SUSTAINABLE SUPPLY-CHAIN TOOL FOR ASSESSMENT OF INITIATIVES (SUSTAIN)
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SUSTAINABLE SUPPLY-CHAIN TOOL FOR ASSESSMENT OF INITIATIVES (SUSTAIN)

A THINK Executive Whitepaper
Environmental sustainability has gained increasing business attention in recent times, due to a range of factors, including the changing awareness and attitudes of public consumers, the economic benefits that can come with taking action, and accompanying legislative pressure. In the case of supply chain operations, sustainability can encompass a broad scope, spanning from designing a green supply chain network to green manufacturing processes.

Companies aiming to move towards a more sustainable supply chain model, may find it difficult to adopt sustainability initiatives, and to know where best to start. Questions like “how much CO₂ can we potentially reduce given a certain budget” and “should we redesign our supply chain network or invest in clean technology vehicles” need answers. In view of this, we propose in this paper the SUstainable Supply-chain Tool for Assessment of INitiatives (SUSTAIN)1. The purpose of the proposed tool is to analyze a given supply chain and to suggest a set of cost-effective initiatives for that supply chain that would help reduce carbon emissions and other environmental impacts, with a range of options to match the target level of ambition for the business.

The objective of this paper is to describe the key features of what we envision in SUSTAIN. We explain the philosophy behind the tool and give a preview of the framework upon which it is focused. In essence, SUSTAIN will be built around the following elements of a sustainable supply chain, namely sourcing & procurement, packaging and packing, transportation, real estate, network design, inventory policies, waste management initiatives and reverse logistics. The costs and benefits of sustainable best practices are to be evaluated based on user’s as-is supply chain data. The most important outputs are the tradeoffs and options for carbon abatement that are directly applicable for that given supply chain.

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As the requirement becomes increasingly clear to tackle the global challenge of climate change, supply chains of today take on an additional layer of complexity. Facing internal, external as well as governmental pressures to reduce negative environmental impact, businesses become increasingly concerned with sustainable supply chain management.

What then is sustainable supply chain management? Simchi-Levi et al. define supply chain management to be “a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, in order to minimize system wide costs while satisfying service level requirements” (Simchi-Levi et al., 2008). Supplementing that, we say that the associated business approaches are sustainable when they yield positive financial profits, positive social outcomes and environmental balance that comply with their shares of the global carrying capacity.

*Figure 1: Defining Sustainable Supply Chain Management*
Indeed, many companies have started exploring how they can move towards that definition. DHL has committed to increase its carbon efficiency, including its subcontractors, by 30% by the year 2020 (from 2007 baseline). Procter and Gamble has targeted to reduce carbon footprint by 40% by 2012 (from 2008 baseline). Walmart has also promised to create zero waste, to be supplied 100% by renewable energy and to sell products that sustain people and environment.

While many large corporations around the world are ahead of the curve in establishing sustainability programmes, others are less advanced. This is particularly true in the Asian context, where rapid economic development may have taken precedence for the past decades over a concern for the environmental impacts of that development. The implication is that there is now a lack of relevant reference models in sustainability for which Asian companies can learn from. Hence many times, the desire to implement a sustainability programme does not translate to a concrete plan. Although aware of the many kinds of projects available, businesses seeking to adopt sustainable supply chain practices may not have access to a systemic approach to identifying opportunities and undertaking such projects.

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2 http://www.dpdhl-gogreen.com/go/
4 http://walmartstores.com/Sustainability/
However, there is no lack of initiatives and examples of best practice, in particular when reviewing broadly in economies where environmental sustainability is more advanced. Extensive academic and industrial research has been carried out in the area of sustainable supply chain, which can be categorised into the following four solution families:

The first category is the decision framework category, where there are various proposals on approaches to tackle sustainability from a holistic point of view. Accenture, for example, has proposed a five step approach beginning with developing an integrated view of the supply chain, a measure of current performance and a calculation of carbon footprint, to adopting and implementing the most cost effective technologies (Accenture, 2009).

The second category is the software tool category. Such tools are usually in the form of web-based questionnaires or spreadsheet software which could be helpful in performing a rudimentary carbon footprint analysis or in more sophisticated redesign of a supply chain network with reduced carbon emission. IBM for example has extended their network design tool to incorporate the possibility of optimization with carbon consideration5.

The third category is the best practice and standards category. The Supply Chain Council has recently introduced GreenSCOR which incorporates basic environment management within their Supply Chain Operational Reference (SCOR) model (SCC, 2010). The ISO14000 environmental management system approach also provides a framework for how to manage environmental aspects including performance evaluation, lifecycle analysis and auditing6.

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6 http://www.iso.org/iso/iso_14000_essentials
The fourth category is the *technology* category with engineering solutions spearheaded by universities or industrial organisations. These innovations aim to provide cost-effective point solutions such as developing commercially viable solar panel technologies, extracting energy from landfill waste and designing energy-efficient vehicles or buildings.

*Figure 2: Categories of Green Initiatives*
While a lot of work has been carried out on multiple frontiers, sustainability managers may still find it difficult to put together a plan of action, or to ensure they have access to all possible abatement opportunities.

**Need for Opportunities Assessment**

The first challenge is to be able to keep abreast of the latest developments in sustainability. With increased funding available and growing demand, we expect green technologies to grow rapidly. Moreover, the softer and more qualitative approaches, such as sustainability frameworks, are also expected to mature over time. Companies are thus finding it difficult to keep up with the best practices and current thinking in sustainability.

The second challenge is that while opportunities are available, it is no easy task to determine which projects one should undertake in order of priority to derive the maximum value at the minimum cost. The reason is that there are many complex tradeoffs to consider, for example, installation cost versus carbon reduction, or customer service level versus frequency of shipment (which translates to carbon emission). There is no single measure of tradeoff and the approach could vary from one company to another.
With these difficulties in mind, we propose the SUSTAINable Supply-chain Tool for Assessment of INitiatives (SUSTAIN), a tool that would present to the user a quantitative assessment of tradeoffs for the various combinations of initiatives. We hope that SUSTAIN will fill the gap and help more companies taking active roles in making their supply chains sustainable.

**Approach of SUSTAIN**

We now describe briefly the design of SUSTAIN. Underlying SUSTAIN will be a database of best practices, which grows with time as new examples become known. While this may not be exhaustive, these initiatives would cover the most important aspects of a sustainable supply chain. They are based initially on research from DHL, GreenSCOR and other sources. Also, to compute the improvement in CO₂ emission, we need an updated database of conversion factors between energy and CO₂. With user's input of supply chain data e.g. annual spending on fuel and electricity, vehicle fleet design characteristics, etc., SUSTAIN will then evaluate the cost and the reduction in carbon associated with each best practice and then present the following analysis approaches for the user.

The first is an *optimization* approach. If manager using the tool is able to quantify objective and constraints precisely, an optimization model would be ideal in helping users to decide on the best decisions. Depending on the business environment, one might want to maximize carbon reduction as an objective or to look for solutions by capping the carbon emission at a known level.
The second approach is a multi-objective *tradeoff analysis*. This would be especially useful when the manager is not able to clarify his or her ambitions quantitatively yet. Various tradeoff curves would need to be built to help user visualize and decide on the best approach.

The third is a *system dynamic* model. It is an effective approach to model the behavior of complex system where there is a lot of interaction between different parties. The objective of setting up a system dynamic model is to study how certain variables are changing with respect to time. While an optimization approach as described above is static in time, a system dynamics approach allows us to visualize evolution of the different variables. This is especially useful when we want to model uncertain factors such as price of fuel, electricity and also the dynamics due to legislation.

![Figure 4: SUSTAIN Architecture](image)

We would like to also highlight the role of GreenSCOR in SUSTAIN. The Supply Chain Operational Reference (SCOR) model is a reference standard developed by Supply Chain Council. The latest edition, SCOR version 10.0, has incorporated environmental elements. Named GreenSCOR, it has a list of 94 best practices which are built on the SCOR framework and it provides a standard reference for describing the key characteristics of a supply chain (SCC, 2010).
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The best practices are built on top of the following five pillars: plan, source, make, deliver and return. For the initial development of SUSTAIN, the best practices from GreenSCOR would be used as the primary basis.

Source: Adapted from Supply Chain Operations Reference Model v10.0, 2010
There are many factors which would affect the decision on which initiatives to undertake. The major factors are the financial cost that these projects incur, the expected financial savings compared to the baseline scenario, the return on investment of the projects, the payback period, the impact on customer service level, the ease of implementation, as well as the potential carbon abatement. Below we explore these factors in detail.

**Potential Carbon Abatement**

A sustainable initiative must be evaluated based on the carbon reduction potential. The question now would be how much reduction is considered enough. The first approach in SUSTAIN is to compute the optimal frontier facing the user. That is, we could compute for different amount of carbon reduction, the best achievable service level or ROI or financial saving for a certain level of carbon reduction.

*Figure 5: Tradeoff between CO₂ Reduction and Cost*
The second approach SUSTAIN takes is based on the premise that companies have a financial budget in mind together with requirements on service level and ROI. It then becomes an optimization to look at the optimal combination of available projects that could maximize carbon efficiency with a given investment.

**Financial Costs**
For each initiative, there is bound to be setup cost and a running cost. In addition we should account for the cost incurred if no action is taken, in other words for carbon emissions at the business-as-usual level. Changing oil prices, as well as carbon taxes or trading costs, come into the cost equation, in particular for supply chain operations in economies building a strong legislative framework to mitigate climate change.

**Financial Savings**
Carbon emissions are proportional to fuel, electricity and other resource consumption. Hence one of the most direct ways of reducing carbon is to reduce resource consumption, impacting positively on the bottom-line. That is why it often makes business sense to go green even from a pure commercial point of view.

**Return On Investment**
In evaluating any project, decision makers will also be concerned with the financial gain as a ratio of the money spent – the return on investment. While a high ROI is favoured, in the context of achieving a sustainable supply chain, one should also look at the possibility of reducing marginally more carbon by sacrificing slightly in ROI. Striving for a balance in these delicate matters is the crux of gaining the maximum benefit from a sustainability project.

**Payback Period**
A complementary indicator is the payback period, in other words the amount of time for a project to reach breakeven. The shorter the payback period, the more viable it is likely to be within the length of a supply chain contract. This indicator is especially important for companies who are leasing assets for a period of time. Any carbon reduction project taking longer than the lease to realize any positive return is obviously not desirable.

**Customer Service Level**
New projects and initiatives should not have any negative impact on customer satisfaction. After all, businesses are created to provide customers with good service. Hence, a minimal amount of carbon emission maybe a necessary evil. For example, in
transporting perishables, quick mode of transport such as flight is preferred even though the carbon emission is high. It then becomes yet another balancing act on how much tolerance one is willing to bear in return for a more socially responsible action.

Ease of Implementation
Large scale projects are often difficult to carry out while point solutions are likely to be easier to implement. On another dimension, projects involving external parties such as one’s suppliers or customers could take more time and effort to coordinate. It is thus important for companies to first identify and focus internally on low hanging fruits. Once there is sufficient learning experience, it would help to embark on more ambitious schemes.

Figure 6: SUSTAIN Decision Framework
We identify eight key areas that constitute a sustainable supply chain. For each category, we discuss some of the best practices. Wherever applicable, we also describe the approaches to quantify the cost and benefit of these initiatives. Examples of tradeoffs will also be illustrated.

**Transportation**
Numerous studies across different countries have similarly concluded that the transportation sector contributes a large part of the total GHG emission. Here in Singapore, land transport contributed 19% of total CO₂ emission (MTI, 2007). Hence it is one of the most important areas of focus. Moreover the proposed solutions for green transport are often quick win technological based solutions. We here highlight notable examples

- Improve the fleet design of vehicles with devices such as aerodynamic kits, automatic transmission kit, engine brakes, selective catalyst reduction and exhaust gas recirculation to improve the efficiency of vehicles
- Explore more energy efficient alternative fuels such as compressed natural gas
- Provide training for drivers so that they practice good driving habits
- Install telematics software for real time route optimization and rerouting of fleet to improve utilization

For most of the measures above, the cost and benefit can be measured, using the total distances to be travelled where one can project from historical data and compute the fuel consumptions under the scenarios for business-as-usual and that for sustainable transport. Carbon emissions are computed based on emission factors determined by the fuel used. The benefit of providing training or use of telematics software is measured by an improvement factor in fuel used per unit distance travelled.
Real Estate

Buildings can also contribute a large proportion of a supply chain carbon footprint, in particular across a supply chain with manufacturing plant, warehouses and office facilities. Some major carbon reduction measures are:

- Using energy efficient lighting technologies, natural daylight systems, motion sensors and reflectors where appropriate.
- Ensuring efficient heating and cooling, including zone heating, air-tightness control, insulation, combined heat and power system
- Generating power from alternative energy sources such as photovoltaic cells
- Putting in place energy-aware practices for operations
- Using eco-friendly building materials especially for green field projects

Again, for such point solutions, evaluating the cost and benefit is straight-forward. For buildings, we can use the expected total electrical energy spend as a basis and then apply a reduction factor for each of the initiative to derive the cost reduction. As for CO₂ reduction, we can also apply an emission factor for each kWh of electricity use and other building-related emissions. Emission factors vary from country to country since the methods of power generation are different.

Figure 7: Transportation Sustainability Practice
Sourcing & Procurement

The UK Government's Sustainable Procurement Task Force (SPTF) defines sustainable procurement as "a process whereby organizations meet their needs for goods, services, works and utilities in a way that achieves value for money on a whole life basis in terms of generating benefits not only to the organization, but also to society and the economy, whilst minimizing damage to the environment" (SPTF, 2006). Successful sustainable sourcing therefore requires proactive engagement with suppliers. We suggest taking the following approach.

- Understand the common standards available, e.g. the ISO14000 series and energy labels
- Develop a policy specifying the boundary of requirements, e.g. spell out clearly what standards are needed
- Set up a measurement and tracking system, so that one can check for compliance continuously
- Evaluate products based on full life cycle analysis, i.e. compute the carbon emission that results from the production all the way to delivery

Figure 8: Real Estate Green Practices
Engage suppliers actively. For example, Unilever requests all suppliers to respect the principles of their Business Partner Code which also includes ensuring operations being carried out with care for the environment. Walmart designed a 15-Question survey for their suppliers focusing on energy and climate, material efficiency, nature and resources, as well as people and community (Walmart, 2009).

The cost and benefit analysis for sustainability sourcing is less straightforward though. How much it costs to set up such a programme depends on the nature of the products involved. A grocery retailer who has a large base of suppliers will need to spend more evaluating suppliers, compared to one whose suppliers do not differentiate from one another on how green they are. Moreover, it could be the case that sometimes purchase of green products is more costly, hence making it slightly difficult to justify.

However, we must note that green products, though having higher capital cost, sometimes offer lower running costs. This means cost savings in the long run. The less tangible benefit is the value of branding that it brings about. This is especially true when customers of today are more environmental-savvy and differentiate products and services based on environmental friendliness.

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**Figure 9: Approach for Sustainable Sourcing**

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Packaging & Packing

Pike Research forecast that the worldwide market for packaging would reach $500 billion by 2014, with an annual rate exceeding GDP growth (Pike Research, 2009). It is a more challenging problem especially since the amount of packaging only increases as products flow from upstream to downstream before reaching the end customers. In building a sustainable supply chain, packaging is all the more important.

Sustainable packaging leverages on the following four principles (Sonneveld K. et al, 2005)

- The packaging system must achieve its functional requirements with minimal environmental impact
- The packaging is designed to use materials and energy efficiently
- The packaging is designed to reduce reliance on non-renewable resources
- Packaging materials used are safe to human health and ecosystems

With the principles in mind, we can explore the opportunities available for more sustainable packaging:

- Ensure that packaging fulfils functional requirements e.g. product containment and protection. Eliminate packaging material which does not serve any purpose
- Reduce packaging volume and weight to the minimum by eliminating unnecessary layers
- Choose renewable materials which provides the lowest environmental impact
- Coordinate with customers and suppliers to reuse packaging
- Avoid use of heavy metal-based additives, or manufacturing process that generate volatile organic compounds

The capital cost of such packaging system might be high, but may offer long term savings. For example, reusable packaging system might cost more to purchase but since it could be used for a much longer time, there would be saving in the long run. Also, if one uses minimal packaging materials there will be a direct impact on saving. As for quantifying the benefit of green packaging to the environment we could look at the expected amount of carbon emission if the packaging waste were simply sent for disposal.
Container packing has an important role to play in sustainability. One should optimize to pack goods into containers so that the fill rate is kept high with minimal amount of space wasted. Higher utilization implies more goods travelled per trip, and the overall effect is a reduced need for transportation. For those who have not deployed optimization for container packing, this could represent a significant opportunity in increasing fill rate and ultimately reducing carbon emission.
Network Design

The most fundamental structure of a supply chain can be described by a collection of demand points, distribution centres, manufacturing plants, and sourcing locations together with their relations. Traditionally, network optimization techniques have been used to develop strategic design of the supply chain. The usual objectives are to minimize cost, maximize revenue or improve customer service levels, where the typical decisions to be made could be some of the following:

- Sourcing locations, i.e. where should the companies obtain raw materials from, and what should the order quantity be
- Manufacturing plants, i.e. where should the plants be located, what products should be produced at which plants
- Distribution centers, i.e. how many distribution centres should there be, where should they be located, which demand locations should they serve
- Transportation modes, i.e. what mode should be used for the inbound and outbound flow,
- Shipment consolidation/break-bulk, i.e. where should the different shipment be consolidated, or should there be more direct shipment, where should break-bulk takes place

Traditionally, all these must be considered with the constraint that the customer service level is met. In view of designing for sustainable supply chain networks, the amount of carbon can be considered in the model through the use of electricity in the warehouses as well as the emission by the different transportation modes. However, in terms of how the new model should be developed, it would depend very much on the company. Here we propose a few possible approaches:

- Minimize the total carbon emission. This is an ambitious approach but practically, one still needs to put a constraint on the service level
- Place a constraint on the maximum amount of carbon emission. This approach is useful in anticipation of legislative measure
- Apply a cost factor for CO₂ emission and then minimize the total cost. This would be applicable in cases where carbon offset measures are viable options
Inventory Policies

In order to manage uncertainties in supply and demand, it is important to implement inventory positioning management. Traditionally, inventory policies are designed to balance customer service level and total cost which could include storage and shipment cost. Basic decision factors to consider include how much stock to keep; where that stock should be held; how often or when to reorder for new stocks. Moreover different manufacturing policies would make a difference on the inventory as well, e.g. should a company make-to-stock or make-to-order, should a company go Just-In-Time (JIT) or lean.

Inventory management has an impact on carbon emission, the most important of which is the emissions from warehouse managements. Transportation related carbon cost could come into the picture essentially through shipment frequency and timeliness. Hence a sustainable supply chain adds new dimensions to inventory policies.

From an end-to-end point of view, products or their components are simply transferred from upstream to downstream. Storage space is still required across the different
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echalons of the supply chain. The sustainable approach is to look for opportunities across the supply chain. For example, keep a higher stock at distribution centres with natural lighting. Also, one could apply the postponement concept to delay assembly of components as late as possible because the smaller components before assembly tend to be more compact.

Synchronization of demand with supply is especially important. One should consider whether being lean or responsive is the more appropriate sustainable response. Being lean means keeping less stock, encouraging frequent direct shipment or cross-docking. This might result in higher stocking at the downstream. Being responsive on the other hand requires more inventory and faster shipment with smaller quantities. This approach, while having customer satisfaction, might not necessarily be sustainable best practice.

Waste Management
Waste refers to materials that are not prime products for which the generator has further use for the purposes of production, transformation or consumption, and of which the generator wants to dispose. Across a supply chain, much waste is generated in various forms especially at manufacturing plants and warehouse, hence the need for more sustainable management. The UK Department for Environment, Food and Rural Affairs (DEFRA) provides the following hierarchical framework for sustainable waste management where it is suggested that more effort to be focused on measures near the top of hierarchy.

- Minimize waste creation, e.g. reduce packaging through consolidation of shipment
- Practice reuse to avoid energy required to process them, e.g. reuse packaging from upstream supplier to downstream customer
- Reprocess waste for further use, where materials should be sent for recycling
- Generate energy from waste. This approach is rather industry-specific, and it is more applicable to manufacturing facility, where often a redesign of manufacturing process is required
- Disposal of waste happens when all the previous measures have been exhausted. The carbon emission due to disposal would depend on the material and the method.

9 http://www.defra.gov.uk/environment/waste/topics/
Minimizing creation of waste and reuse of materials would help cut down both emission and cost simultaneously – hence they should be early priorities. As for other measures, we need to carefully consider the total cost of the solution. For example, if there is a technology to reprocess waste to form useful product, how much energy would that process require? To be justifiable one needs to ensure that the total energy spend should be lower than the case where the useful products are obtained in the standard manner.

![Diagram showing the hierarchy of waste management: Minimize, Reuse, Recycle, Energy, Disposal.]

**Figure 13: Waste Management**

**Reverse Logistics**
Supplementing its direct counterpart, reverse logistics is “the process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal” (Rogers D.S. and Tibben-Lembke, 1998). The activities include processing returned (e.g. due to damage or excess inventory) goods efficiently, refurbishment, remanufacturing and recycling. They are important in making businesses sustainable through the following value creations

- Reducing cost through reuse of materials
- Revenue adding by reselling refurbished products
- Waste minimization by extending product life with refurbishment
- Improve customers’ satisfaction level with quick processing of returned merchandise
In order to build an efficient reverse logistics management system, one needs to look at the current returns process, then evaluate potential revenues generated and compared that to the cost of processing the returns. The following suggestions could be applicable:

- Incorporate as much backhauling as possible to collect returned goods while delivering, so as to minimize transportation required.
- Explore setting up a returns management centre, much like the distribution centre in the forward logistics, by computing the total costs (financial and carbon) for the different scenarios.
- Design a process to manage unsold goods so as to reduce need for inventory.
- Provide an avenue for returns of packaging.

**Source:** Adapted from “A Strategic Decision Framework for Green Supply Chain Management” (2003)

**Figure 14:** Approaches for Reverse Logistics
Based on the elements of sustainable supply chains described above, we have seen that the various levers for carbon abatement could be classified under the categories of technological adoption, process redesign and behavioural changes. Beyond carbon abatement, there are additional tools available, including carbon offsetting.

The *technological* adoptions are usually point solutions, eg. retrofitting of lighting system and changing the fuel type for vehicles. These are easier to implement but the potential benefit is usually not high.

Solutions that involve *process* redesign are typically more difficult to manage and costly. Examples include network redesign and design for environment (DfE) in the manufacturing sector. However, a successful implementation would likely bring about a substantial reduction in carbon.

The last group of initiatives would be *people*-oriented initiatives, including for example energy efficiency awareness, reducing business travelling or increasing the materials recycling rate at offices. For a more effective implementation, they can go beyond basic awareness materials, and can be supported by new processes and technologies such as smart metering systems.
Beyond direct carbon abatements, there are economic instruments to reduce emissions using financial means. The first financial instrument is carbon trading. This is where companies trade permits for GHG emissions under voluntary and/or mandatory schemes, enabling carbon reduction where it is most financially efficient to do so. Another approach is via carbon offsetting, which is making financial contributions towards organizations involved in projects that are able to secure additional carbon dioxide absorption, such as renewable energy technologies and tree planting.
In this section, we would like to illustrate a simplified opportunities assessment exercise with SUSTAIN. There are two levels of engagement possible with SUSTAIN. At a basic level, one could quickly identify the areas of opportunities with SUSTAIN-Lite, a questionnaire-based assessment.

For a more comprehensive treatment, user would have to provide more information. In this illustrative case, we look at some opportunities in transportation, real estate and packaging. To begin, information on energy spending, fuel spending, fleet design, building design, packaging considerations etc. should be provided. In addition, user also specifies levels of ambitions such as expected financial savings and expected carbon reduction.
After completion of data input, one could run the analysis and interpret the results. As shown below, the left section is the output from the optimization module while the charts are outputs from the tradeoff analysis module.
In this case, the optimization module is designed to search for initiatives which would result in the maximum potential carbon abatement, such that a minimal amount of financial savings and CO₂ reduction are achieved while not exceeding a given budget. Clearly as shown above, if much funding is available, then a company would be able to undertake more sustainable initiatives.

For the optimization module, one must be able specify quantitatively his or her ambitions. Sometimes, it is not quite possible especially for one who is new to sustainability. The tradeoff analysis would then become useful.

The CO₂ versus cost analysis computes the maximum amount of CO₂ reduction possible for different budgets. In the example above, one observes that beyond a certain investment, the marginal reduction in CO₂ is diminishing. This could suggest that one might want spend up to that level of investment.

The savings versus cost analysis similarly computes the maximum amount of savings for different budgets. A similar trend is observed where marginal financial savings is diminishing beyond certain investment. Finally, after a quick glance at the results, user could set a minimum and maximum amount of budget that is available, and a list of sustainable initiatives with total cost falling under this range would be highlighted.
It is an uphill task to take on sustainability program especially one involving the end-to-end supply chain. Recognizing the challenges in putting in place a sustainability programme, we propose SUSTAIN, a tool that would explore the many possible sustainable initiatives and present to user a way to understand the tradeoffs as well as present recommendations on projects to undertake. We hope that this would enable more companies to get into the sustainability projects with confidence and speed.
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