

# Cost Of Transportation In Supply Chain Management

Posted on September 6, 2019

## Introduction

Transportation is one of the most visible and difficult-to-control costs in supply chain management. It connects suppliers, factories, warehouses, ports, stores, and final customers, but every movement consumes capacity, labor, fuel, equipment, time, and administrative effort. A company may negotiate a low freight rate and still experience high total transportation cost if shipments are poorly consolidated, trucks wait at loading docks, containers incur detention charges, products are damaged, or late deliveries create emergency orders and lost sales.

The original discussion correctly emphasized the need to understand total transportation cost and use business intelligence, but it treated monthly recurring revenue as the best transportation metric. That measure may be useful for a subscription business, yet it does not show whether freight operations are efficient. A stronger approach combines cost, service, asset use, risk, and environmental performance. This essay explains the major components of transportation cost and proposes practical methods for reducing expense without weakening customer service or supply chain resilience.

## What Transportation Cost Actually Includes

The invoice from a carrier is only the most obvious cost. Total transportation cost includes line-haul charges, fuel surcharges, accessorial fees, customs brokerage, insurance, loading and unloading labor, packaging, tracking systems, claims administration, and the inventory tied up while goods are moving. It can also include demurrage and detention at ports, redelivery charges, expedited freight, temperature-control expenses, and penalties for missed appointments.

Indirect costs are equally important. A late component may stop a production line. A delayed retail shipment may cause a stockout and lost customer loyalty. Excessively slow transport increases pipeline inventory and working-capital requirements. Conversely, choosing the fastest mode for every shipment can produce a high service level at an unsustainable cost. Transportation management therefore requires balancing money, time, reliability, and risk rather than minimizing a single rate.

## Major Cost Drivers

## Distance, Weight, Volume, and Density

Longer routes generally cost more, but the relationship is not perfectly proportional because terminal handling and pickup costs are incurred even on short journeys. Weight and volume affect vehicle capacity, while product density determines whether the shipment reaches a weight limit or a space limit first. Lightweight but bulky products may “cube out” a trailer before it reaches its legal weight. Packaging design can therefore have a direct transportation effect.

## Mode Selection

Air freight is fast but expensive. Ocean shipping offers low unit cost for large international volumes but involves long lead times and port-related uncertainty. Rail can be efficient for heavy long-distance freight, while trucking provides flexibility and door-to-door access. Intermodal transport combines modes and may reduce cost and emissions, although transfers can add complexity. The correct choice depends on product value, perishability, urgency, shipment size, route, and the financial consequence of delay.

## Fuel, Labor, and Equipment

Fuel prices influence freight rates, but labor availability, driver hours, equipment supply, maintenance, tolls, and insurance also matter. The Bureau of Transportation Statistics reported that transportation producer-price measures in 2026 remained substantially above their January 2019 levels across several freight modes. This does not mean every company experienced the same increase, but it shows why budgets based on old rate assumptions can become unreliable. (U.S. Bureau of Transportation Statistics, 2026)

## Network Design

The locations of plants, distribution centers, suppliers, and customers determine how many miles and handling steps are required. A centralized warehouse may lower facility cost while increasing outbound distance. A decentralized network may improve delivery speed but duplicate inventory and overhead. Network decisions should therefore be evaluated using total landed cost and service requirements rather than transportation expense in isolation.

## Variability and Poor Information

Uncertain demand causes rushed shipments, unused reservations, and inefficient capacity. Inaccurate purchase orders or weak visibility can lead to missed sailings, premium air freight, and congestion. The U.S. Department of Transportation’s Freight Logistics Optimization Works program illustrates the

value of shared, forward-looking data. It combines aggregated demand and logistics-capacity information so participants can anticipate bottlenecks and adjust operations before disruption becomes an emergency. (U.S. Department of Transportation, 2024)

## Measuring Transportation Performance

No single metric is sufficient. A useful dashboard should contain several linked measures: (World Bank, 2026)

- Freight cost per unit, order, kilogram, or sales dollar: shows the cost relative to business activity.
- On-time pickup and on-time delivery: measure service reliability.
- Cost per lane and mode: reveals routes or services that require investigation.
- Load factor and trailer utilization: indicate whether available capacity is being used.
- Empty miles: expose unnecessary movement without revenue-generating cargo.
- Damage and claims rate: connect transportation decisions to product quality.
- Accessorial cost as a percentage of freight spend: identifies avoidable detention, redelivery, and handling charges.
- Average transit time and variability: show both speed and predictability.
- Carbon emissions per shipment or tonne-kilometer: support sustainability and efficiency analysis.

Metrics must be interpreted together. A lower freight cost can be a false saving if late deliveries rise or damage increases. Similarly, perfect on-time delivery may be too expensive if every order is expedited. Management should establish service targets by customer and product segment instead of applying the most demanding standard to all shipments.

## Strategies for Reducing Cost

### Consolidate Shipments

Combining smaller orders into fuller truckloads or containers can reduce unit cost. Consolidation can occur at the origin, a cross-dock, or a regional distribution center. The trade-off is time: orders may wait until sufficient volume is available. Companies should set consolidation windows according to promised delivery dates and product urgency.

### Optimize Routes and Loads

Transportation-management systems can select carriers, build loads, plan routes, and compare expected rates. Route optimization should account for delivery windows, vehicle limits, driver hours,

traffic, road restrictions, and backhaul opportunities. The objective is not merely the shortest route but the lowest feasible total cost with reliable service.

## Reduce Empty and Partially Filled Movement

Empty miles waste fuel, driver time, and equipment capacity. Backhauls, collaborative shipping, continuous-move planning, and better coordination between inbound and outbound freight can improve utilization. EPA's SmartWay program encourages companies to measure and benchmark freight efficiency and select more efficient carriers, modes, technologies, and operating practices. Fuel savings can lower both emissions and operating cost. (U.S. Environmental Protection Agency, 2026)

## Improve Packaging and Handling

Packaging should protect the product while using space efficiently. Standardized carton sizes, stronger pallet patterns, and reduced empty space can increase load density. However, aggressive packaging reduction can increase damage. Engineers, procurement teams, warehouse staff, carriers, and sustainability specialists should evaluate packaging together rather than allowing one department to optimize its own cost at the expense of the system.

## Manage Carriers Strategically

Competitive bidding is useful, but selecting solely on the lowest rate can create service failures and hidden charges. Carrier scorecards should include safety, on-time performance, claims, communication, capacity reliability, technology integration, and environmental efficiency. Longer-term relationships can improve planning and encourage joint problem-solving, while a diversified carrier base reduces dependence on a single provider.

## Control Accessorial Charges

Detention, demurrage, liftgate, redelivery, storage, and appointment fees often reflect process failures. Their causes may include inaccurate documentation, late warehouse preparation, insufficient labor, or poor appointment scheduling. Coding each accessorial charge by cause and responsible process makes it possible to correct recurring problems instead of treating the fees as unavoidable.

## Inventory, Service, and Transportation Trade-Offs

Transportation cannot be managed separately from inventory. Faster, more frequent shipments reduce inventory but raise freight cost. Larger and less frequent shipments reduce transport cost per

unit but increase cycle stock and may reduce responsiveness. Managers should calculate the combined cost of transportation, inventory carrying, warehousing, stockouts, and obsolescence.

Product segmentation helps. High-value or highly time-sensitive items may justify faster modes. Stable, low-value products can move in consolidated loads. Spare parts required to prevent equipment downtime may require strategic regional stocking. A single transport policy for every item ignores these economic differences.

## Building Resilience Without Excessive Cost

The least expensive route under normal conditions may be fragile during a strike, extreme-weather event, border delay, cyberattack, or geopolitical disruption. Resilience does not require duplicating every route, but it does require understanding critical lanes and developing realistic alternatives. Companies can prequalify backup carriers, identify secondary ports, maintain emergency communication procedures, and decide which products deserve buffer inventory.

Scenario planning should estimate both probability and impact. A rare event that can stop production for weeks deserves more attention than a frequent but minor delay. Contracts should also clarify capacity commitments, data-security duties, force-majeure provisions, insurance, and claims procedures.

## Implementation Plan

A practical cost-reduction program can begin with a twelve-month baseline of freight invoices, shipment records, accessorial charges, claims, service results, and inventory data. The company should clean lane and carrier information, calculate total cost by customer and product group, and identify the largest cost and service gaps. It can then pilot improvements on selected lanes rather than changing the entire network at once.

Each pilot should have a defined target, such as reducing empty miles, increasing trailer utilization, or lowering detention charges while maintaining an agreed on-time-delivery rate. Results should be reviewed with finance, operations, sales, procurement, and customer-service teams. Cross-functional governance is essential because transportation decisions affect promised delivery dates, inventory, pricing, and customer relationships.

## Conclusion

Transportation cost in supply chain management is not simply the carrier's rate. It is the combined economic effect of moving goods, holding inventory in transit, managing exceptions, protecting products, meeting delivery commitments, and maintaining resilience. Companies reduce cost most

effectively when they measure the entire system and avoid false savings that transfer expense to another department or customer. (Bowersox et al., 2002)

The strongest strategy combines accurate data, shipment consolidation, route and load optimization, strategic carrier management, packaging improvement, accessorial control, and differentiated service policies. Technology supports these decisions, but it does not replace disciplined processes or cooperation. When cost, reliability, risk, and environmental efficiency are managed together, transportation becomes a source of competitive advantage rather than an unavoidable expense.

## References

- Bowersox, D. J., Closs, D. J., & Cooper, M. B. (2002). *Supply Chain Logistics Management*. McGraw-Hill.
- U.S. Bureau of Transportation Statistics. (2026). [Transportation Producer Price Index—June 2026](#).
- U.S. Department of Transportation. (2024). [Freight Logistics Optimization Works](#).
- U.S. Environmental Protection Agency. (2026). [Learn about SmartWay](#).
- World Bank. (2026). [Logistics Performance Indicators 2.0](#).