



Green cooperation - How supply chain partners can jointly reduce their costs and eco-footprints

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Companies that only look into their own value chain operations often find they have reached a point where there is little room for further improvements. A new approach that can reap substantial benefits is to take a look at the integral supply chain perspective, which can not only improve your bottom line but also leave you with a vastly improved eco-footprint. This article shows how to get there.

Manufacturing companies across the world are finding that initiatives to reduce costs and improve sustainability can go hand-in-hand, yielding true win-wins for customers, shareholders and society. However, after years of diligent efforts, many of them, especially in developed economies, are also finding that there is little room left for further improving their bottom line or the environment simply by looking at their own operations. As a consequence, the most proactive ones are starting to examine cost and emission reductions from an integral supply chain perspective. They are achieving economic and environmental improvements by cooperating with suppliers, customers and nearby companies. By changing from the traditional zero-sum relationship into an approach based on enabling mutual success across the supply chain, they succeed in delivering differentiating products and services with a vastly better eco-footprint.

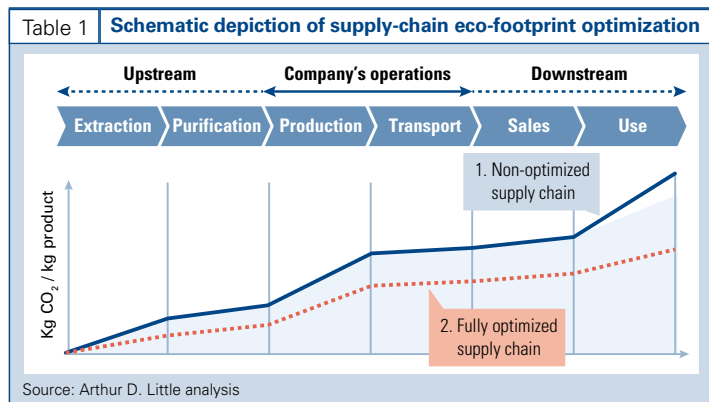
In this article we will make the case that more intimate cooperation between manufacturers and their supply chain partners can deliver real results in both cost reduction and eco-footprint improvement. First, we will point to the areas and interfaces in the supply chain where such opportunities are to be found. Then we will provide an estimate of the quantitative and qualitative value that implementation of these opportunities can generate. Finally, we will present three routes for putting “green cooperation” into practice.

Scanning the supply chain for “green cooperation” opportunities

Let’s assume that you are a refrigerator manufacturer. Table 1 shows the supply chain both upstream and downstream of your own activities. From raw material extraction all the way to consumer end-use, each participant in the supply chain will contribute to the total eco-footprint, for example as a result of CO₂ emissions, as indicated by the shaded area below the full line. The dotted line indicates

how a joint effort by all participants can result in a significant reduction of emissions.

While every participant can continue to take individual measures to reduce costs and emissions, there are significant additional reduction opportunities at the interfaces between the participants. Cooperation is a prerequisite to realizing and benefiting from these opportunities. The opportunities lie upstream (the company's suppliers), downstream (customers and end-users) and in the so-called "side stream", i.e. the local, regional or sometimes even national business eco-system of which the company is a part. Additional opportunities reside in the design and provision of products that have a lower in-use footprint.



Upstream

Upstream opportunities lie in the better alignment of transport, logistics and packaging, and raw material and energy supplies. For example, raw material suppliers are often still adhering to old product specifications, while recent technological advances allow the use of raw materials with less footprint-intense specifications. In another example, two chemical manufacturers saw that they could jointly achieve energy savings by constructing pipelines for transportation of key raw materials from local strategic suppliers. Doing so not only reduced the energy used for transportation but also eliminated the need to concentrate the product prior to shipment. The total return on investment exceeded 20 %. Hitherto such opportunities had not made it onto

the company's priority investment list, but they received renewed attention because of the additional benefit of a lower (joint) eco-footprint.

Side stream

Side stream opportunities pertain to the better integration of the company with its local environment. There are three types of opportunities. First, consider who could use your waste. Many companies currently dispose of high-volume waste streams through incineration either on-site or by an external waste processor. However, there are frequent opportunities to supply waste streams as raw materials or fuels to interested parties nearby.

Second, investigate whether you have a deficit or a surplus in specific energy needs, such as heating, cooling or steam, that matches someone else's surplus or deficit. In many cases, excess heat can be used to partly meet the energy needs of someone else's plant nearby. In other cases, excess heat can be used for residential heating in neighboring districts.

Third, check whether you can pool certain waste streams with others on your site or in your region to make it worthwhile investing in shared facilities to valorize these streams, for example for recycling or use in a bioreactor to yield gas fuel that can in turn supplement local energy needs.

Downstream

Downstream opportunities relate to the design of the product and how it is supplied to the customers and possibly all the way to the end-user. Examples include product portfolio standardization, the use of product swaps to avoid transport, or simply transport optimization. For example, companies are collaborating with transportation service providers to reduce fuel consumption by offering additional driver training or by modifying trucks for better aerodynamic performance.

End-use

Opportunities abound to design and provide products with lower in-use and end-of-life footprints yet equal or better performance than that of existing products. These benefits can be achieved by designing solutions jointly with supply chain partners and keeping the end-user in mind. Take cars for example: design changes that lead to better engine performance and lower weight through the use of plastics and aluminium can also lower energy consumption both in the supply chain and by the end-user. The Tata Nano, for example, is not only one of the cheapest cars to produce but is also remarkably fuel-efficient.

Table 2 provides an overview of opportunities and some specific examples in the four categories described above. Most opportunities are not really new – they are technically rather straightforward and could have been implemented earlier. But often they are ignored because they require fairly sophisticated cooperation between supply chain partners. They have remained largely untapped, even at companies that are leaders in sustainability. It is the additional element of eco-footprint reduction that is putting them firmly on company agendas.

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When scanning for opportunities in the supply chain, it is important to determine its boundaries carefully. These boundaries are by no means static. For example, a multi-plant cluster run by a single owner may be broken up into multiple units owned by different players. A good example is the Taft chemical site in Louisiana, formerly owned by Dow, which now hosts dozens of companies. Where previously the single owner would optimize the site as a whole, multiple owners tend to focus chiefly on their own, in-house operations. Nevertheless, they can still access the benefits of site integration if they make a deliberate effort to work with the relevant partners. This concept can be scaled up to the local, regional and sometimes even national level.

In these broader clusters companies can realize considerable savings through synergies in the areas of energy, services, maintenance, warehousing, shipping and even training. A good example of industrial symbiosis is the Kalundborg site in Denmark (see box on the next page). Such a network acts as a business eco-system, with the

most efficient participants providing significant cost savings to the others, making the system as a whole more competitive on a regional or global scale.

Table 2 Overview of green cooperation opportunities, with specific examples	
Area	Opportunity
Upstream	
Materials and energy	<ul style="list-style-type: none"> Optimize product specs or supply to save energy during production Replace materials with renewable alternatives (1)
Transport	<ul style="list-style-type: none"> Reduce number of trips by pooling or delivery of larger loads Invest in energy efficiency options Change to a less energy-intensive transport mode (2)
Logistics & packaging	<ul style="list-style-type: none"> Reduce packaging, volume or weight Consider returnable packaging Optimize warehousing
Side stream	
Waste materials	<ul style="list-style-type: none"> Sell waste as fuel (3) Sell waste as raw material Pool waste materials with neighbors to enable scale for valorization
Energy surplus or deficit	<ul style="list-style-type: none"> Share deficits or surpluses of heat, steam or cold with nearby partners (4)
Downstream	
Transport	<ul style="list-style-type: none"> Incentivise customers to locate closer to supply plant Swap products with competitors to reduce transport distance Reduce number of trips by pooling or delivery of larger loads Invest in energy efficiency options (5)
Logistics & warehousing	<ul style="list-style-type: none"> Reduce packaging, volume or weight Consider returnable packaging Optimize warehousing
Product specification	<ul style="list-style-type: none"> Optimize product specs or supply to save energy or emissions (6) Replace materials with renewable alternatives
End-use	
End-use	<ul style="list-style-type: none"> Provide energy-saving version of products (7) Increase shelf life to avoid waste Replace materials with renewable alternatives Enable recycling (8)
<p>(1) Mixing in recycled materials to replace fossil-based alternatives allows reduction of the cradle-to-cradle footprint of raw materials and reduction in energy use in an overall cost-neutral manner.</p> <p>(2) Transporting a diluted product by pipeline instead of concentrating it and shipping it by truck enabled a company to achieve expected energy savings of 130 TJ, with an expected project return (IRR) of 23 %.</p> <p>(3) Selling waste materials to a cement plant as fuel instead of incinerating them at a dedicated facility yielded energy savings with a direct impact on the bottom line.</p> <p>(4) Sourcing surplus steam from a waste-processing plant enabled a company to cut down on heating, equivalent to 400 TJ with a positive project return (IRR) of 7 %.</p> <p>(5) Investments in driver training and truck enhancements for selected transportation partners resulted in energy savings of 30 TJ, returning more than 100 % on investment, while at the same time contributing to the sustainability image of the company and brand.</p> <p>(6) By persuading a customer who produces parts for the automotive industry to relocate production closer to the site where production of virgin plastic material takes place, reheating of the plastic pellets can be avoided, cutting down on energy needs.</p> <p>(7) Fuel-efficient cars, energy-saving lamps and refrigerators are a few examples.</p> <p>(8) A system approach to nylon carpet tile recycling for office buildings can be cost-neutral relative to “disposable” nylon carpet, thus allowing this “supply-chain alliance” to grow market share among eco-sensitive customers.</p>	

Sizing the benefits of green cooperation

To get an indication of the quantitative benefits of green cooperation, let's consider two ballpark figures. First, "outside the fence" activities such as freight, warehousing and distribution typically represent 15 % of a product's total cost. Second, decades of continuous improvement initiatives "inside the fence" in many industries such as plastics and chemicals have typically led to savings of up to 30 %. Consequently, as companies are – at best – only now initiating optimization efforts with third parties and services or utility providers "outside the fence", similar savings levels of 30 % would imply a 5 % bottom-line increase. Although

Industrial Symbiosis Institute in Kalundborg, Denmark – Reducing footprint and greenhouse gas emissions through clustering

The industrial complex at Kalundborg in Denmark, managed by the Industrial Symbiosis Institute, is one of the most celebrated functioning examples of a network of companies sharing by-products. The philosophy behind the Symbiosis is that the companies involved, which range from power stations through a plasterboard factory, an oil refinery and biotech/pharmaceutical plants to waste companies, exploit each other's residual or by-products on a commercial basis.

The overall goal of Kalundborg is to improve joint environmental standards through efficiency, further development and information exchange on by-product utilization. The collaborating partners also benefit financially because bilateral agreements within the Symbiosis are based on commercial principles.

Through these collaborative actions, the cluster minimizes the use of energy, gypsum, gas, steam and water. The use of excess heat from the Asnaes power plant as process steam and for central heating decreases the site's CO₂ emissions by approximately 240,000 tonnes per year, whereas recycling and the reuse of water between the companies saves about 3 million m³ of fresh water per year.

the gain has to be shared among supply chain partners, in today's environment it still remains sizeable. Additional gains would arise from aligning products and supplies across the supply chain.

Further anecdotal evidence abounds in the area of transport. In the European Union alone, it is estimated that trucks drive over 150 billion kilometres each year, and for up to 30 % of that distance they may be driven empty. This equates to \$40 billion worth of fuel, and about 20 to 30 million tonnes of carbon dioxide. Another example is the collaborative transportation management project that Wal-Mart piloted with Procter & Gamble and carrier J.B. Hunt in 2000. It allowed Wal-Mart to reduce significantly the number of steps required to process goods for promotion, while J.B. Hunt reported a 16 % decrease in unloading time and 3 % fewer empty miles traveled. Since then networks such as the US-based Nistevo web-based platform, which includes more than 400 carriers, have pushed this type of collaboration even further. Through the platform, the carriers combine shipments for several customers and thus reduce the number of (partially) empty transports. The impact of collaboration in such platforms can be major, with participants such as Land O'Lakes and Georgia Pacific reporting freight savings of between 5 and 10 %.

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Collaboration among supply chain partners can also be used to reduce inventory and waste. In the Netherlands, Kimberly-Clark and Unilever Home & Personal Care developed the concept of shared warehousing after discovering that 93 % of their combined volume was delivered to the same 127 drop-off points. During the 2006 pilot, both parties found that they could achieve inventory reductions of up to 65 % and out-of-stocks decreases of 30 %.

Green cooperation can also impact the top line. An increasing number of companies market green products to entice customers who are looking for products with superior environmental performance. For example, food and drink group Princes and retailer Tesco in the UK have jointly developed a novel concentrated drink called "double concentrated squash", with significantly lower packaging and transport costs. The consumer adds nine instead of the traditional four parts of water to the squash concentrate, which leads

to packaging reductions of up to 46 %. The product thus delivers both environmental benefits (transport vehicle movements are reduced by one third) and consumer benefits (smaller, lighter, more portable pack sizes).

Putting green cooperation into practice

Realizing the benefits of green cooperation is more easily said than done. Supply chain partners that have haggled over price and delivery terms for years will not easily reach the more trusting relationship in which both parties open up and share operational details. What makes the barrier even higher is that very often the benefits and efforts are divided asymmetrically - one company might have to do all the work while the other will reap all the benefits. Thus, overcoming distrust and learning how to share the benefits between partners is the critical element of supply-chain cooperation. There are three increasingly sophisticated routes for achieving cooperation.

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Carrot-and-stick

The carrot-and-stick approach is the most basic route toward supply chain cooperation, and one that companies are intimately familiar with, both on the receiving and applying end. It is easy to see how the purchasing department can add energy savings to the requirements in its supply contracts. Certainly in a market where the customer has significant buying power, multiple suppliers compete and transparency about cost and eco-footprint drivers is high, this approach can deliver the desired results. For example, a car company procuring plastic components such as bumpers can make its suppliers compete also on the basis of the carbon footprint of its plastics. However, this approach is not very effective in a market where the customer holds less bargaining power and interests in footprint reduction are not aligned.

Creating win-wins

To move beyond the traditional carrot-and-stick approach, a number of leading-edge players are setting up supply chain partnerships to achieve a mutually beneficial outcome. For example, large retailers and transportation companies are

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cooperating to reduce fuel consumption, with the retailers co-investing in driver training and truck modification. While transportation companies in principle could implement these changes on their own, in practice their incentives are insufficient. In addition to cash constraints, energy efficiency is insufficiently important to them to persuade them to make the investments needed. However, for retailers with well-known brands and reputations on the line, it is important to work with supply partners that are perceived as sustainable and responsible. Apart from the positive impact on reputation, this cooperation leads to energy cost savings which can be partly passed on to consumers through lower prices.

Clearing house

Realizing green cooperation opportunities becomes increasingly difficult when they require the involvement of more than three or four partners. This is often the case in multi-site clusters where many interdependencies are at play at the same time. An advantageous solution in such cases is to set up a third-party, dedicated organization, whose very reason of existence is the identification and implementation of such multi-party efficiencies. Such a “clearing house”, which aims to capture and realize synergies for third parties, can be very effective in improving the competitiveness of local, regional or even national clusters. While the clearing house should be co-owned by the cluster participants, it has its own profit and loss statement, with profits regularly paid out to the owners. With such a set-up, it can act as an independent and neutral party, brokering synergies and, where necessary, paying industrial partners if the cluster as a whole would be better off. The clearing house solution is presently deployed at the aforementioned Kalundborg complex, on a limited scale at clusters in Germany and the Netherlands. A much broader use could enable the optimization of energy and product streams at the regional and national level – this is in fact an area where governments could also help to bring parties together.

Insights for the executive

More than ever before, executives are being made accountable both for reaching financial targets and for improving their company's sustainability record. Fortunately, recent experience shows that achieving the one objective need not be at the expense of reaching the other: initiatives to reduce costs and improve sustainability can go hand-in-hand. So far, most of these initiatives have focused on actions taken within the company's own operations, by using measures such as reducing energy consumption in production, recycling waste water and encouraging employees to use public transport.

Leading-edge companies, however, are now going one giant step further. They cooperate with supply chain partners outside their own operations to reduce both costs and the eco-footprint of all parties concerned. Such "green cooperation" not only provides an attractive return on investment, but it also responds to growing expectations from governments and environmental groups about the transparency of the sustainability record of entire supply chains.

Opportunities for green cooperation abound for any manufacturing company. They can be upstream (the company's suppliers), downstream (customers and end-users) and in the so-called side stream, i.e. the local, regional or sometimes even national business eco-system of which the company is a part. However, realizing the benefits of green cooperation is more easily said than done.

Depending on the situation, different approaches for achieving this kind of cooperation are called for. In some situations the traditional carrot-and-stick approach still works. However, in an increasing number of situations, companies should set up supply chain partnerships to achieve genuine mutually beneficial outcomes. To that end, it is critical for companies – and their purchasing and marketing functions in particular – to acquire a new set of competencies aimed at brokering win-wins with their supply chain partners, in addition to their more traditional profit maximization abilities. Green cooperation increases the competitiveness not just of a company's own opera-

tions, but also of the supply chain and the local business eco-system of which it is a part.

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