Blue Yonder

SUPPLY CHAIN MANAGEMENT

Team 19

Warehousing

Inefficiency in Modern Supply Chain and Our Solutions

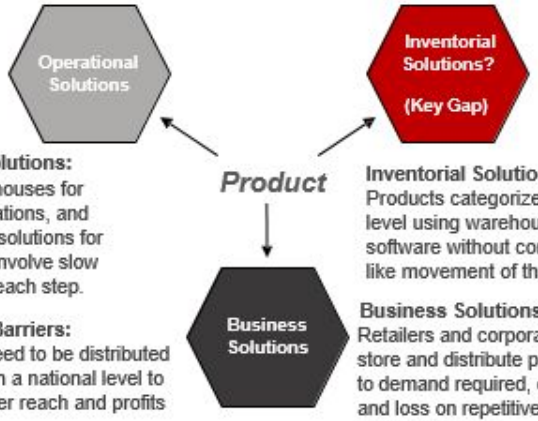
Most of the inventory management is handled on a local level, with third party 3PL logistics providers connecting the available warehouses. Our solution uses a hybrid blockchain connecting NAWCIs warehouses to implement smart contracts at every step of the products journey to make it fast and better[1]

Status-quo

Individual solutions at every step for the *product* exist, but are grossly inefficient and the whole process can be centralized and automated

Operational Barriers:
A product has to be stored and sent to different locations during its journey from the plant to the customer, so storing and transportation required at various locations

Inventorial Barriers:
Products at warehouses need to be available for quick departure and stored according to various factors like shelf life, demand etc.



Operational Solutions:
Individual warehouses for different corporations, and distributed 3PL solutions for logistics which involve slow transactions at each step.

Inventorial Solutions:
Products categorized at warehouse level using warehouse management software without considering factors like movement of the product etc.

Business Barriers:
Products need to be distributed to people on a national level to ensure better reach and profits

Business Solutions:
Retailers and corporations in NAWCI store and distribute product according to demand required, causing emissions and loss on repetitive transportation and return items

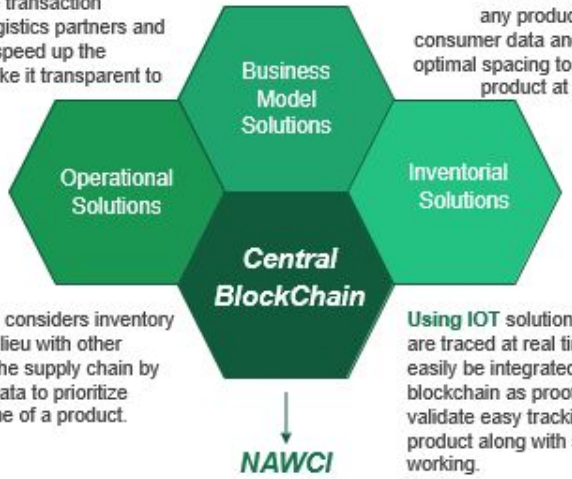
Multiple providers, gaps in solution, friction is **high**

Our Model

We introduce a blockchain based solution to *NAWCI members* through their network of warehouses, and plug an efficiency gap with an automated warehouse cum logistics solution

We offer ***NAWCI members*** a hybrid blockchain with smart contracts for the transaction between 3PL logistics partners and warehouses to speed up the process and make it transparent to them.

This Blockchain utilizes the network of warehouses to pre determine the demand of any product using available consumer data and pre defines the optimal spacing to be kept for each product at each warehouse



Our model also considers inventory management in lieu with other warehouses in the supply chain by using demand data to prioritize space in real time of a product.

Using IOT solutions, products are traced at real time. These can easily be integrated into the blockchain as proof of work to validate easy tracking of the product along with smooth working.

Single, tailored solution, friction is **low**

1. https://www.mckinsey.com/business-functions/operations/our-insights/supply-chain-40--the-next-generation-digital-supply-chain

Predicted benefits from researches and similar models in western corporations

With the implementation of our proposed blockchain system, and integrating it with all warehouses in NAWCI's network with IOT solutions, we can achieve low CO2 emissions

SECTOR	Automation of connectivity of warehouses	Automation of supply chain	Automation of inventory stocking	Renewable energy sources	Efficiency boost In operations
EXPECTED BENEFITS	▪ Transactions between warehouses involving logistics part can be done through smart contracts on the blockchain. Such automation will give around 15% boost in efficiency[1], thus decreasing the delivery time and ultimately lowering the carbon emission per product.	▪ As most of the NAWCI members deal in FMCG, a broad spectrum of products have a massive potential in a completely automated supply chain. Primitive forms of such methods exist at local levels, but with the exact details, transportation improvements will give an efficiency increase of 30%[1].	▪ Automation of these processes will give huge profits and reduce losses incurred. ▪ Storing them individually can be automated with minimal human interaction. It will stop all errors caused by inadequate storage techniques. ▪ Estimates from western counterparts indicate a possible two-fold increase in efficiency[2], reducing carbon emissions from repetitive shipping according to demand	▪ The members will implement renewable energy in the form of solar panels, which will generate 1.5 million units a year[3], offering benefits such as reduced costs, reliable power and strengthening corporate reputation.	▪ Companies like Unilever and Walmart have already tried blockchain technology for their inventory management across the nation and reported profits.

1. https://www.mckinsey.com/business-functions/operations/our-insights/supply-chain-40--the-next-generation-digital-supply-chain
2. https://locusrobotics.com/
3. https://irena.org/-/media/Files/IRENA/Agency/Publication/2019/Nov/IRENA_Future_of_Solar_PV_2019.pdf

Untapped Potential of Rooftop Solar in Warehousing

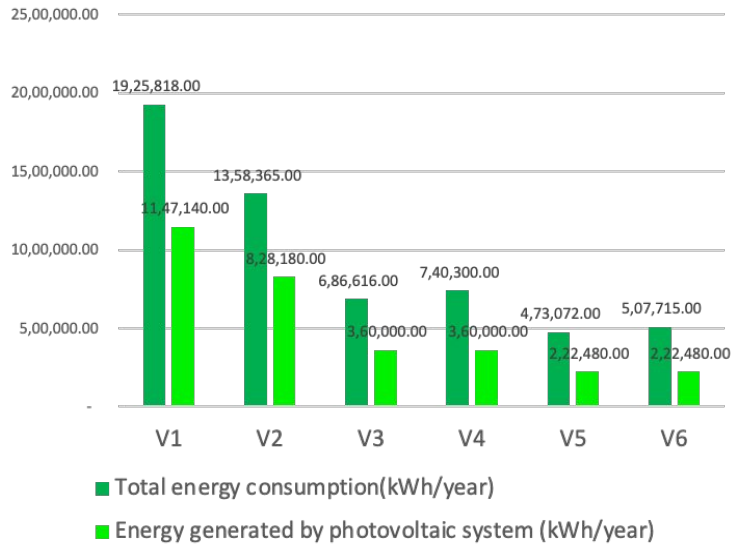
Owing to the rise in demand for warehousing space, govt. schemes and subsidies and interest from institutional investors, the warehousing industry is set to get a bigger share in rooftop solar

Favourable market scenario[1]

1. **Untapped market:** JNNSM set a target of 100GW of installed solar capacity by 2022. Currently about 91% of the market is untapped.
2. **Govt. subsidies:** Since large warehouses are sources of great tax-collection, they are favoured by the govt. for subsidies not just for solar installation.
3. **Rooftop Solar capacity:** Large warehouses have potential for a 1-2 MW rooftop solar project. A 1 MW rooftop solar can generate up to 1.5 million units a year.
4. **Customer perception:** Rooftop solar is a great way for companies to move towards a sustainable future and improve their perception.

Rooftop solar can supply a large share of the required energy

Total energy consumption and production in the examined warehouse system compared with energy potentially generated from 60% of the roof surface[2]



Source:1. Mercom Capital, clean energy insights.

2. Lewczuk,K.;Kłodawski, M.; Gepner, P. Energy Consumption in a Distributional Warehouse: A Practical Case Study for Different Warehouse Technologies. *Energies* **2021**,*14*,2709. https://doi.org/ 10.3390/en14092709

Amazon India Case Study

Amazon India is investing heavily in rooftop solar across its fulfilment and sortation centres to achieve Amazon's long term goal of powering its global infra with 100% renewable energy

Conclusions and Investment Highlights

- India plans to achieve 100 GW of solar capacity across the nation by 2022.
- Amazon India is taking initiatives to do its part by installing rooftop solar capacity in its sorting and warehousing facilities across the country.
- This will help It achieve self sustaining facilities with clean energy.
- Amazon aimed to achieve solar energy installation in 50 of its centers worldwide.
- The company installed solar capacity in its Amazon Community Care Centres in Haryana.

Roadmap to Execution

- Planned to set up 8000kW of rooftop solar by the end of 2018 in its facilities.
- Had 1600 kW of capacity installed in its facilities in Delhi and Hyderabad by 2018.
- Further plans to expand to 5 fulfillment centers and 2 sorting facilities in Bangalore, Mumbai and Chennai

Big Basket's Example:

- The monthly average units consumed are nearly 36,000 kWh for a dark store and 65,000 kWh for a mother warehouse.
- With an average tariff of ₹ 8, the monthly bill is about ₹ 0.52 million
- With a total installed capacity of 1.2 MW, they have been able to reduce their carbon emission by 430 tons.
- Have saved about ₹ 4.9 million using solar capacity systems

Source: Mercom India, Clean energy insights, aboutamazon.in

Our model under the MAQ framework

The suggested model follows the MAQ framework and stands out as an excellent solution for reducing carbon emissions generated from warehousing and supply of products.

Measurable profitability and revenue impact

- ✓ The proposed idea would cut off all the middle transactions at an individual level by **automating** the process and thus create an optimum continuous supply flow.
- ✓ It would tremendously improve the transparency in the process for the company, thus allowing them to make further amends in their operations.
- ✓ Similar usage by Walmart shows reduced product tracking time from 7 days to mere 2.2 seconds[1]
- ✓ Also, the automation of storing and inventory management is expected to give 30-40% improvements in inventory-related costs

Actionable initiatives

- Currently most of such independent companies use their own warehouse management system at an individual level, and integrating the information into a central chain can be done alongside normal functioning.
- The process will also help predict in advance the amount and types of goods to be stored in a warehouse, and hence they can be prepared for in advance.[2]
- Most NAWCI members deal in FMCG (Fast Moving Consumer Goods) products, so their product movements can be planned more effectively using data for all the warehouses in their network.
- Implementing solar panels and smart lighting solutions is also a one-time investment and achievable for all major warehouses.

Quantifiable and predictable benefits

1. Carbon emissions due to inefficient supply techniques will make the tracking and delivery easier, hence less energy would be required per product's journey to the consumer
2. Warehouse stocking will be much more efficient hence more products can be handled on the same amount of area.
3. We need a system that combats, not fuels, climate change, and that is also resilient to its effects
4. An efficient inventory will drastically reduce the waste generated at these warehouses, accounting for almost 0.45 kg of waste per 100 square feet in the US.[3]

1. https://www.hyperledger.org/learn/publications/walmart-case-study
2. https://www.forbes.com/sites/onmarketing/2014/01/28/why-amazons-anticipatory-shipping-is-pure-genius/?sh=2849b9254605
3. https://www2.calrecycle.ca.gov/wastecharacterization/general/rates

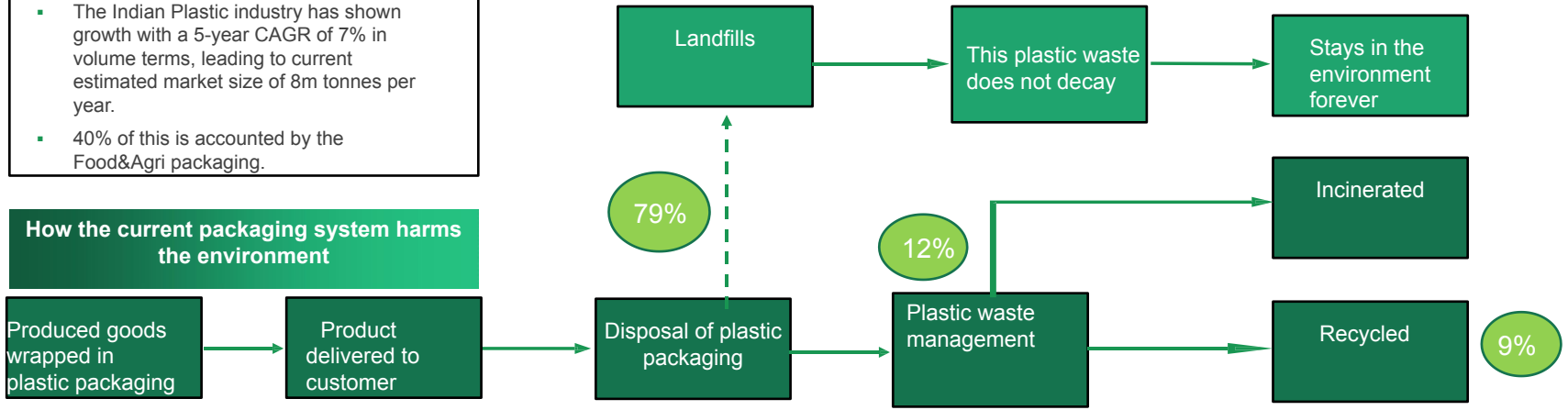
Packaging

Packaging status quo: PLASTIC

Packaging is a key component that surrounds the value chain of products and often multiplies in the supply chain in the form of returns or extra transportation cartons.

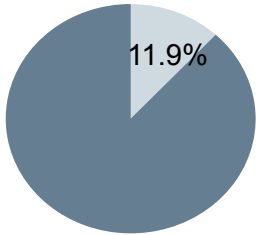
- The Indian Plastic industry has shown growth with a 5-year CAGR of 7% in volume terms, leading to current estimated market size of 8m tonnes per year.
- 40% of this is accounted by the Food&Agri packaging.

How the current packaging system harms the environment



Packaging materials harmful to the environment:

- Plastic bubble wraps.
- Plastic bags.
- Plastic casings.
- Plastic tapes.
- Petroleum inks for printing
- Styrofoam containers



- ***11.9 % of the carbon footprint comes from packaging alone.***
- The CPG(Consumer Packaged Goods) market is expected to grow at an annual average rate of 5.3%.
- This industry must reduce its GHG emissions by more than half, to meet the 2050 targets, which aims to reduce global GHG emissions enough to prevent the planet from warming by more than 2 °C.

Source: https://black-walnuts.com/

Key strategies

We must take into account the three basic parts of packaging sustainability; decrease packaging leakage into the environment, asses the GHG emissions per packaging material through a holistic approach while considering full life cycle, increasing recyclability and utilisation of recycled content in packaging.

MITIGATION STRATEGIES

Sustainable inks for printing

- Vegetable oil-based inks are more sustainable as compared to the traditional petroleum-based ink.
- Degrade naturally and allow a reduction in the consumption of Volatile Organic Compounds (VOCs).
- Cost effective, as the amount of ink required is less than that of traditional inks, due to high brightness and intensity of colours.

Cushioning paper

- Layers of 100 percent recycled paper are linked together to create a durable, absorbent, and resilient protective cushioning option.
- It has a great possibility of reducing carbon emissions.
- Durable enough for industrial applications and gentle enough to protect delicate objects.

Paper tape

- Widely known as Gummed tape or Water Activated Tape (WAT)
- These tapes use water-activated adhesives to seal boxes.
- The flexibility of this tape makes it ideal for sealing carton edges, corners, and uneven surfaces.

Choosing sustainable raw materials

- Plastic, paper, and cardboard are the most common packing materials.
- Choosing certified raw materials helps to reduce packing carbon footprints by favoring environmentally conscious suppliers.

Save resources

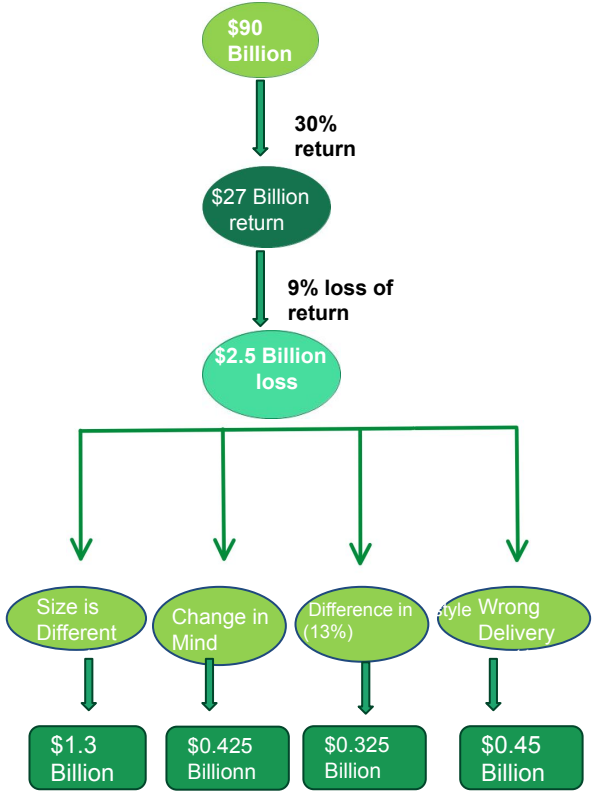
- Saving resources by analyzing closely the packaging dimensions.
- The size of the cardboard container, weight of the materials required, are all considered when designing the packaging, with the goal of optimizing the space available without compromising the basic features that protect the product.

THE RETURN PROCESS:

Around 30% of all online purchases are returned. Digital sales increased by 71% in the second quarter of 2020 and 55% in the third as people started shopping online even for many items that are easier to buy in person.

Carbon emissions from online shopping and returns

- There is a considerable amount of CO2 emission due to returns.
- Worldwide, approximately 17 billion items are returned every year. It totals to 4.7 million metric tons of CO2 emitted yearly.
- It's estimated that just 50% of returns go back into store inventory. Because of their condition, due to use, damage, or even just opened boxes, the rest have a more cruel fate.



Solutions:

- **Reusable Packaging:** Startups like RePack and LimeLoop offer reusable shipping pouches for online apparel orders. Merchandise can also be stored locally and shipped directly to a new customer.Happy Returns employs reusable containers to consolidate and bulk-ship box-free returns at hubs in California and Pennsylvania.

- **Warehousing:** ZigZag is a platform that helps retailers consolidate returns in a network of warehouses for bulk reverse shipping.

- **Milkman Model:** Products will be delivered at your door, at the same time empty containers are picked up, washed, refilled and readied for delivery to another customer.

https://www.forbes.com/sites/gulnazkhusainova/2019/03/28/there-is-no-such-thing-as-a-free-return/?sh=55147d757135
https://earth911.com/business-policy/the-environmental-cost-of-online-returns/#:~:text=We%20all%20realize%20that%20returning,emissions%20from%203%20million%20cars.

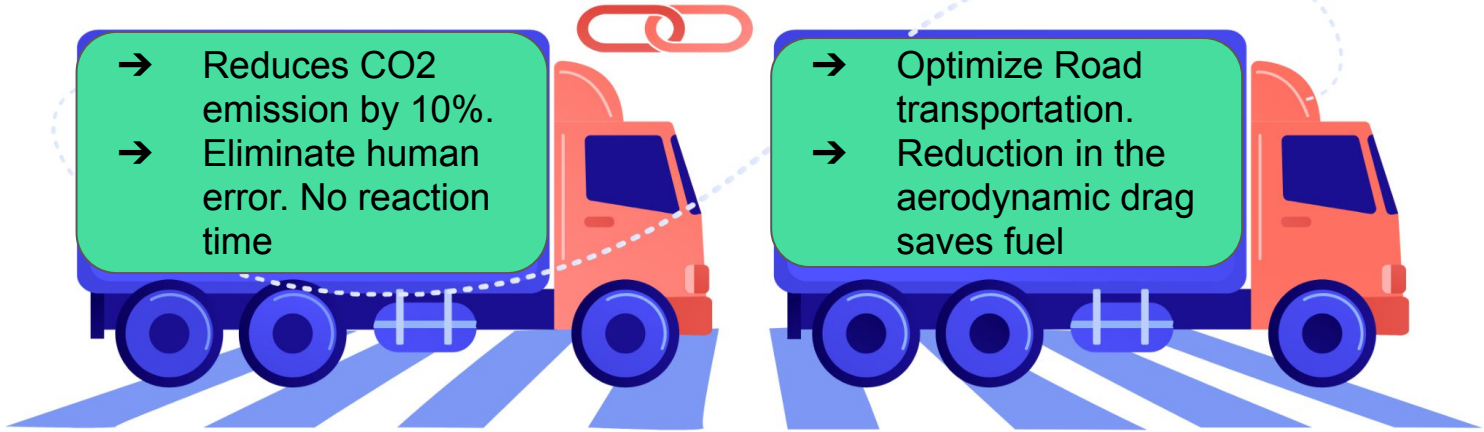
Transportation

Transportation

1. According to a 2004 report by EPA, 23% of all the greenhouse gas emissions comes from heavy and medium duty trucks.

2. Large number of trucks moving from factory/ warehouses creates not only road spacing problems but are of safety concerns as well.

Solution: Truck platooning is the linking of two or three trucks in a convoy. These trucks closely follow each other at set distance and one vehicle lead the other and is linked through wireless communication.



1. Truck Platooning: History, Benefits, Future

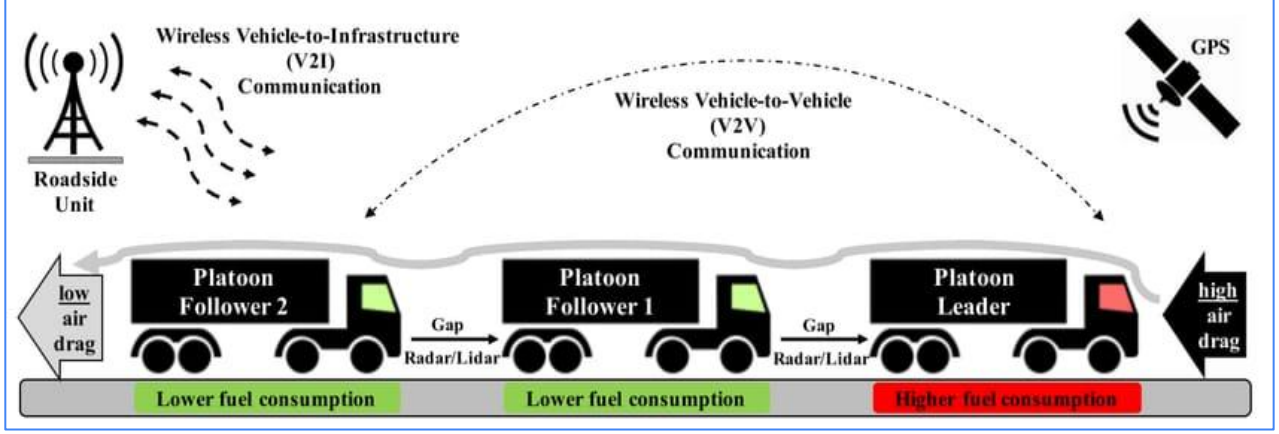


Fig: Mechanism of truck platooning.

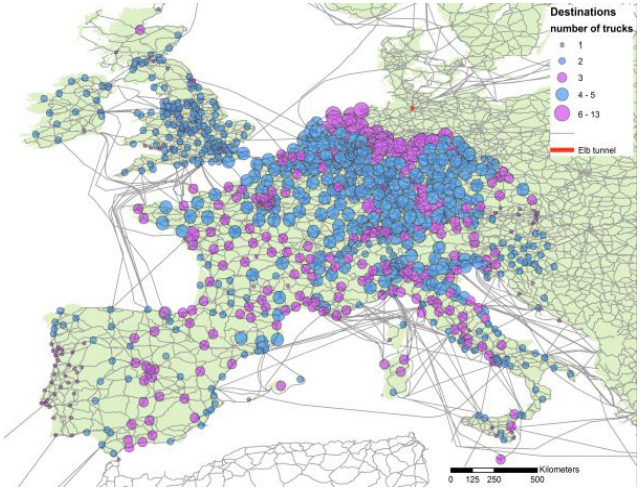


Fig: Destination distribution

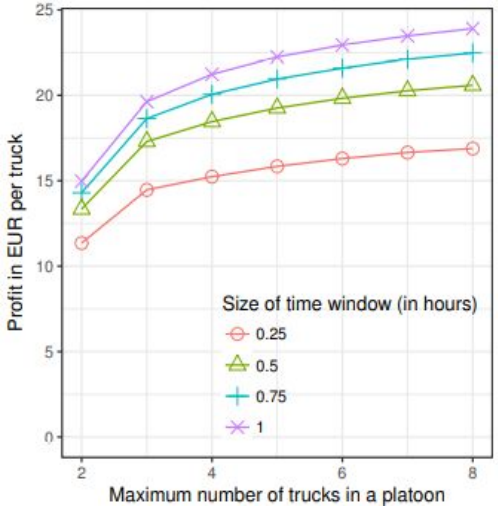


Fig: Profit per truck

Case Study

The case study is based on data from the TransTools3 transport network model which was recently developed for the European Commission. The model covers the entire Europe, The model includes all modes of freight transportation (road, air, sea, inland waterways) as well as private transport modes

1. Hub-based truck platooning: Potentials and profitability - ScienceDirect

Drone Deliveries

57.55 CAGR

- In 2020, the global Drone Package Delivery market size will be USD 241.53 Million and it is expected to reach $ 3694.38 Million by the end of 2027 with a CAGR of 57.55% during the forecast period of 2021-2027.

3rd Largest Market

- With Ministry of Civil Aviation updating the Drone Rules 2021 and reserving INR 120 crore, efforts are to make India a global drone hub by 2030. By 2025, India is anticipated to be the world's third-largest drone market

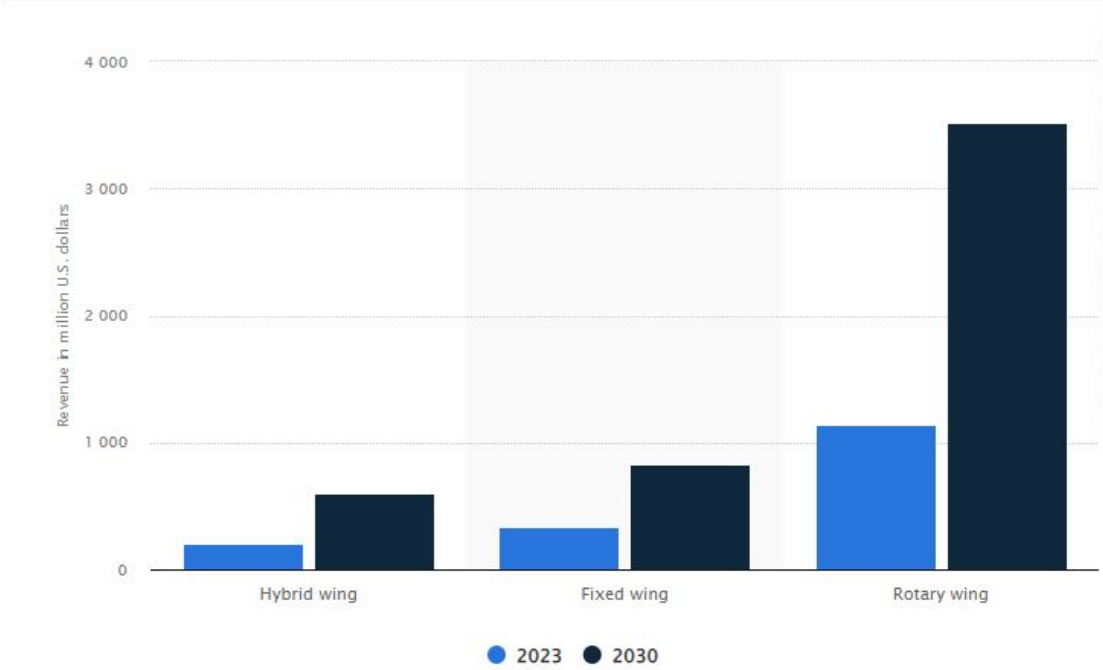
High Revenue

- By 2030, the global drone delivery market is projected to generate over 4.9 billion U.S. dollars in revenue. By that time, the rotary wing segment will generate over 6.5 billion U.S. dollars in revenue.

1.Drone Package delivery market

Future Implication: Drone Delivery

1. **Vision:** With the efforts of the government and vision to make India **3rd largest** drone market. India has a huge potential to generate a substantial revenue from the drone delivery market.
2. **Sustainability in Remote Areas:** This is highly sustainable in the areas where land deliveries are very difficult.
3. **Increased Reachability:** An efficient drone delivery network will not only solve the problem of reachability but it will also be sustainable.



Source: Graph
Source: Drone

Case Studies: Virginia and Rwanda

According to a case study by Virginia tech on measuring the effect of drone delivery in Virginia US:

- It will be serving 50.7 % of the total population
- Recover $23.0-45.9 million in time savings for consumers using drones.
- Generate $25-73,000 per year in additional sales for participating retail businesses
- Reduce vehicle travel by 18.7-30.5 million miles per year in the service area, equivalent to 13.5-14.5% of all delivery and pickup car
- Prevent as many as 28-46 car crashes per year by reducing road travel

In Rwanda, Zipline made 200,000 deliveries of blood& vaccines rural hospitals and clinics. As part of their five-year review, the company performed a sustainability analysis of its delivery emissions,

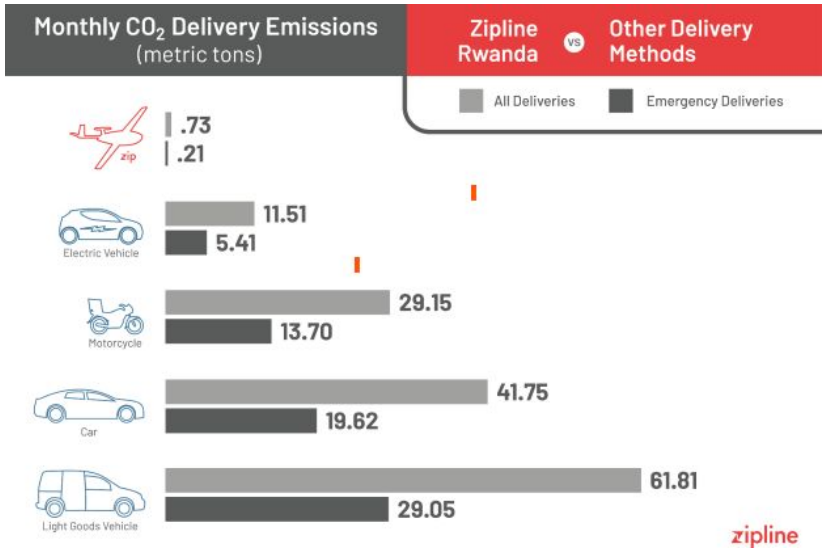


Fig By using Zipline's autonomous aircraft to provide essential medical products to rural hospitals and clinics, these on-demand deliveries experienced a:

- **99% reduction in delivery carbon emissions compared to using vans**
- **98% reduction in delivery carbon emissions compared to using cars**
- **94% reduction in delivery carbon emissions compared to using electric vehicles**

1.Measuring the effect of drone delivery in United States:Virginia tech
2.The Sustainability of Zipline's Autonomous Aerial Logistics

Expressways For Logistics

1

Logistics Subsidiary: The **National Highways Authority of India** (NHAI) has constituted a logistics subsidiary - **National Highways Logistics Management Company** for logistics movement across the country, transferring the existing nine contracts to the arm.

2

Revenue and Fuel Savings: The government believes that having a dedicated entity for cargo movement between ports and roads will lead to revenue and fuel savings.

3

First Mile Connectivity: The idea to create a single entity for port-led development is to enhance port-road connectivity for seamless logistics movement and to improve first-mile connectivity.

4

LEEP: The roads will be built in such a way that they will not impact city traffic despite all-day truck movement. **The Ministry of Road Transport and Highways** (MoRTH) plans to develop multimodal logistics parks under its **logistics efficiency enhancement programme** (LEEP) in 15 locations across India.

Source: Expressways

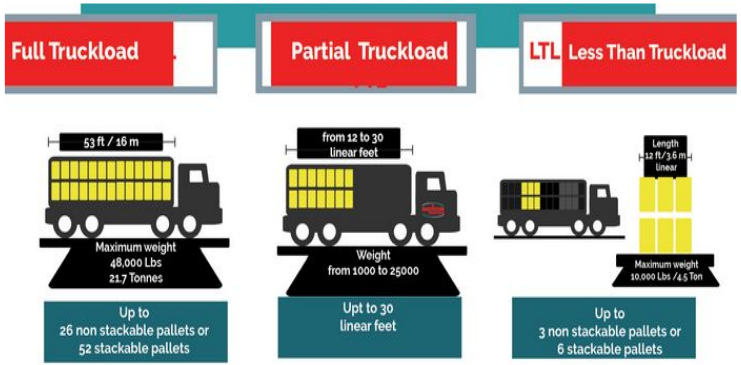
Application for LTL and Partial Truckload Drivers

A dedicated application will be made which will keep track of LTL and partial truckload drivers in an area.

This will help them fill their truck boot space to the maximum enabling better revenue and sustainability.

Their location will be tracked and via supplier partnership, the products will be delivered using the app for better efficiency.

It will in turn also save costs for the suppliers as they would only have to pay for the space their shipment is occupying.




Thank You!