**Ecological Footprint**

**Definition**

The ecological footprint is an accounting tool for ecological resources. Categories of human consumption are translated into areas of productive land required to provide resources and assimilate waste products. The ecological footprint is expressed in “global hectares.” Each unit corresponds to one acre of biologically productive space with “world average” productivity. Ecological footprint can be summarized as a measure of the sustainability of our lifestyles.¹

1. What is a "hectare" and how does it compare in size to an "acre"?

**How is it Used?**

The ecological footprint provides a comprehensive comparison of natural resources demand and supply availability. The ecological footprint analysis compares the actual geographic area or footprint of a region (e.g., city, country, etc.) with the virtual footprint that would be required for that region to be sustainable. Reese & Wackernackel, the originators of the concept, estimate that the residents of the Earth are currently consuming resources at a rate that would require four times Earth’s resources in order to be sustainable. The analysis is primarily based on data published by United Nations agencies and the Intergovernmental Panel on Climate Change. In summary, ecological footprint can be used as a measure, or indicator, of progress towards sustainability, rather than a tool to improve the environmental performance of an organization. The data resulting from such measurement can be used for communication purposes both internally and external to an organization (see City of Toronto example).

2. What is a natural resource?

**Who Uses It?**

**Industry** — Ecological footprint calculations are typically applied to communities as opposed to industrial operations; however, the quantifiable nature of the concept is applicable to private industry and could be used as an evaluative tool. Industry would benefit from an understanding of the implications of corporate decisions relevant to the ecological footprint. Such a measurement may stimulate the emphasis on environmental initiatives to reduce an individual company’s ecological footprint.

**Government** — The United Nations calculates the ecological footprint for nations. National consumption is calculated as domestic production plus imports minus exports. This balance is computed for 72 categories such as cereals, timber, fishmeal, coal and cotton. Some examples of ecological footprints (in global hectares) are as follows:

---

<table>
<thead>
<tr>
<th>Country</th>
<th>Global Hectares per capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>10.3</td>
</tr>
<tr>
<td>Canada</td>
<td>7.7</td>
</tr>
<tr>
<td>Sweden</td>
<td>5.9</td>
</tr>
<tr>
<td>India</td>
<td>0.8</td>
</tr>
<tr>
<td>Global Average</td>
<td>2.8</td>
</tr>
</tbody>
</table>

**Organizations** — Local interest groups, NGOs and environmental organizations use the calculated ecological footprint to define issues of concern and reinforce the need for environmental and sustainability initiatives in developed countries. Numerous web sites⁢ and resources allow crude personal ecological footprint calculations to emphasize the environmental consequences of the modern Western lifestyle.

**Individuals** — A person’s ecological footprint can be computed using a “top-down approach,” by dividing the regional or national total consumption by its population size. The footprint can also be determined using a “bottom-up approach,” by estimating the footprint of individuals, households or communities from the results of a lifestyle questionnaire. The latter is an example of direct measurement.

3. What does it mean that the USA has a higher number than India?

**Business Case**

The ecological footprint is an indicator of sustainability and risk, globally and locally. It shows where humanity needs to improve and where innovation will be required. This can be of strategic value for businesses thinking about the next generation of their technology and service innovations. In this way industry can use systems knowledge to evaluate risks and economic success much like the principles of backcasting advocated by The Natural Step pedagogy, which opens new opportunities for business development by adding value through sustainability. In this way businesses can secure their economic success and become leaders for sustainable development.⁴

Mathis Wackernagel and contributors have defined the business benefits of the Ecological Footprint:⁵

**Competitive Advantage** — Biophysical assessments are critical to making businesses become more competitive. In a time when products and their prices are becoming increasingly similar, product sustainability may determine the competitive advantage on the market. Among comparable products, the modern consumer will pick the more sustainable choice. Also for companies, sustainable production will reduce long-term costs and exposure to risks like pollution damage or resource exhaustion. Footprint based eco-labels could be an

---

effective strategy to differentiate products. The companies introducing them first will achieve their product differentiation cheaper and more effectively than the followers.

**Business as Leaders for Sustainable Development** — With hardly any exception, conventional corporate greening and “environmental responsibility” have side-stepped measurable and meaningful improvements toward sustainability. To date no business has established a basis for assessing sustainability and declared its performance. Their indices, measures, conventions or codes of conduct have served only to increase the noise and obscure the signal. The result is crushed public confidence and little action. However, sustainable behaviour can be business driven if appropriate measures and ethics are applied. In fact, it can create a potential renaissance for business. Activities of benefit to the environment generally have lower social costs, which eventually pay back for the company, its shareholders and society. These advantages of environmental leadership have been well elaborated by organizations like The Natural Step.

**Wasting Waste** — Tools like the ecological footprint to assess resource inputs and waste discharges can become valuable tools for managers to analyze business operations and technologies. Knowing in physical terms what enters and what leaves a business and its production processes helps detect unnecessary costs and untapped opportunities. It points to waste that could become a resource and to resources that are squandered. It also assists the planning of ecologically sounder production and business operations.

4. Is the ecological footprint an expert or layperson tool for risk assessment? Why or why not?

5. How could ecological footprint analysis save businesses money?
The Ecological Footprint Questionnaire Pilot Study was developed by the Environmental Division of the former City Works Services (now Works and Emergency Services) to test how effective the ecological footprint concept is at educating the residents of Toronto about the environmental impact of individual consumption. A questionnaire was designed and a method of calculating a participant's ecological footprint was developed to use the information provided from the survey. The questionnaire was introduced in the fall 1997 issue of Waste Talk (newsletter produced by the former City Works Services) and distributed to over 200,000 households during the second and third weeks of October 1997. To date, this article has generated 345 inquiries to which 261 questionnaires have been sent out. Of the 261 questionnaires, 156 were completed and ecological footprints were calculated from the information provided.

The ecological footprint of the "average" respondent was 4.94 ± 2.00 hectares, which is 31 per cent smaller than the Canadian average. The appropriated carrying capacity, or the land needed to support the 156 respondents, is 770.64 hectares or 7.71 km². Thus, the amount of land needed for all of Toronto's residents, if the "average" participant from this pilot study sample is the "average" Torontonian, is 11,783,983 hectares or 117,840 km². In other words, if the area of Toronto is 630 km², the amount of land that its residents appropriate is approximately 187 times larger than its geographic size.

The results of the pilot study show that people are interested in learning more about the environment and the impact their various lifestyles have. The ecological footprint is an excellent method of educating people. It is not only effective at quantifying this impact, but is also a powerful tool that presents this information through an illustration. To manage over-consumptive behaviour, we must first take a "snapshot" of where we are now, identify the activities that can be reduced, implement techniques that lower resource use in these targeted areas, and then re-calculate and reduce the size of our ecological footprint.
**Trends and Future Importance**

The results of a pilot study to measure the ecological footprint of Toronto show that the public is interested in the environment and how their choices impact the world. The ecological footprint is a tool for quantifying the sustainability of our behaviour. This type of measurable approach helps government understand the direct cause effect of our actions on the environment.

Environmental groups as well as governments recognize that to manage our environmental impacts, we require an understanding of where we are now and how to measure improvement. The ecological footprint allows government to target activities and sectors for legislation towards reducing their footprint.

**Related Legislation and Regulations**

Not currently a regulated environmental assessment concept. The quantitative nature of the ecological footprint does, however, make it a potentially applicable concept when developing new regulatory frameworks.

**Linkages to Other Tools**

**Environmental Impact Assessment (EIA)** — EIA is an approach to assess potential impacts of a planned project, activity or process. This compares to ecological footprint’s use as an estimating tool for resource use of an organization, activity, etc.

**Key References**

Mathis Wackernagel, Coordinator of the Centro de Estudios para la Sustentabilidad at the Universidad Anáhuac de Xalapa in Mexico and Director of the Indicators Program at Redefining Progress based in San Francisco, US. He has a Ph.D. in community and regional planning from the University of British Columbia in Canada and a mechanical engineering degree from the Swiss Federal Institute of Technology. www.ecouncil.ac.cr/rio/focus/report/english/footprint.


Redefining Progress is a nonprofit, nonpartisan public policy organization that seeks to ensure a more sustainable and socially equitable world for our children and our children's children. The web site had detailed information on the Ecological Footprint. www.rprogress.org/programs/sustainability/ef.

7. What does it mean that ecological footprints have a "quantitative nature"? Why is this important?