

Updated Survey Report

Supply Chain & Freight Transportation Challenges in Chemical Manufacturing

Pressures Ease Over H2
2022 but Conditions Remain
Worse Than Pre-Pandemic

Q1 2023



Survey Background

Although much of the U.S. chemical production is concentrated in about a dozen states, the business of chemistry has customers located throughout the United States and around the world. Thus, a large volume of chemistry products is moved within the U.S. and to foreign destinations every year, playing an important role in the transportation services industry.

Chemical companies are some of the largest shippers across all modes of transportation. Nearly a billion metric tons of products are transported annually, and the industry's transportation future needs are only expected to increase as the chemical manufacturing in the U.S. grows.

With announced investments of more than \$200 billion and over 350 chemical manufacturing projects, ACC estimates more than 1 million additional chemical shipments are expected per year by 2030, including:

540,000

additional marine
shipments

200,000

additional railcar
shipments

600,000

additional truck
shipments

Supply chain and freight transportation disruptions have caused considerable challenges for U.S. chemical producers. These challenges can create widespread impacts in downstream sectors, including:

Food

Fuel and
Energy

Water
Treatment

Building and
Construction

Infrastructure
Projects

In December 2021, the American Chemistry Council (ACC) conducted a survey of member companies doing business in the U.S. to better understand the issues chemical manufacturers were facing. We have since conducted three follow-up surveys (March 2022, July 2022, and January 2023). Each one has identified significant challenges for the efficient movement of freight across transportation modes, and findings show how these challenges have impacted ACC members.

This report contains results from the January 2023 survey focusing on the second half of 2022. Seventy-six chemical manufacturers participated in the survey.

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This report was prepared by ACC's Economics and Statistics Department. Questions about the survey and findings may be directed to Emily Sanchez, Director, Economics & Data Analytics (emily_sanchez@americanchemistry.com).

March 2023

Key Survey Findings (Q1 2023)

GENERAL

- Compared to conditions in the first half of 2022 (H1), 67% of companies reported supply chain and freight transportation disruptions were generally better in the second half of the year (H2). Compared to conditions prior to the pandemic (i.e., “normal” or “baseline” conditions), however, 83% of companies say they are worse.
- Companies continue to report that supply chain and freight transportation disruptions are harming their U.S. manufacturing business. Nearly all (93%) companies say supply chain and freight transportation disruptions are currently impacting their U.S. chemicals manufacturing business. About half say impacts are minor, and about half say they are moderate. A few companies are dealing with severe impacts.
- Among respondents, a majority (86%) reported they modified operations because of supply chain issues and/or transportation disruptions in H2.
- Down from 92% in H1 2022, 75% of companies reported increasing materials/supplies on hand in the second half of the year. Numerous companies highlighted that this raises costs and further stresses already constrained warehouse capacity. Almost half (45%) of companies had to increase inventories of finished products in H2, an improvement from 62% in H1.
- Fewer chemical producers (31% in H2 compared to 52% in H1 2022) had to curtail production due to inability to ship products to customers.
- Supply chain issues and transportation disruptions continue to push up transportation costs. More than half (62%) of chemical manufacturers saw costs rise over H2.
- Regarding specific policy reforms aimed at solving supply chain problems, most companies said that standardized service reporting by railroads (73%) and reciprocal switching (77%) would help mitigate freight rail problems. Many companies also said that increasing gross vehicle weight limits for interstate highways (75%) would help alleviate trucking capacity constraints.

TESTIMONIALS

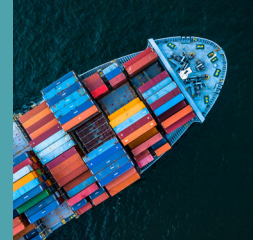
“Although improved versus 2021 and early 2022, Supply Chains have still not returned to pre-pandemic performance. Costs are generally higher, service is generally worse.”

“We have adjusted raw materials and finished good inventories to compensate for the performance level and variability in transit times.”

“The increased cost of warehousing raw materials both on-site and off-site increases expenses and storage risks.”

“Ocean and truck dynamics have improved greatly compared with 2021 and 2022 H1, but rail is still seeing challenges in terms of transit time.”

Ports and Ocean Shipping



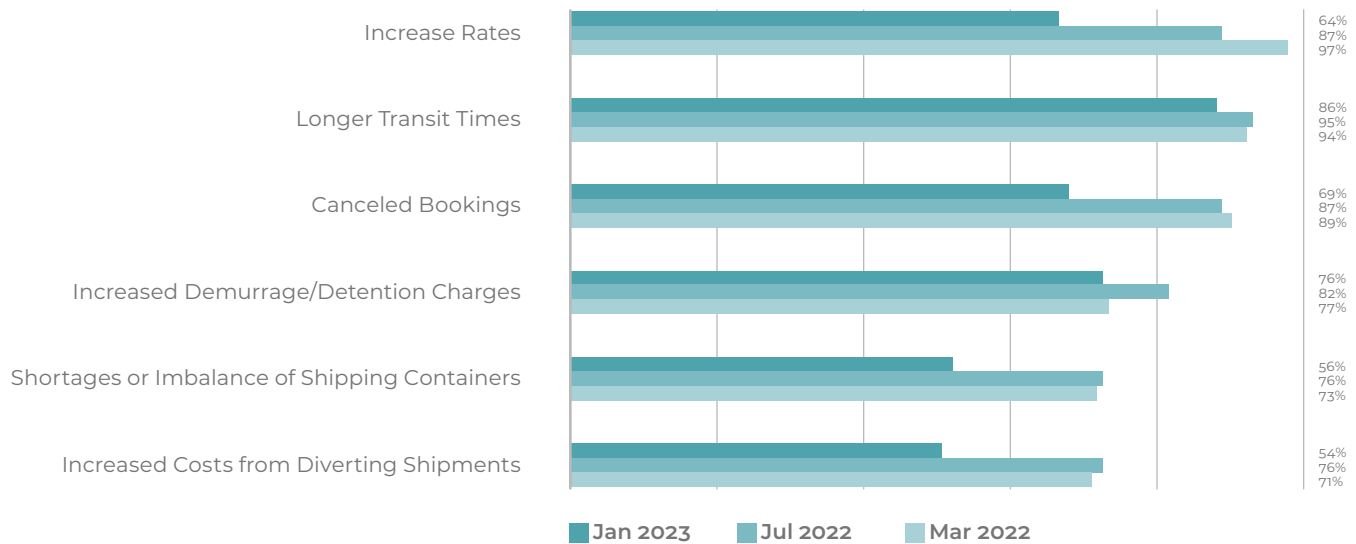
Are port related delays and congestion generally worse, better, or are they about the same?

	March 2022	June 2022	H2 vs H1 2022	H2 vs Pre-pandemic
Worse	55%	33%	10%	79%
About the Same	39%	48%	30%	17%
Improving	6%	19%	61%	4%

KEY FINDINGS

- Compared to conditions in the first half of 2022, 30% of companies reported delays and congestion was about the same through the second half of the year (H2) while 10% report that it was worse and 61% report conditions improved. Compared to pre-pandemic, however, most companies (79%) report port related delays and congestion are worse.
- Chemical manufacturers continue to deal with negative impacts as a result of delays and congestion at the ports, but less so at the beginning of 2023 than in 2022 or 2021. For example, 97% of companies reported increased rates in ocean shipping when surveyed at the end of 2021. That declined to 87% in H1 2022 and was down further to 64% of companies in January 2023.
- Down from a peak of 94% of companies (in Q4 2021), 86% of companies continue to deal with longer transit times.
- Down from a peak of 89% of companies (in Q4 2021), 69% of companies continue to deal with canceled bookings.
- Some business impacts occurring due to delays and congestion at the ports continued to build through mid-year 2022 and eased over H2. These include increased demurrage/detention charges, shortages or imbalance of shipping containers, and increased costs from diverting shipments. More than half of companies continue to navigate these challenges.

BUSINESS IMPACTS DUE TO DELAYS AND CONGESTION AT THE PORTS



TESTIMONIALS

“The number of bookings that were “rolled” week after week was the highest in our last 15 years of exports out of the U.S.”

“[O]cean carriers around the world coming into U.S. ports made decisions in most of the year to return empty containers instead of moving loaded export containers they had accepted.”

“Port congestion in the Gulf is still a problem with sailings being inconsistent through the ports.”

Rail Transportation



Are rail transportation related delays/service challenges generally worse, better, or are they about the same?

	March 2022	June 2022	H2 vs H1 2022	H2 vs Pre-pandemic
Worse	39%	46%	30%	77%
About the Same	53%	48%	48%	22%
Improving	8%	7%	22%	1%

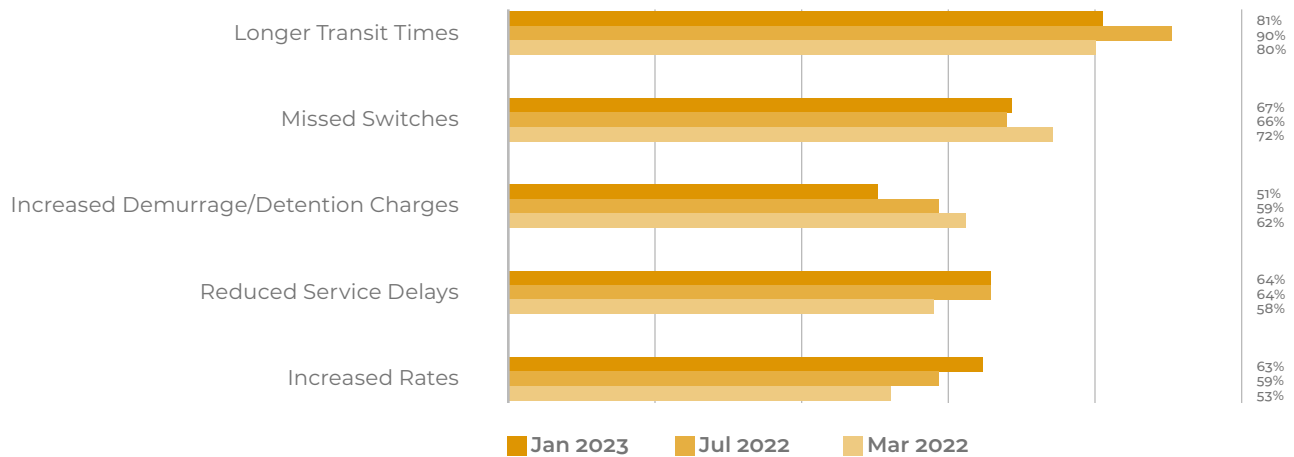
KEY FINDINGS

- Unlike the improvements seen in other shipping modes (e.g., truck and ocean shipping), chemical manufacturers reported conditions were the same (48%) or worse (30%) in the second half of 2022. Most companies (77%) reported worse conditions for rail shipping compared with conditions before the pandemic.
- Rail users reported longer transit times (81%), missed switches (67%), increased demurrage charges (51%), reduced service days (64%), and higher rates (63%).
- More than half (62%) of companies (and/or their customers) facilities were subjected to **railroad service embargoes** in 2022. Most (89%) reported they were subjected to more embargoes than in prior years.
- Three quarters of companies believe that the use of rail embargoes has not been effective in reducing congestion and/or alleviating supply chain problems. Companies highlighted that the embargoes created supply chain problems and forced them to switch to sub-optimal transportation options. Among companies that said embargoes did help reduce congestion, many noted that the benefit was limited and failed to address the root causes of congestion.
- Embargoes impacted companies by increasing transportation costs, increasing administrative/operational costs, requiring companies to move shipments to truck and/ alternate rail provider and embargoes also resulted in curtailed production at company and customer sites.

POLICY SOLUTIONS

- Nearly three quarters of companies believe that **standardized reporting of first-mile/last-mile information** would help them better manage and mitigate rail transportation challenges. Companies reported that this additional visibility would enhance their ability to plan and mitigate potential disruptions.
- A large majority of companies (77%) believe that **reciprocal switching** would help them better manage and mitigate rail service challenges. Companies cited the potential use of switching to address specific disruptions and the potential for expanded competition to drive long-term service improvements in the rail industry. Multiple companies note that these potential benefits are limited and would depend on how it is implemented.

BUSINESS IMPACTS DUE TO DELAYS/SERVICE CHALLENGES IN RAIL TRANSPORTATION



TESTIMONIALS

“[R]ail transit times are ~14% longer than pre-pandemic performance.”

“We consistently work with our account manager to track lost cars, missed pickups, routing issues and errors in billing. We added a full time employee on our side just to manage what the railroad should be managing.”

“Increased frequency of missed rail switches, and reduction in weekly rail switch service has created operational challenges.”

“[E]mbargoes have caused further disruption because of the nature of how they were administered with such short notice, leading to significant loading and shipping inefficiencies.”

“In the case of time sensitive rail moves, [embargoes] make it really difficult to manage transit inventory. It also creates a bullwhip effect of increased buffer inventory and fleet to make up for potential embargoes which exacerbates the situation.”

Trucking



Are truck transportation related delays and capacity constraints generally worse, better, or are they about the same?

TRUCK SHIPPING — OVERALL

	March 2022	June 2022	H2 vs H1 2022	H2 vs Pre-pandemic
Worse	55%	29%	12%	61%
About the Same	38%	45%	23%	32%
Improving	8%	26%	65%	7%

TRUCK SHIPPING — PACKAGED VS BULK TRUCKING

	H2 vs H1 2022		H2 vs Pre-pandemic	
	Packaged Trucking	Bulk Trucking	Packaged Trucking	Bulk Trucking
Worse	7%	14%	52%	63%
About the Same	30%	32%	41%	32%
Improving	62%	55%	7%	5%

KEY FINDINGS

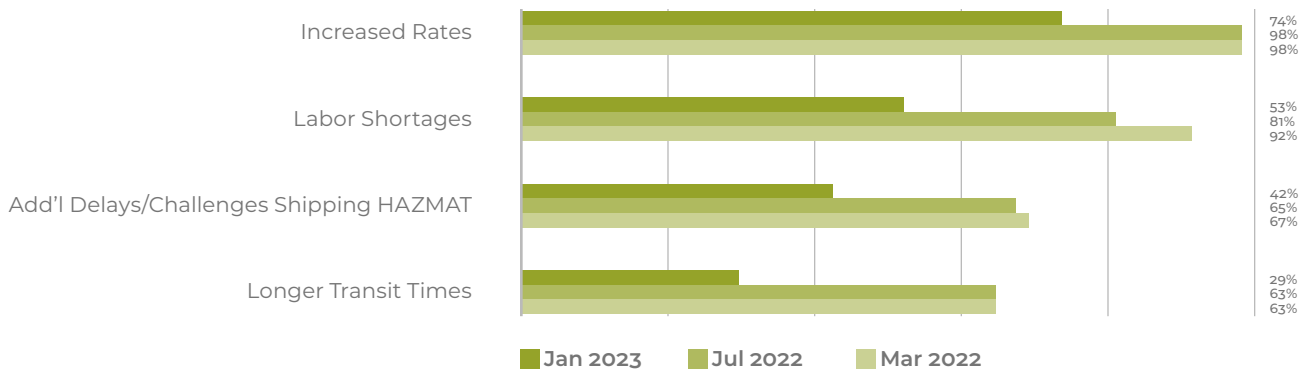
- For trucking, a majority of (65%) companies reported that conditions improved in the second half of 2022, while 23% reported that conditions remained about the same. However, a majority of companies (61%) reported that conditions remained worse than conditions prior to the pandemic. Companies were somewhat more likely to report worse conditions for bulk trucking than for packaged trucking compared with the first half of 2022 (14% vs. 7%) and prior to the pandemic (63% vs. 52%).
- Chemical manufacturers experienced some relief in negative business impacts due to delays and capacity constraints in trucking. Down from a peak of nearly all companies (98%) previously, fewer companies (74%) reported facing increased rates in January 2023.
- Labor shortages continue to be a challenge for about half of companies, but this is an improvement from a peak 92% of companies at the end of 2021.
- The percent of companies reporting longer transit times in trucking was down to 29% in January from a high of 63% previously.

- The percent of companies reporting additional delays or challenges in shipping hazmat was down to 42% in January from 65% previously.
- Negative impacts due to delays and capacity constraints in truck transportation were more prevalent for bulk trucking (compared to packaged). For example, 80% of companies using bulk trucking reported increased rates in January 2023 compared with 62% of those using packaged trucking.
- About half (51%) of companies using bulk trucking reported additional delays or challenges shipping hazardous materials in January 2023 while only 37% of those using packaged trucking were dealing with this impact.
- Sixty-one percent (61%) of companies using bulk trucking reported dealing with labor shortages in January 2023 while 47% of those using packaged trucking faced the issue.

POLICY SOLUTIONS

- Most companies (75%) believe that **increasing federal gross vehicle weight (GVW) limits for interstate highways** would help to alleviate trucking capacity constraints. Companies note that, for some products, higher GVW limits would allow them to reduce the number of shipments, lowering costs and easing congestion. One manufacturer shared, "... the ability to increase payload and ship more product on fewer shipments improves coverage, labor utilization for carriers and manufacturing sites, improved safety and sustainability impact of fewer trucks on the roads."

BUSINESS IMPACTS DUE TO DELAYS AND CAPACITY CONSTRAINTS IN TRUCK TRANSPORTATION



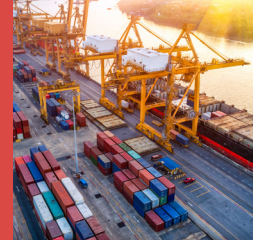
TESTIMONIALS

“Shortage of truck drivers continue to impact our operations.”

“Packaged Truckload transportation began improving at the end of Q1, Bulk truck transportation began improving in Q4.”

“Still constrained bulk truck liquid capacity is resulting in higher rates.”

Inland Waterways



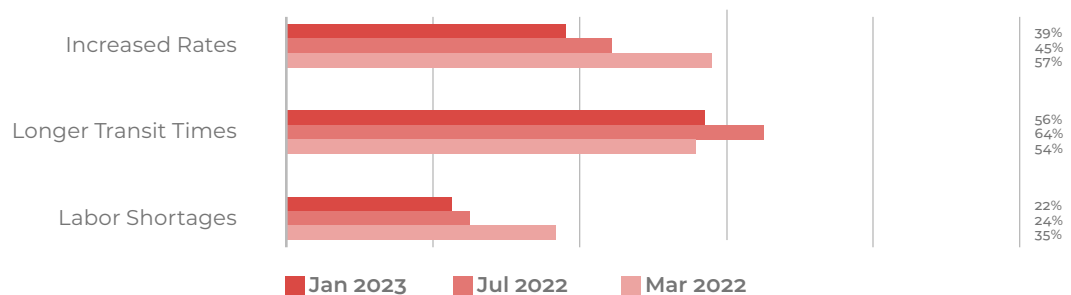
Are inland waterways related delays and challenges generally worse, better, or are they about the same?

	March 2022	June 2022	H2 vs H1 2022	H2 vs Pre-pandemic
Worse	21%	13%	26%	27%
About the Same	68%	77%	60%	73%
Improving	12%	10%	11%	0%

KEY FINDINGS

- Compared to conditions prior to the pandemic, 73% of companies report inland waterways transportation related delays and congestion are about the same. Comparing H2 to H1 of 2022, 60% of companies report conditions are about the same, 11% saw improvement and 26% reported conditions worsening over H2.
- In January 2023, 39% of companies reported dealing with increased rates due to delays and congestion in inland waterways transportation (down from 45% and 57% reported in previous surveys.)
- Just over half of companies (56%) continue to deal with longer transit times and 22% of companies are dealing with labor shortages (down from 35% at the end of 2021).

BUSINESS IMPACTS DUE TO DELAYS AND CONGESTION IN INLAND WATERWAYS TRANSPORTATION



TESTIMONIALS

“We do not have many delays with inland marine movements. If we do, they are related to specific customer/suppliers.”

“Shortages were not pandemic related, but rather related to the low water conditions on the Mississippi.”

Survey Findings & Company Responses

Based on 76 responses.

Supply Chain Disruption

1. Are supply chain and freight transportation disruptions currently impacting your company's U.S. chemicals manufacturing business?

% of Companies	
4%	Yes, impacts are severe
42%	Yes, impacts are moderate
47%	Yes, impacts are minor
7%	No, no impacts experienced

2. Compared to conditions in the first half of 2022 (H1), were supply chain and freight transportation disruptions in the second half of 2022 (H2) generally worse, better, or are they about the same overall?
3. Compared to conditions prior to the pandemic (i.e., "normal" or "baseline" conditions), are supply chain and freight transportation disruptions generally worse, better, or are they about the same overall?

	Supply Chain and Freight Transportation Disruption	
	2022 H2 vs H1	"Now" vs Pre-pandemic
	% of Companies	% of Companies
Worse	12%	83%
Better	67%	3%
About the same	21%	14%

4. At any point during the second half of 2022 (H2), did your company need to modify its operations because of supply chain issues and/or transportation disruptions delays?

% of Companies	
86%	Yes
14%	No

5. At any point during the second half of 2022 (H2), did your company increase inventories of raw materials/supplies on hand in response to supply chain challenges?

% of Companies	
75%	Yes
25%	No

6. At any point during the second half of 2022 (H2), did your company increase inventories of finished products in response to supply chain challenges?

% of Companies	
45%	Yes
55%	No

7. At any point during the second half of 2022 (H2), did your company curtail production due to the inability to ship products to customers?

% of Companies	
31%	Yes
69%	No

8. At any point during the second half of 2022 (H2), did customers cancel orders because they were concerned their order would not arrive or would not arrive on time?

% of Companies	
36%	Yes
64%	No

9. Did your company's transportation costs increase over the second half of 2022 (H2) because of supply chain issues and/or transportation disruptions/delays?

% of Companies	
62%	Yes
38%	No

Ports & Ocean Shipping

10. Does your company utilize ocean shipping for importing materials?

11. Does your company utilize ocean shipping for exporting products?

95% of companies use ocean shipping for either importing materials (87%) or exporting products (91%) or both.

12. Compared to conditions in the first half of 2022 (H1), were port related delays and congestion in the second half of 2022 (H2) generally worse, better, or are they about the same overall?
13. Compared to conditions prior to the pandemic (i.e., “normal” or “baseline” conditions), are port related delays and congestion generally worse, better, or are they about the same overall?

	Port-related Delays and Congestion	
	2022 H2 vs H1	“Now” vs Pre-pandemic
	% of Companies	% of Companies
Worse	10%	79%
Better	61%	4%
About the same	30%	17%

14. How are delays and congestion at the ports impacting your business?

% of Companies	
86%	Longer transit times
69%	Cancelled bookings
56%	Shortages or imbalance of shipping containers
38%	Shortages or imbalance of specialized containers (e.g., refrigerated containers, ISO tanks)
42%	Carriers restricting/rejecting specific hazmat commodities
54%	Increased costs from diverting shipments to alternative ports
76%	Increased demurrage/detention charges
64%	Increased rates
42%	Higher costs due to rerouting
1%	Security/theft risks for loaded containers stored outside of ports

Other:

- Chassis shortages impacting ability to deliver cargo, increasing costs for grounding and storing containers
- Contracted ‘special loaders’ with marine carriers at higher cost to catch up on customer orders that had been significantly delayed and couldn’t be accommodated on our normal ship allocation.
- Longer lead times to customers
- Rail embargoes or restriction to get containers from inland ramps to ports. Vessel schedule changes, primarily on Transatlantic routes can still move cutoffs.
- Shortages or imbalance of intermodal equipment including chassis in the Columbus & Houston area
- The number of bookings that were “rolled” week after week was the highest in our last 15 years of exports out of the US. We had containers loaded at ports that rolled 8 times or approximately 2 mos after when we intended to ship and from the original cut off date for the booking. Our Per Diem costs in US ports also has significantly increased.

15. Does your company utilize rail shipping?

Most companies (95%) of companies utilize rail shipping.

16. Compared to conditions in the first half of 2022 (H1), were rail transportation related delays/service challenges in the second half of 2022 (H2) generally worse, better, or are they about the same overall?

17. Compared to conditions prior to the pandemic (i.e., “normal” or “baseline” conditions), are rail transportation related delays/service challenges generally worse, better, or are they about the same overall?

	Rail Transportation Related Delays/Service Challenges	
	2022 H2 vs H1	“Now” vs Pre-pandemic
	% of Companies	% of Companies
Worse	30%	77%
Better	22%	1%
About the same	48%	22%

18. How are delays/service challenges in rail transportation impacting your business?

% of Companies	
81%	Longer transit times
67%	Missed switches
64%	Reduced service days
51%	Increased demurrage/detention charges
63%	Increased rates

Other:

- Bad ordered cars out of service for longer periods of time
- Came close a few times to having to shut down operations when crews did not materialize to bring empty railcars into our production facilities from nearby serving yards.
- Embargoes
- Embargoes to sites and interchange points, additional fleet requirements due to increased cycle times. Strike threats and service interruptions.
- Labor constraints
- Lost railcars
- Onboarding cars in 2H due to 1H service and continued uncertainty
- Poor service to customers
- Railcar maintenance delays
- Significant time spent managing service challenges/embargoes.

19. In 2022, were your company or customer facilities subjected to railroad service embargoes?

% of Companies	
62%	Yes
38%	No

20. If yes: were your company or customer facilities subjected to more railroad service embargoes in 2022 than in prior years?

% of Companies	
89%	Yes
11%	No

21. Do you think the use of embargoes has been effective in reducing congestion and/or alleviating supply chain problems?

% of Companies	
75%	No
4%	Other/Neutral/Not Sure
6%	Yes
16%	Yes, but...: <ul style="list-style-type: none"> • In some instances, the use of embargo is effective, but the lack of notification and lack of overall planning by railroads in the embargo affect our business negatively • Yes, in some cases. • Yes, but only temporarily - root of issue is labor. • Yes, but they are not solving the root problem, they seem to put a band-aid on it. • Yes, reduces congestion but creates other problems when raw materials are needed • Yes, the embargoes have helped the rail carriers reduce congestion. No, they did not alleviate supply chain problems. These embargoes compounded the supply chain problems. • Yes, but when used repeatedly it can have very adverse effects on planning, inventory levels, shutdown production and routes which increase cost, carbon footprint and efficiency. • Yes, in situations where manpower shortages were the root cause.

FINDING

Three quarters of companies believe that the use of rail embargoes had not been effective in reducing congestion and/or alleviating supply chain problems. Companies highlighted that the embargoes created supply chain problems and forced companies to switch to sub-optimal transportation options. Among companies that said embargoes did help reduce congestion, many noted that the benefit was limited and failed to address the root causes of congestion.

22. If your company experienced embargoes in 2022, how did the embargoes impact your business? How did they impact your customers' business?

% of Companies	
43%	Curtailed production at company sites
41%	Curtailed production at customer sites
41%	Moved shipments to alternate rail provider
78%	Moved shipments to truck
76%	Increased transportation costs
72%	Higher administrative/operational costs
	<p>Other:</p> <ul style="list-style-type: none"> • In the case of time sensitive rail moves, makes it really difficult to manage in transit inventory. It also creates a bullwhip effect of increased buffer inventory and fleet to make up for potential embargoes which exacerbates the situation. Fluidity in the system is essential for planning and execution. • Incurred additional SIT Yard costs • Moved shipments to alternate ports • Our sites are captive so there's no optionality. • Rail and switching services curtailed the number of days per week from five to three. • Stress to the organization was felt by sales and customer service teams along with rail operation teams.

23. Would standardized reporting of first-mile/last mile rail service information help your company better manage and mitigate rail transportation related delays/service challenges?

% of Companies	
73%	Yes
18%	No
6%	Unsure
3%	<p>Other type of response (e.g. comment):</p> <ul style="list-style-type: none"> • We have access to this information today. • We have similar though our TMS application.

24. Would access to reciprocal switching help your company better manage and mitigate rail transportation related delays/service challenges?

% of Companies	
77%	<p>Yes</p> <ul style="list-style-type: none"> Includes 6 “perhaps” or “yes, but...” responses
17%	<p>No</p> <ul style="list-style-type: none"> No impact to business given small scale of rail operations. No, the freight that moves on the rail is arranged by the Steamship Lines (SSL) and a competing rail would not be applicable. No, this is not a significant issue for our company. No. At least not significantly. Because our rail volume is mainly vendor managed, our relationships are with the local delivering railroad who interchanges and delivers cars coming from multiple other railroads. The volume of lanes we manage end to end is minimal, so I believe our potential benefit/opportunity to be minimal.
6%	<p>Other/Not Sure</p> <ul style="list-style-type: none"> “Not sure. Theoretically, improvements in service level should be a result of a more competitive market for rail service services, but it is hard to evaluate this in the real world without historical data or test cases.”

Trucking

25. Does your company utilize truck shipping?

26. Does your company utilize packaged truck shipping (van, reefer, flatbed, LTL)?

27. Does your company utilize bulk truck shipping (liquid, dry)?

All companies (100%) use truck shipping. Most use both packaged (95%) and bulk truck shipping (99%).

28. Compared to conditions in the first half of 2022 (H1), were truck transportation related delays and capacity constraints in the second half of 2022 (H2) generally worse, better, or are they about the same overall?

29. Compared to conditions prior to the pandemic (i.e., “normal” or “baseline” conditions), are truck transportation related delays and capacity constraints generally worse, better, or are they about the same overall?

	Truck Transportation Related Delays and Capacity Constraints					
	2022 H2 vs H1			“Now” vs Pre-pandemic		
	% of Companies			% of Companies		
	Overall	Packaged	Bulk	Overall	Packaged	Bulk
Worse	12%	7%	14%	61%	52%	63%
Better	65%	62%	55%	7%	7%	5%
About the same	23%	30%	32%	32%	41%	32%

30. How are delays and capacity constraints in truck transportation impacting your business?

Overall	Packaged	Bulk	
29%	28%	32%	Longer transit times
42%	37%	51%	Additional delays or challenges shipping hazardous materials
74%	62%	80%	Increased rates
53%	47%	61%	Labor shortages

Other:

- 5x - Longer Lead Times/ longer lead times than pre-pandemic for bulk/haz-mat
- 2x - delivery delays/ Decreased on-time delivery
- Mechanical equipment reliability
- THE LABOR SHORTAGES!
- Additional delays or challenges shipping hazardous materials!

31. Would increasing the federal gross vehicle weight limits for interstate highways help to alleviate trucking capacity constraints for your company?

% of Companies	
75%	Yes
25%	No

Inland Waterways

32. Does your company utilize inland waterways shipping?

Almost half (47%) of companies utilize inland waterways shipping.

33. Compared to conditions in the first half of 2022 (H1), were inland waterways transportation related delays and congestion in the second half of 2022 (H2) generally worse, better, or are they about the same overall?

34. Compared to conditions prior to the pandemic (i.e., “normal” or “baseline” conditions), are inland waterways transportation related delays and congestion generally worse, better, or are they about the same overall?

	Inland Waterways Transportation Related Delays and Congestion	
	2022 H2 vs H1	“Now” vs Pre-pandemic
	% of Companies	% of Companies
Worse	26%	27%
Better	11%	0%
About the same	60%	73%

35. How are delays and congestion in inland waterways transportation impacting your business?

% of Companies	
56%	Longer transit times
39%	Increased rates
39%	Labor shortages
	<p>Other:</p> <ul style="list-style-type: none">• Shortages were not pandemic related, but rather related to the low water conditions on the Mississippi• The infrastructure on the ICWW east of Baton Rouge is in dire need to investment, we are able to take alternate routes when it's a problem but most cannot.• We do not have many delays with inland marine movements. If we do, they are related to specific customer/suppliers poor training of employees.