Using Eco-Efficiency as a Strategic Innovation Indicator

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Summary

With carbon regulations and impending resource constraints, a more comprehensive strategy is needed in order to identify, target, and execute on the highest value opportunities for your business. To develop a successful portfolio management strategy an organization needs tools and management processes. In this paper we want to focus on the tools needed to manage toward environmental constraints.

In this paper we will introduce a strategic approach to product innovation that is based on the eco-efficiency framework. This framework can help organizations manage their product portfolios to environmental goals, leading to groundbreaking new products and a strengthened competitive position.

Introduction

The rising price of oil, emerging local and federal governmental carbon regulations, and consumer preference for sustainable products have presented new challenges to corporations: i.e. bottom line protection, risk management and new market creation. It has also left Corporate Managers searching for ways to identify inefficiency and waste associated with their business activities, their products and their services, across the board. Most companies have yet to scratch the surface of the financial returns they could gain by looking more closely at carbon and resource use intensity as an indicator.

Meanwhile, the cheap and abundant resources we've had for generations are getting harder to find, harder to extract, and they're located further from the point at which they are consumed. This has the predictable result of volatile, rising energy costs, which takes with it the costs of all the energy-intensive materials, products, and services that we consume. This has occurred even in the absence of a regulatory cost of carbon in the US.

While we may not know how carbon regulation or resource constraints will affect our businesses directly, we do know that the costs are passed down the value chain as much as possible. The environment, and the resources it provides, is already part of our cost structure, and non-sustainable practices are resulting in both direct and indirect impacts to our cost of doing business. Due to the rising consumption and accelerating depletion of nature's goods and services, the availability of natural resources are changing. Your dependency on these resources in the production of your products and services will impact your competitive position sooner or later, calling for a new focus on innovation that addresses present and future environmental and resource constraints.

For instance, buying offsets for your business's carbon footprint is not an innovation. Neither is the installation of new light bulbs or some solar panels on a building. These are tactics that many of your competitors are using already, and thus they merely set the bar for performance today. Obvious, off-the-shelf solutions won't give you a lasting edge. A more comprehensive strategy is needed in order to identify, target, and execute on the highest value opportunities for your business. And this requires an integrated, big picture look at the unique dependencies, relationships, and

drivers among your business's various activities.

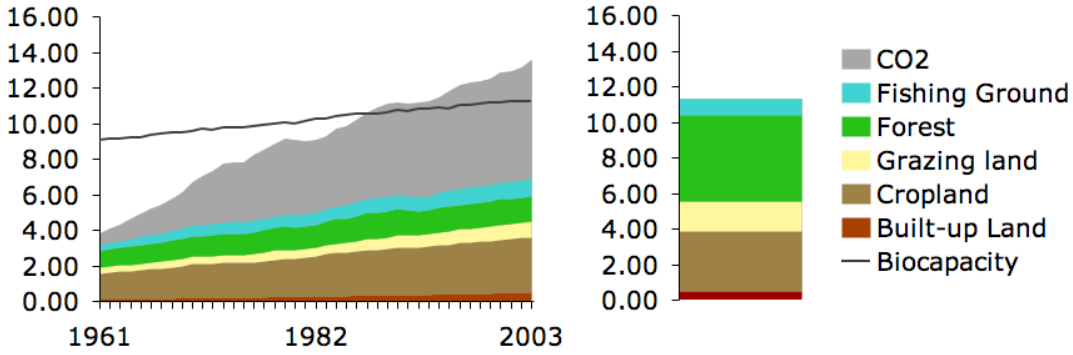
Those companies that understand and culturally embrace 'systems thinking' will learn how to search methodically for innovation potential using carbon and resource use as a proxy for (the cost of) inefficiency and waste. We will examine this concept as a fundamental approach for how to orient and train your stakeholders so they can evaluate carbon and resource use intensity across your entire value chain – from materials extraction to manufacturing, in distribution networks, in the use phase of products, and in disposal. In the process we will discuss how to quantify performance and create metrics that you can use to measure progress toward objective goals.

Driving product Innovation in a carbon and resource-constrained world

There is consensus that humanity is using global resources faster than the planet can replenish them. According to the Living Planet Report 2006 (WWF), humanity as a whole uses nearly 25% more resources than the planet can make available annually. Or in other words, humanity today would need 1¼ planet to sustain us. Some people use more, and some people use less. If everybody lived like the average American, we would need more than 5 planets and the average European life style requires 3 planets. At the same time developing economies are growing rapidly, driving up the consumption patterns of billions of new consumers.

Humanity's Ecological Footprint has been steadily increasing over the past 4 decades. The Ecological Footprint measures the amount of cropland, grazing land, forest area, and fishing grounds that are needed to satisfy humanity's need for food, clothing, shelter, and products and services. In addition to that, it measures the amount of land required to sequester our emissions after subtraction of the oceans' absorptive capacity. When this total amount of land needed exceeds the amount available to us, we are in said to be in overshoot, as we have been since the mid-1980's. Over the years, we have been able to increase biocapacity, mainly through increased crop yields and expanding area under cultivation. This increase has, however, not been able to keep up with the increase of the world population and with our increased rates of consumption.

Ecological Footprint 1961 - 2003 **Biocapacity, 2003**



Humanity's Ecological Footprint 1961 – 2003 and Biocapacity 2003 in Billions of 2003 Global Hectares.

Source: Global Footprint Network 2006

Business leaders have become increasingly aware of the link between climate change and humanity's role in causing this change and are actively joined in the effort to address it. At the same time they are concerned about rising costs and increased competition around the energy resources and the materials they use to produce their products and services. Becoming resource efficient is rapidly growing to be a competitive issue, if not a matter of survival. For this reason, leaders are looking for systems and metrics that can help them endure and thrive in an increasingly

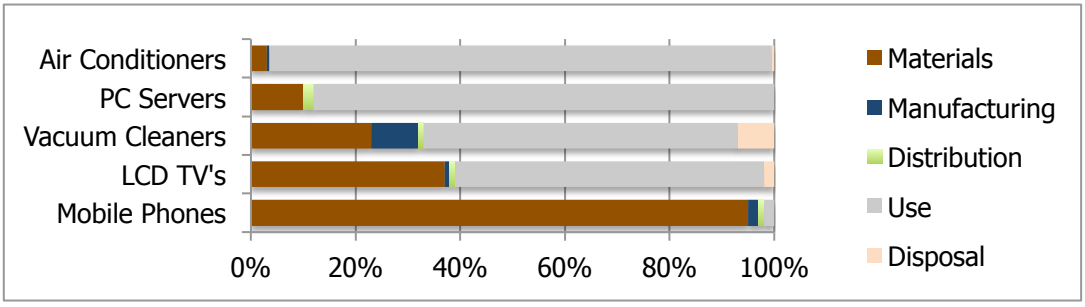
resource-constrained world.

Whatever approach a company chooses, it is likely to (need to) have a number of common characteristics:

- A product portfolio-wide strategy
- A suite of common, comparable scores applied to all products
- A strategic goal to improve the score of the entire portfolio by a certain factor, in the order of 4 to 10

Implementing a strategic product improvement process will take time in most organizations and with a lack of industry standards and benchmarks it is attractive to procrastinate implementing new practices. But not taking action has to be weighed against the time required to move from taking the first steps to bringing new products to market. In some sectors the international competition is already managing their product portfolios to environmental goals, leading to groundbreaking new products and a strengthened competitive position. Leadership in this area is coming from some major Japanese conglomerates, including Toshiba and Matsushita who are using versions of an eco-efficiency indicator framework called Factor X to measure and compare product progress.

Product impacts vary widely by life cycle stage between different products as shown here for emissions associated with a small selection of electric products (source: Toshiba environmental report 2008).



What does managing a product portfolio to environmental goals look like?

To develop a successful portfolio management strategy an organization needs tools and management processes. In this paper we want to focus on the tools needed. The main tools required are:

- Metrics
- Benchmarks
- Goals
- Systems

Metrics

Following the eco-efficiency framework, the metrics that will help create a unified measurement and tracking system across a product portfolio provide the ability to quantify product utility (i.e., how well does a product perform its intended function) and product impacts (e.g., greenhouse gases emitted and resources used). Combining these two metrics provides a measure of eco-efficiency for a given product. Finally, a factor comparing the eco-efficiency of a product to a benchmark product will also allow for reasonable comparisons of the progress achieved in eco-efficiency across different types of products.

Product Utility is a metric that is expressed in a unit or combination of units that are relevant to what the product is designed to do: e.g. lumens for light bulbs, cooling capacity for refrigerators, processing power for computers. These metrics needs to be determined by the developers of a product and crosschecked by neutral observers.

Greenhouse Gases Emitted (GHGs) and **Resources Used** are two independent metrics. In fact, resource usage can even be subdivided into more granular metrics, depending on which resources you want to account

for. Both metrics need to account for the full life cycle of the product since a fully valid product evaluation needs to look at the product's performance and impacts from cradle to grave. Note that this does not discount the value of being able to evaluate a product's impacts at each stage of its life cycle.

GHG efficiency and **Resource efficiency** are metrics that are derived from the above metrics by dividing product utility by GHG emissions and resource use respectively.

$$\text{GHG Efficiency} = \frac{\text{Product Utility}}{\text{Life Cycle GHG Emissions}}$$

$$\text{Resource Efficiency} = \frac{\text{Product Utility}}{\text{Virgin Materials Used + Materials Discarded}}$$

Finally, we calculate the **Eco-Efficiency Factor** for a given product by dividing its efficiency factors by the same efficiency factors for a benchmark product. Since there are multiple efficiency factors, there can be multiple eco-efficiency factors for a product. It is possible to combine them into a single factor by applying common normalization factors to them, using accepted methods from the field of life cycle assessment.

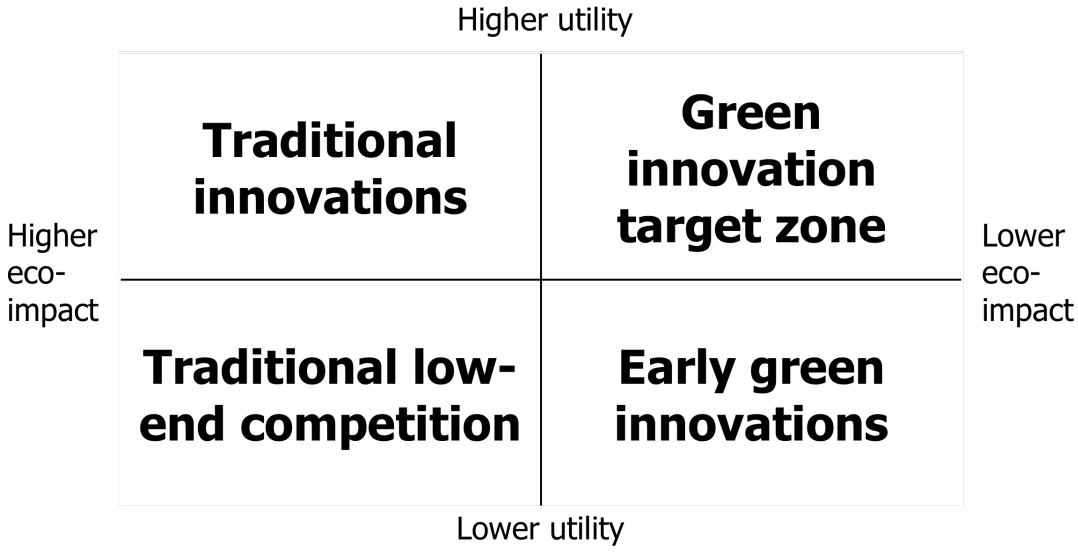
$$\text{Eco-Efficiency Factor} = \frac{\text{Product Eco-Efficiency}}{\text{Benchmark Product Eco-Efficiency}}$$

Benchmarks

Benchmark products are products to which we are comparing our new product with enhanced environmental performance. There is no strict

guideline on which product to choose within a given product family. As a rule of thumb, a company could choose a representative product from a certain year (e.g. year 2000 models) from each product line. If certain product families do not have yearly models, or if the model for a certain product from the year chosen was designed to be 'green,' the company can choose a different baseline product for that product family. The main objective is to have a valid, representative set of relatively current 'pre-green' products that can withstand public scrutiny and provide a sensible benchmark. Since the objective is to manage the product portfolio toward achieving a certain level of eco-efficiency there may be an inclination to choose older, low performing benchmark products in order to achieve

The most successful innovations will have the highest eco-efficiency factors associated with them. It is clearly possible to increase product utility while increasing GHG emissions and resource use at the same time. Cheap resources and free GHG emissions have enabled business to externalize most of their environmental cost up till now. In a carbon and resource constrained age however the focus of innovations will shift into a different quadrant. Products with a high eco-efficiency factor will typically be found in the "Green Innovation Target Zone" since only those will be delivering what customers want at a low impact.



perceived quick wins. While quick wins are often good for morale and generating headlines, they may be damaging in the long run if they result in shooting for goals that are set too low to drive longer-term ROI, competitive advantage, and true business sustainability.

Eco-efficiency factors could be normalized across industry sectors, but companies should not wait for trade associating agreements before starting to use the practice. Eco-efficiency is not a labeling scheme, or may take a long time to evolve into such. It is a tool that guides internal business strategy and drives competitive advantage.

Time Horizon and goals

Starting an eco-efficiency project and getting it into full swing across a company and product portfolio is a long-term project. There will be clear phases that such a project will go through:

- Initial pilot, including a high level mapping of the product portfolio or initial benchmarking of a subset of product families
- Setting priorities, as a result of creating a company-wide GHG and resource-use map and identifying major areas of impact
- Setting long-term goals, such as a factor 4 improvement (on the average) over a 5 year period, and gaining company-wide support for the process
- Benchmarking products across product families
- Managing progress by rolling out company-wide use of systems that have been put into place in the early stages of the process

How Planet Metrics can help

Planet Metrics' Rapid Carbon Modeling software is able to support eco-efficiency projects in companies of any size, and across product

portfolios of great diversity.

At Planet Metrics, we think about carbon footprinting as a useful way of accounting for the greenhouse gas (GHG) emissions generated in the creation and delivery of a product or service. In order for a carbon footprint to truly provide meaning and utility to companies, manufacturers, and consumers, we believe a carbon footprint must be far more than a single number – it should offer a view into how things are made and consumed. Rather than a single metric, we feel that any exercise in carbon footprinting should provide a breakdown, or map, of emissions generated at each stage in creation, delivery, and use of a product or service, and should be turned into a meaningful performance metric. Compared to a single metric that represents the "total" emissions associated with a product or service, this sort of emissions map and associated performance metrics offer significantly more insight into a company's GHG impacts and provides actionable intelligence that better informs management of strategic progress in addressing those impacts.

By understanding where emissions originate throughout their facilities, supply chain, and product use phase, companies and manufacturers can identify where to focus emissions reduction efforts and understand how design or operational changes would affect the environmental impact of their product or service, allowing for more optimal and strategic environmental decision-making. In addition, managing to strategic goals and employing tools such as the eco-efficiency framework enables companies and manufacturers to more effectively quantify and communicate their competitive advantage both internally and externally.

For more information

Contact us for more information on what Planet Metrics' Rapid Carbon Modeling™ software can do for you at:

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