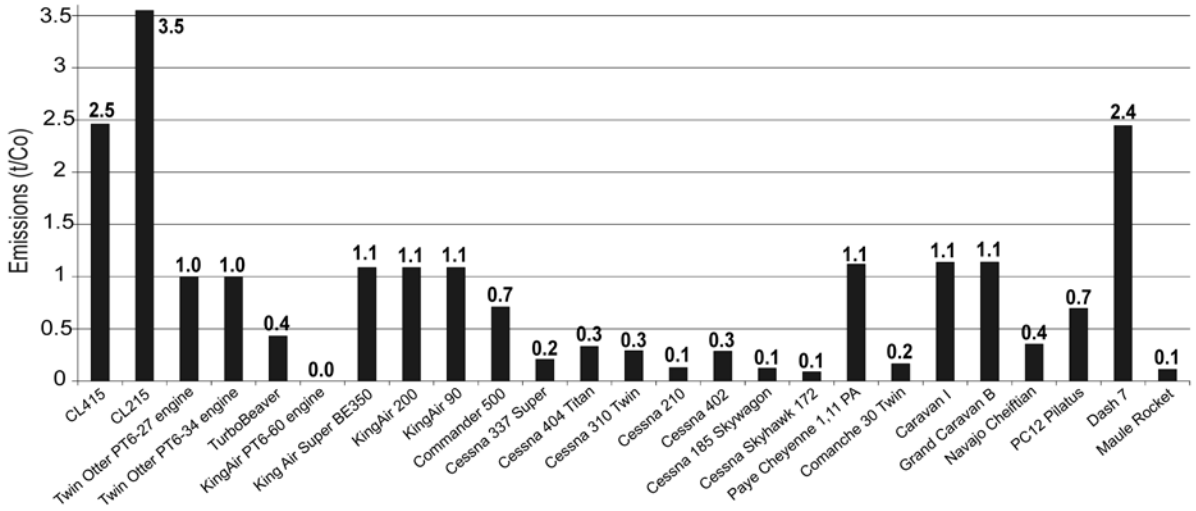

Figure 2. Estimated CO_2 emissions per hour of use for various fixed-wing aircraft operated by MNR's Aviation and Forest Fire Management Branch.

Data gap analysis

Part of the purpose of this assessment was to identify gaps in data and recommend next steps to support future, more accurate carbon footprint accounting of MNR's activities across all business areas. Results indicate that to support such assessments, MNR requires:

- **More accurate accounting of electricity and fuel use in non-ORC, MNR operated facilities.** For example, 39% (615,837 ft^2) of the space occupied by AFFMB operations and 4% (2,301 ft^2) of that occupied by Hearst District operations are located in non-ORC facilities for which data are not available.

- **More accurate accounting of fuel consumption,** particularly for off-road vehicles but also for some on-road vehicles. Fuel consumption is difficult to estimate because it can be purchased and consumed in several ways and in a variety of engine types. For example, vehicle fleet fuel is typically purchased via a dedicated credit card assigned to a particular vehicle, however, to reduce the cost of maintaining dedicated cards, in some cases fuel for multiple pieces of equipment is purchased with a single card. This makes it difficult to assign an accurate end-use to fuel consumption. Likewise, in many field-based operations where off-road mobile equipment is used, fuel is purchased in bulk, stored, and used for many different purposes, making it difficult to accurately determine how much is consumed by a particular mobile source.

- **More accurate accounting of business air travel.** Although the corporate travel company documents most business flights taken by MNR staff, approximately 10% of MNR flights are booked privately and thus not captured in the data.

- **Improved estimates of non-air business travel.** When fleet vehicles are unavailable, MNR staff often use rental vehicles or travel by bus or train. For this preliminary assessment, we attempted to capture other types of travel by assessing individual ministry travel claim reports but the accuracy of this approach was debatable.

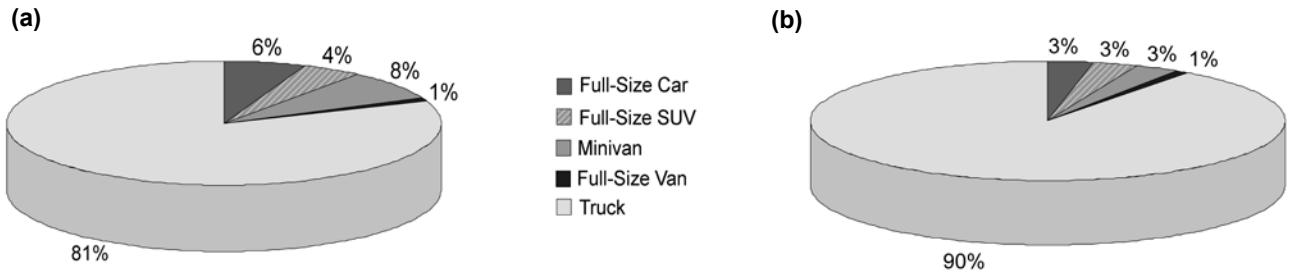

Figure 3. Relative proportion of types of on-road vehicles in MNR's Enforcement Branch fleet (a) and estimates of CO_2 emissions from their use in 2006 (b).

Conclusions

Undertaking a carbon footprint assessment is a way to measure an organization's GHG emissions based on its specific activities. Increasing understanding of MNR's carbon footprint can inform initiatives to reduce emissions from government operations.

In this carbon footprint pilot project, we assessed direct and indirect emissions in three of MNR's business areas. This assessment provides an indication of the carbon emissions of buildings, fleet vehicles, off-road mobile sources, and business air travel. The information obtained may aid efforts to make informed choices for procurement and operations that consider the environmental effects of infrastructure and assets. As well, we identified data gaps that will need to be addressed to increase the accuracy and completeness of future assessments for these and other business areas within MNR.

MNR programs are already taking action to reduce emissions from infrastructure and operations. The ministry has participated in an OPS-wide fleet renewal project to replace aging high-emissions vehicles with fuel-efficient ones. AFFMB is examining the emissions footprint of its aircraft and field equipment, and evaluating the feasibility of using lower-emissions vehicles and aircraft and more efficient gasoline-powered equipment. Other innovative and progressive initiatives also are being pursued by MNR to support the province's commitment to reduce its carbon footprint.

Acknowledgements

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L'empreinte carbone du MRN : évaluation de trois secteurs d'activités

Le Plan d'action de l'Ontario contre le changement climatique établit les mesures que doit prendre le gouvernement pour réduire les émissions de gaz à effet de serre (GES) découlant de ses activités et ainsi donner l'exemple. Pour soutenir ce plan, le ministère des Richesses naturelles (MRN) a lancé un projet pilote sur l'empreinte carbone visant à évaluer des stratégies potentielles de réduction des émissions de GES. La note résume les résultats initiaux de l'évaluation de l'empreinte carbone réalisée pour trois secteurs d'activités du MRN : la Direction de l'aviation et de la gestion des feux de forêt, la Direction de l'application des règlements et le District de Hearst de la Région Nord-Est. Les sources directes ou indirectes d'émission de GES examinées dans le cadre du projet comprenaient les immeubles, les parcs de véhicules routiers et non routiers ainsi que les voyages aériens. La note donne plusieurs exemples d'analyses détaillées portant sur diverses sources d'émission. Elle présente aussi des recommandations destinées à améliorer l'accessibilité des données et les méthodes de collecte pour les évaluations futures de l'empreinte carbone.

Cette publication hautement specialisée *MNR's Carbon Footprint: An Assessment for Three Business Areas* n'est disponible qu'en Anglais en vertu du Règlement 411/97 qui en exempte l'application de la Loi sur les ser les services en français. Pour obtenir de l'aide en français, veuillez communiquer avec au ministère des Richesses naturelles au information.ofri@ontario.ca

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