

Sustainable Logistics

Challenges and ways to go green



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Top reasons to embrace sustainability and social responsibility for businesses

Global leaders across all countries are realizing the perils of Global Warming and the words 'Green,' and 'Sustainability' have captured everyone's attention due to the concerning rise in global temperature, fast depleting glaciers, rising ocean levels, increasing instances of droughts, floods, and hurricanes. Companies worldwide face the mandate to minimize their emissions and reducing their carbon footprints. Government agencies are coming up with more stringent regulations and norms every five years. Supply chain is also one of the focus areas for organizations worldwide to reduce and track greenhouse gas (GHG) emissions and measure the carbon footprint.

Today's rapidly changing world, and the necessity for new post COVID-19 norms are forcing logistics companies to adopt sustainable business practices. In addition, the end customers of the logistics industry are requesting their service and solution providers to reduce the carbon footprints associated with their deliveries. To meet these requests companies are looking for a solution that actively calculates and tracks emissions related to freight transport and provides that information to its customers. This paper presents key sustainability themes in logistics and how digital is helping the logistics world to achieve its sustainability goals.



Why is sustainability important in logistics?

Transportation and logistics across globe can be broken-down based different mode of transport like road, railway, airway and waterways, these further classified in two main segments commercial or freight transport and passengers transport. According to the International Transport Forum (ITF)^[1], both freight and passenger transportation volumes will triple between 2015 and 2050. All these modes of transport heavily depend on the petroleum and contributes 24% of total global CO₂ emissions. This shows, undoubtedly, that the logistics industry is the biggest polluter and primary greenhouse gas emitter. Additionally, considering fossil fuel consumptions from this industry and huge dependency on petroleum products makes this industry vulnerable to fuel price fluctuations.

For example, 50% of trucks travel empty on their return journey after making a delivery^[2]. These are the main reasons the logistics industry has become a major target for the environmentalists and there is a need to implement more sustainable business practices across the value chain. The logistics industry experts and companies are working together to find innovative ways to reduce carbon emissions and meet sustainability goals.

As a part of this journey some of the measures the logistics industry is trying to adopt are:



01

Sustainable packaging

Currently, recycled cardboards, cornstarch based biodegradable plastics and organic fabric are among the alternate packaging modes being used to promote biodegradable and reduced waste.

02

Carbon neutral measures

Measuring the carbon footprint is critical and should be accurate, consistent and transparent to calculate total carbon emitted by businesses per year. For this, organizations are utilizing advance analytics based on digital measurement tools.

03

Offsetting carbon emissions

Logistics companies are trying to measure, reduce and offset their greenhouse gas emissions caused directly and indirectly by a person, organization, event, product or services.

04

Efficiency improvements

Fuel and energy conservation and network efficiency improvement across the logistics value chain are some of the initiatives the logistics organizations are embarking upon. For example, it has been a top priority for logistics companies to reduce emissions and improve operational efficiency by managing huge petroleum dependent operations by implementing advanced fuel consumption motoring tools, route optimization methods.

05

Environmental leadership

By adopting alternate energy sources, green fuels and alternate modes of transport, the logistics leaders are setting examples and trying to achieve environmental leadership and a brand value boost within the industry.

06

New business models

Adoption of emerging business models or assets light business models like uberization of trucking, OnDemand warehousing and crowd sourced shipping, have been tested by logistics companies as a part of their last mile delivery operations, showing significant contributions towards reducing the carbon footprints.

Sustainability in logistics with digital tools and technologies

With the endeavour to make the supply chain more sustainable, some of the key themes in logistics are emerging. Among those are initiatives like paperless supply chain, shifting transport to alternate modes of transport, reduction in transport volume, distance, reduction of empty miles with better route planning and efficient utilization of energy, resources and infrastructure helping reduce the overall CO₂ emission. Historically the logistics industry suffered from many inefficiencies and slow adoption of digital technologies. As per the World Commission on Environment and Development report digitization in the logistics industry can reduce carbon emission by 10-12% by 2025^[3]. With a growing trend and availability of digital instruments like Blockchain, RPA, Internet of Things (IoT), Artificial Intelligence/ Machine Learning (AI/ML), driverless or automated vehicles, logistics companies can redesign their business processes, adopt innovative business models, serve their customers with less ecological damage, and ultimately achieve sustainability objectives.

Some of these themes, developments and technology led initiatives are discussed in detail below:

Use of alternative means of transport

The usage of alternative means of transport is an emerging trend in the logistics industry. Number of examples like Robot delivery and Drone delivery pilots have been tested by major logistics players in collaboration with technology start-ups across major cities. The other emerging trend of transport “Autonomous Vehicles (AVs)” also seems to have a promising future. As per the world economic forum self-driving trucks pose a direct savings impact of USD 30 billion plus, additionally an indirect impact including fuel cost savings, maintenance cost, driver cost and related insurances will have significant impact in the coming decade. These indirect measures contribute to sustainability for the sector.

Individual successful efforts in setting good benchmarks include United Parcel Service (UPS) partnering with the German drone maker Wing-copter for drones conducting contactless pick-ups and delivery of packages^[4]. In the U.S., UPS Flight Forward received the U.S. government’s first full approval to operate as a drone airline^[5].

However, the German Federal Association for Information Technology (Bitkom) reports that only 2% of German logistics companies are using drones for their internal operations. Most of these initiatives are driven by start-ups and hence they need support and acceptance from all the entities involved in the supply chain, especially the government agencies, regulators and researchers who can create support ecosystems for such initiatives to flourish. Undoubtedly, exploring and implementing alternate means of transport can help to achieve sustainability and better infrastructure and ecosystems provided in the future.

Dynamic route / Tour planning

For logistics companies to maintain customer satisfaction, they need to adopt best possible route optimization methods in their last mile delivery network. Route optimization means logistics companies create and maintain their own routes based on past or historic delivery order data. While doing that, companies consider the traffic-data, weather conditions and other similar factors to reach the scheduled destination in less time through a short driving distance. Due to technology advancements companies are collecting data from various tools and technologies like GPS and RFIDs to design best possible routes. This dynamic routing helps companies to track fleets and drivers, improve efficiency, and reduce overall delivery time and revenue. For instance, when companies track movement using dynamic route planning, they manage to utilize assets and resources to their optimum level. This additionally helps companies to plan customer delivery plans



efficiently and reduce the delivery fail and stop time per delivery. A well-planned route reduces the overall fuel consumption and hence the carbon emission and pollution. According to Foreye solution research, overall fuel consumption per delivery can be reduced up to 40% with dynamic route planning^[6]. Dynamic route planning and related tools also help in reverse logistics process. Logistics companies can plan pick-up jobs smartly and reduce the 'empty kilometres', thereby tackling one of the major challenges that renders the logistics industry to become inefficient and a polluter. Recently UPS declared to achieve reductions of the greenhouse emissions in their global ground services of up to 12% by 2025, UPS invested in the 'UPS Smart Logistics Network program' that includes advanced technologies for smart and efficient logistics (Route optimization, Network planning tools). The German logistics company DHL has worked towards reducing CO₂, noise, air pollution and other greenhouse gases by implementing the company tested dynamic route-planning pilot across five cities in India. The objective of this project is to cut down the distance travelled by each smart truck, reduce travel time and ultimately reduce overall fuel consumption and CO₂ emissions^[7]. With such proven initiatives dynamic route planning is considered as key technology to achieve a sustainable future for the logistics industry.

Based on a Deutsche Telekom patent and meanwhile defined by ISO as standard to calculate CO₂ emissions, T-System's partners DHL and DB Schenker used LCMM (Low Carbon Mobility Management) in China and Europe for fleet monitoring to reduce fuel consumption and carbon emissions. The projects have shown an average of 20% of pollutant emissions reduced (saving of 468 kg CO₂ per truck within one month). In addition, the fuel costs fell by up to 15%. The starting point of the solution is an analysis of individual driving behavior. This application helps drivers to develop an environmentally friendly driving style. A cloud backend with appropriate dashboards helps fleet operators to optimally control their fleets with position detection of the respective vehicles.

Smart buildings

Globally, buildings demanding large quantities of energy, which often goes waste, and a growing urban infrastructure, is pushing government and municipal corporations to take immediate actions to conserve energy. According to the Federation of German Heating Industry (BDH)^[7], in 2018, one third of Germany's total energy was consumed in water and space heating in buildings. Greenhouse gas emissions from buildings only contributed up to 15 % of the total emissions with an additional 30% indirect emissions. Germany has around 22 million buildings and most of the German building heating systems are running on Oil and natural gas. According to BDH more than 50% of these heating systems are outdated and inefficient making the reduction of emission from buildings a challenging task for the sector. A study conducted by BDH also concluded that replacing these inefficient systems can help Germany's building sector to reduce 70–72 million tons of CO₂ emissions by 2030. There are multiple technologies also providing solutions to bring this change and IoT related technologies are leading this transformation. IoT based

smart building technologies can help the sector achieve this transition, conserve energy significantly and meet sustainability goal for the sector. Smart buildings and smart cities are closely related, and both can be put together by IoT based solutions. IoT is providing a holistic approach by integrating existing complex systems and applications that are implemented in modern smart buildings. Basically, it creates a cloud-based interconnected smart network where different devices and systems can communicate and take smart decisions^[8]. One of the best and well proven examples is the IoT based building management system (BMS) which can control, and monitor building temperature, ventilation and lighting systems based on the employee availability on the premises. During recess time, devices can be switched off or kept on low power mode till the employees return to their desks. Such innovations are helping reduce energy consumption and hence contributing to sustainability. Other areas for implementation of sustainability measures that are getting attention are data centers and their related infrastructure. Recently these data centers have become the biggest contributors of energy consumption like heating and lighting systems.

To reduce carbon footprint T-Systems' European data centers are certified participants in the "EU Code of Conduct on Data Centre Energy Efficiency" since 2013. T-Systems with Kapital S also generates 42% of its revenue from products and services that enable its clients to reduce emissions. For example, solutions like Cloud based data center infrastructure, which can significantly reduce the client's energy consumption, and building monitoring analytics / smart spaces for sustainable and efficient building management, have shown great benefits to end customers.

Paperless supply chain

From sustainability perspective usage of paper in logistics operations has been a serious issue for many years. Logistics operations produce millions of documents across the globe. There are many areas where logistics companies depend on paper-based transactions e.g. consignment notes, customs clearance documents, agencies inspection documents, insurance documents, proof of deliveries etc. Involvement of physical paper in these processes creates multiple process delays and challenges including drivers producing unreadable or damaged papers after the completion of the journey, as well as loss of important documents. In certain cases, the loss of official documents leads to the rejection or delay in insurance claims. According to the Transport and Logistics Netherlands Federation, in the Netherlands annually over 40 million CMRs (Convention on the Contract for the International Carriage of Goods by Road) are used. With the conversion to digital, a 180 million euros can be saved in administrative costs^[9]. In Germany according to the Federal Association of Road Haulage Logistics and Waste Management, or BGL, 600 billion euros would be saved every year in Germany alone if goods traffic documentation were to be completely converted to digital consignment notes.

By considering this huge impact and achieving a paperless supply chain, a digital technology like blockchain can contribute significantly in international carriage. For instance, the implementation of Hyperledger based smart contracts

can avoid tons of paperwork and eliminate counter signature issues. Additionally, blockchain can help achieve near paperless processing for the generation of bill of lading/airway bills etc. Recently the global logistics leader DHL implemented a blockchain based serialization project to track pharmaceuticals supply chains across the globe^[10]. With this DHL achieved a paperless, transparent process and a reliable feature to track the authenticity of lifesaving medicines. Another digital instrument is Robotic Process Automation (RPA) which can be implemented for Optical Character Recognition (OCR), Bill of Lading (BOLs), and Invoice automation processes. This helps to reduce the amount of physical paper consumption and hence conserves millions of trees. In the last two years Switzerland based Kuehne + Nagel International AG, a global transport and logistics company invested in RPA tools and realized a huge potential of RPA implementation opportunities across the company. Internet of Things (IoT) has shown significant results to the logistics leader DB Schenker. DB Schenker in partnership with T-Systems implemented Jit-Pay, an IoT solution with a 'no touch signature concept'. This led to direct benefits like cost saving and time saving as a result of real-time information availability and indirect benefits including reduced CO₂ emissions and resource consumption.

Smart Labels

In intralogistics sustainability plays important role and can be improved with the help of digital tools, for example, daily millions of information pieces accompanying goods is generated in the supply chain, they have to be filled in, printed out and, affixed to pallets, containers and transport boxes, and removed again. This costs time, is error-prone and produces waste. A digital label is a sustainable alternative here; all relevant information about the load can be digitally uploaded from the inventory management system to the device and read remotely at any time. When the shipment reaches its destination, such as a geofence or yard around a company site or warehouse, the recipient of the goods is automatically shown on the display of the digital label together with the delivery location. This device not only prevents errors, but also saves time and tons of paper.

Shared Resources

Growing population, expanding cities with limited resources or urban infrastructure and the recent boom in the e-commerce industry and freight movement traffic, are adding an increased pressure on the logistics industry especially in last mile delivery. The most pressing problem for the logistics industry is to cope up with the growing urban demand with limited resources. Growing urbanization is also creating environmental challenges like air pollution, water and noise pollution hence adding to the hurdles that come in the way of achieving sustainability for industries. To achieve more error free and environment friendly last mile delivery the 'resource sharing concept' can be groundbreaking concept, for example, transport space sharing, warehouse space sharing and the likes, can prove to be highly efficient. These concepts have recently been executed and tested with relevant technologies by creating market platforms such as Uberisation of resources like trucks, delivery vans and even additional available warehouse space. Technology tools AI/ML, Big data and advanced analytics making it easier for companies to share data, create tech-platforms and track movement of goods in real time. DHL's Digital Freight Platform Saloodo in Europe is helping the company to reduce driving empty or partially filled trucks and consequently reduce CO₂ emissions. Another example for resource sharing is the 'economy on demand labors' for the logistics industry, or crowd sourced parcel delivery showing huge benefits for both logistics users and contributors. Jobdoh^[11], a Hong-Kong based start-up providing freelancing jobs available in logistics companies is helping both job seekers and logistics companies, that are always struggling to reach out each other during peak days because of seasonality of their business. There are multiple possibilities with new age business models based on resource sharing in warehousing material handling. Equipment like forklifts and cranes are not constantly used and hence sharing/lending of these with other warehouses or retailers would add revenue to the source warehouses.

Recent growth of digital brokers helping the logistics industry with the efficient use of cargo space, has reduced empty miles and carbon emissions. These platforms are also helping to address other sustainability challenges emerging from delays caused by slow loading and traffic congestion. The driver and helper activity monitoring and individual driving behavior analysis and scoring is a complete system in itself. With these examples and benefits logistics companies have good reason to embrace the resource sharing models or sharing economy. This has also provided a win-win for other businesses, city planners, municipal corporations and residents of sustainable cities.



Conclusion

Sustainability in logistics is not limited to policies and ethics discussions, it has a huge economic impact. Sooner or later logistics companies need to realize the importance of environmental sustainability. Most importantly, sustainability is here to stay and should be considered at par with strategic considerations such as the organization's overall economic impact, cost and resource savings. Today Digital tools and technologies are available to realize the sustainability objectives immediately. Digitization is changing the way logistics companies operate and do business with their customers. Digital transformation in logistics is still at an early stage and would need time to reach its maturity level. There are many barriers that come in the way of adopting new tools and technologies in logistics due to financial

resources, lack of will from the relevant leadership and adoption and cultural barriers within different layers of the organization. However, to achieve a significant positive impact of sustainability merged as major driver, companies have slowly started adopting digital tools and methodologies. Sustainability initiatives like reverse logistics, green supply chains, new business models are welcome initiatives to be implemented by organizations to mitigate environmental risks. Finally, adopting digitization and achieving sustainability will create more value for companies, businesses, regulators, policy makers and the entire logistics industry. This strategy will shift focus from merely 'doing less harm' to becoming a 'net positive' industry.



What digital can offer for sustainable logistics? – Few Use Cases



Blockchain

Paperless processing, reduction in paperwork

- Blockchain based digital bill of lading and airway bills
- Hyperledger based smart contracts
- Streamlining the bidding process through blockchain and smart contracts, enhancing real-time transparency

Reduction in process complexity, fuel consumption and CO₂ emission through:

- IoT-enabled blockchain to facilitate trust and transparency in freight transportation including cold chain temperature monitoring



Internet of Things (IoT)

IoT Based Building Management Systems reduction in fuel consumption:

- Smart building technologies to conserve energy significantly and achieve sustainability
- Technologies provide a holistic approach by integrating existing complex systems and applications implemented in modern smart buildings
- Building management system (BMS) can control, and monitor building temperature, ventilation and lighting systems, in turn saving energy

IoT Based location tracking in warehouse and ports reduction in time and efforts

- Gloves and vision devices in warehouses, location-based sensor technologies to track smart containers, smart bins, Inventory management using digital labels

IoT Enabled vehicle movement tracing fuel consumption management

- RFID and GIS technology for traffic movement flow analysis, Smart pick-up and drop



Robotic Process Automation (RPA)

RPA and RPA enabled bots used for/instead of paper and reduce time and efforts:

- Implementation of Optical Character Recognition (OCR), Bill of Lading (BOLs), and Invoice automation processes
- After sales quotes and invoices automation via e-mail
- Paper based proof of delivery documents verification and uploads into legacy ERP systems
- Customer enquiries about which mode of transport is required, hence saving the time and efforts spent by logistics executives



Alternative means of transport

Pollutions free electric vehicle option in transportation

- Electric Vehicle/Hybrid Vehicles that lead to direct fuel savings and reduction in carbon emission

Futuristic and environment friendly mode of transport

- Robot delivery and drone delivery pilots have been tested by major logistics players will save fuel in the last mile delivery
- Self-driving trucks or digital trucks pose a direct savings impact of 30 billion and an indirect impact of fuel cost savings, maintenance cost, driver cost



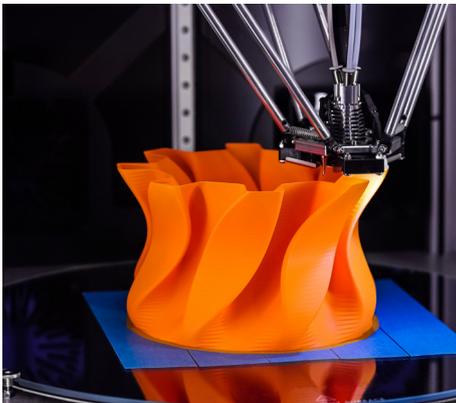
Advanced Analytics, Artificial Intelligence / Machine learning (AI/ML)

Dynamic route planning with Advanced Analytics (AI/ML) enables reduced consumption of CO₂

- Dynamic route planning using advanced analytics and GPS and RFIDs based technologies that help track fleets and reduce the overall fuel consumption and carbon emission
- Route optimisation, traffic predictions, shipping time. Hence leaving logistics companies with happy customers even in peak hours
- Algorithm-based availability of trucks, vehicles and parking spaces

Supply Chain Visibility with Big Data Analytics enables process optimisation

- Supply chain visibility and efficiency for transport chains and logistics centers, increasing optimization potential through big data analytics



3D Printing

Decentralised 3D printing reduction in carbon emission for last mile delivery operations

- Enables decentralised manufacturing that reduces total order fulfilment time significantly and impacts overall cost and fuel savings, hence reducing carbon emission in the last mile delivery

Environment friendly pallets and packaging material manufacturing

- Creates opportunities for manufacturing pallets and packaging material that are biodegradable (e.g. coco-pallet) infinitely recyclable

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