Ecological Footprint Progress Report

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1 Introduction

The Ecological Footprint (EF) of an entity is defined as the biologically productive land and water area required to provide the resources consumed and assimilate wastes produced. The concept was developed in 1996 by Mathis Wackernagel and William Rees, at the University of British Columbia.

The Ecological Footprint of the average Canadian is 7.2 hectares. In contrast, the average "Earthshare" - the available per capita productive land - is only 1.9 ha (Chambers et al., 2000). If everyone lived up to North American standards, we would need the resources of at least three planet earths to sustain our consumption.

EFs have been calculated for countries, businesses, households, individuals, and most recently, educational institutions. While there are several universities and colleges that have undertaken EF analyses in the US and Australia (Flint, 2001; Venetoulis, 2001; Dawe et al., 2004; Wright, 2002), UTM is the first campus in Canada to do so. The UTM EF has also been one of the most detailed campus Ecological Footprint studies to date.

2 Project Background

The UTM Ecological Footprint project was initiated in the summer of 2004 by UTM student Greg Bunker. The initial phase of the project involved measuring UTM’s footprint using two different calculators. Both were developed by Redefining Progress. Redefining Progress is an organization that "works with partners to change technology, influence the choices individuals make, and resolve pressing social and environmental issues" (Redefining Progress, 2003). The first calculator was an exhaustive calculator that had been designed for household use, and the second was a simplified calculator developed for use in grade schools. Although both calculators gave similar results, neither was particularly well suited to a university setting.

As a result of this, the main recommendation made from the preliminary study was to develop a calculator specifically for the purpose of calculating the Ecological Footprint of UTM.
3 Results

Over the summer of 2005, UTM student Chelsea Stewart and UT St. George student Jennifer Loo worked under the supervision of assistant professor Tenley Conway to develop an Ecological Footprint calculator specific to UTM.

UTM’s Ecological Footprint Calculator is uniquely tailored to UTM’s consumption patterns. The most useful aspect of the calculator is its organizational structure. Rather than being organized using impact categories, as most calculators are, it follows the university’s departmental structure (see Appendix 1). This streamlines the collection of data, and allows the user to easily see which departments on campus can be targeted for footprint reduction strategies.

The calculator is colour-coded by impact categories as well. There are a total of six impact categories: materials (including waste), built-up land, water, energy, food, and transportation. The calculator aggregates the individual footprints by impact category and the results are displayed at the bottom of the spreadsheet. As a result of the design, the impact categories and departments that have the largest contributions to UTM’s footprint are clearly indicated.

The Ecological Footprint calculator includes on-campus consumption and commuting only. Activities that occur off-campus, such as field trips and at-home consumption by commuter students, are not included. In addition, materials used to construct new buildings are not included, due to the difficulty of tracking the weights and exact amounts consumed.

When computed using the new calculator, UTM’s total footprint came out to 7827 ha, or 1.04 ha per campus community member (campus community members refers to the total full-time equivalent number of students, staff, and faculty). Of all the impact categories, energy made up the largest part of the footprint, accounting for 71.65% of the total footprint, followed by transportation at 18.72%, food at 5.61%, materials and waste at 2.61%, built-up land at 1.26%, and lastly, water at 0.21% (see Figure 1).

In EF calculators, the footprints of different energy sources are usually accounted for using CO$_2$ emissions. The emissions from a particular source are calculated, and the area of forested land required to sequestrate the carbon emissions is used as the footprint. In the case of renewable energy sources, such as solar and wind, the embodied energy used for manufacturing and maintaining the generating equipment is usually used. The large footprint
of UTM’s energy use suggests that effort needs to be made to reduce \( CO_2 \) emissions from the university.

Transportation footprints are calculated in a similar manner. \( CO_2 \) emissions from buses and cars are calculated, and the area needed to sequestrate these emissions is used as the footprint. An “uplift factor” is also included which accounts for emissions generated in the manufacture and maintenance of the car, and for the maintenance and construction of road infrastructure. Again, a high volume of \( CO_2 \) emissions are being generated from the university for transportation purposes, suggesting that UTM needs to continue to encourage alternative forms of transportation for students, staff, and faculty.

For a printout of UTM’s Ecological Footprint Calculator see Appendix 1. For a detailed report of how the footprint was calculated, as well as derivations of conversion factors and the calculator equations, see the UTM Campus Calculator Manual.

### 4 How Does UTM Compare to Other Schools?

UTM is not the first university to undertake an Ecological Footprint Analysis (EFA), nor will it be the last. Many other universities and colleges, of all sizes, have conducted ecological footprint analyses of varying scope, with widely different results. Table 1 summarizes four of these analyses, with UTM included for comparison purposes.

<table>
<thead>
<tr>
<th>Name of Institution</th>
<th>Location</th>
<th>Year of EFA</th>
<th># of CCMs</th>
<th># of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTM</td>
<td>Ontario, Canada</td>
<td>2005</td>
<td>7509</td>
<td>1023</td>
</tr>
<tr>
<td>University of Newcastle</td>
<td>Newcastle, Australia</td>
<td>1998-1999</td>
<td>Over 19200</td>
<td>800</td>
</tr>
<tr>
<td>Holme Lacy College</td>
<td>Herefordshire, UK</td>
<td>2001</td>
<td>524</td>
<td>No data</td>
</tr>
<tr>
<td>Colorado College</td>
<td>Colorado, USA</td>
<td>2001</td>
<td>Approx. 2500</td>
<td>No data</td>
</tr>
<tr>
<td>University of Redlands</td>
<td>California, USA</td>
<td>1998</td>
<td>2727</td>
<td>No data</td>
</tr>
</tbody>
</table>

The purpose of this comparison is not to determine which institutions are "better" than others; rather, it gives us an opportunity to "compare notes" on how the studies were done, how methodologies could be improved, how ecological footprints can be reduced, and, most importantly, what the implications of these footprints are for sustainability at post-secondary institutions.
5 Recommendations

For simplification purposes, only the four largest components of UTM’s footprint are targeted for reduction strategies.

5.1 Materials and Waste

The main material impact examined in the analysis is paper. There are several recommendations that can be made as to its use and disposal.

1. The ecological footprint of virgin paper is much higher than that of recycled paper. This is because of the higher inputs of energy and raw materials into virgin paper. It takes only 30% of the energy required for virgin paper to make the same amount of recycled paper (Chambers, Simmons, and Wackernagel, 2000).

Switching to recycled copy paper would mean a substantial decrease in our Ecological Footprint. Currently, the Ecological Footprint of paper ordered through UShop is about 54 ha; switching to 100% recycled paper would reduce this to 7.5 ha, clearly a significant drop. Even a switch to paper with 30% recycled content constitutes a 14 ha reduction in the paper footprint, from 54 ha to 40 ha. Since each department on campus orders its own paper, this change may be difficult to implement; however, if no particular type of paper is ordered through UShop, the default should be set to recycled paper.

In addition, in areas such as the library, photocopies on recycled paper should be available. Currently, environmentally-conscious students do not have an option as to the type of paper that they are able use to make photocopies; there should always be at least one machine available that contains recycled paper, with sufficient signage indicating this, so that students can make a choice as to the type of paper they wish to use. Supply can be adjusted to meet demand.

2. Unfortunately, the most recent information on waste that could be obtained was from 2001, before UTM’s new recycling program was implemented. In order to implement waste reduction strategies, UTM needs to first commit to yearly waste audits. What isn’t measured cannot be managed; yearly waste auditing will give UTM the opportunity to track its progress in waste reduction, and provide valuable information.
on how waste can be further reduced. However, even without recent waste audit information, recommendations can be made as to the best ways to reduce this component of UTM’s footprint.

(a) Reduction of wastes is the first step. This can be done through elimination of excess packaging, especially in the area of food services. If disposable, single-serving food containers are replaced with reusable metal cutlery and china plates, waste food packaging is dramatically reduced. This has already been implemented in Spiegel Hall in the South Building; this program should also be applied to the North Building cafeteria. A further reduction in waste can be achieved through replacement of paper towels in washrooms with air-jet hand dryers.

(b) Recycling education campaigns, aimed at students, staff, and faculty, can be increased, to reduce contamination of existing recycling bins and increase awareness of proper recycling practices. In common areas, such as cafeterias, hallways and student lounges, garbage bins should be directly adjacent to the recycling receptacles, so that students have equal access to both. If students have to walk farther to the recycling bins than to the garbage bin, they may not make the effort, and recyclable items may get thrown into the trash.

(c) Organic wastes can be reduced through continuation of composting programs in both residences and cafeteria kitchens. If necessary, these programs can be expanded to accommodate demand. In addition, a large volume of waste animal bedding is disposed of from laboratories; composting for these wastes should be investigated as a way to reduce the amount that is sent to landfill.

5.2 Food

3. For this EFA, very little information about consumption of food by residence students was available. It is suggested that a survey of residence students’ eating habits be carried out to determine what they are consuming and the amounts at each serving. This would make data analysis much easier and gives a more precise footprint value.
4. In order to reduce UTM’s food footprint, more emphasis should be placed on locally-grown food, when in season. Since it travels a much shorter distance than food grown far away, locally-grown food has a much smaller footprint. Therefore, food service providers on campus should preferentially purchase fresh, locally grown food when possible.

5. In addition, UTM residents should have the opportunity to grow their own food. The recent closing of the MaGrath valley community garden due to the placement of the construction access road has left students with no opportunity to grow their own food. The construction of a community garden, with plots available to be signed out to students, will give students the option to grow local and/or organic food while simultaneously reducing UTM’s footprint.

5.3 Transportation

Transportation makes up the second-largest component of UTM’s footprint, accounting for 18.7% of the total. Most of this is due to students commuting to school by means of private vehicles.

6. UTM is largely known as a commuter campus; a relatively small proportion of the students live in residence (approximately 14%). As the Ecological Footprint numbers show, more people must be encouraged to use more environmentally-friendly forms of transportation, such as carpooling, cycling, walking, and public transit. Cycling can be encouraged through increased use of bike-only lanes or bicycle paths, as well as access to bike racks and bike lockers. The Bikeshare program is an excellent way to increase interest in cycling; it should be expanded as demand increases.

7. The UTM carpooling program is also an excellent initiative to reduce transportation-related impacts. As such, its advertisement and popularity should be expanded. Increased use of carpooling will also help to ease the ever-increasing demand for parking spaces on campus, which threatens valuable greenspace.

8. Recently increased Mississauga Transit service to UTM is also a welcome initiative which encourages students to avoid the use of private
vehicles for transportation. Implementation of a student bus pass, included in tuition and distributed to all students, would also help increase the number of students who choose to take the bus over driving.

9. UTM’s fleet and grounds vehicles can contribute to footprint reduction as well. Cleaner-burning, renewable fuels, such as biodiesel and ethanol blends, can greatly reduce a vehicle’s emissions. These fuels are comparably priced to gasoline do not require any infrastructure changes or upgrades to the vehicle (Natural Resources Canada, 2005).

5.4 Energy

Energy accounted for the largest component of UTM’s footprint, at roughly 70%. While hardly surprising for a campus located in a climate such as that of Southern Ontario, this large footprint has far-reaching consequences.

10. Nevertheless, UTM and the Centre for Emerging Energy Technologies has shown a great commitment to exploring alternative, environmentally-friendly forms of energy generation that will reduce reliance on imported energy. With increased environmentally-friendly energy generation on-campus, reductions should soon be seen in this category of the footprint.

6 Timeline for Future Ecological Footprint Analyses

To assist in the achievement of sustainability, UTM should continue to track its Ecological Footprint, ideally completing an assessment once every two years. In the years when an EFA is not being actively carried out, recommendations from the previous years’ analysis can be examined for feasibility and implemented. In this manner, reductions in UTM’s footprint can be tracked, and the results of sustainability initiatives easily seen. Changes in the composition of the footprint can also be noted, guiding which categories need to be targeted next.

Carrying out EFAs once every two years also creates a great opportunity for students to become actively involved in sustainability matters at UTM.
Students can become involved in data gathering, conducting surveys, and making improvements and additions to the calculator. Students can also work with administrators and staff to implement recommendations arising from the EFAs.

Finally, during a period of such rapid growth and expansion as UTM is experiencing, conducting EFAs is critical in providing an ecological impact assessment for the administration. The university’s very own Grow Smart, Grow Green campaign sets out to prove that rapid development can occur in an environmentally responsible and sensitive manner. Just as student enrolment, and the construction of new facilities serve as indicators for growth, the EFA is an indicator of whether or not this growth is truly sustainable. As a community within Mississauga and a university which is recognized internationally for its dedication to quality, innovation and excellence, UTM has a responsibility to uphold its commitment in being a leader in sustainable development.

7 Acknowledgements

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8 References

9 Appendix 1 - UTM’s Ecological Footprint Calculator

10 Appendix 2 - Notes on Ecological Footprint Data

See the UTM Campus Calculator Manual for a complete description of the calculations and data used.

Student Services
ECSU paper use from 2003 calendar year.
Beer consumption based on 2003 data, includes the Blind Duck Pub only.
SAC paper use based on orders from Sept 2004 - June 2005, adjusted to a full year’s consumption.
Medium paper use based on number of copies printed over a one year period.

Shuttle Bus
Sheridan and St. George shuttle buses based on a full year’s transport, adjusted for periods with reduced service.

Facilities Resources
Facilities resources paper use based on 2003-2004 data.
Ground vehicles gas and diesel use based on April 2004-March 2005, adjusted to a full year’s consumption.
Water, electricity, natural gas, and propane use all based on 2004-2005 data.
Waste based on 2001 waste audit data. Includes school year only.
Recyclables based on 2003 data. Includes school year only.

Parking Office
Parking permit numbers are from 2004.
Transportation information (distances traveled by students, etc.) based on 2004 UTM transportation survey, conducted by Aubrey Iwaniw.

Residence Centre
Residence students food consumption based on estimates from grocery receipts from 100 students, collected over a one month period.

*Mississauga Transit*

Mississauga Transit data based on Ridership Survey conducted in October 2004.