



January 12, 2022

Hon. Martin Oberman
Chairman
Surface Transportation Board

Hon. Robert Primus
Vice Chairman
Surface Transportation Board

Hon. Patrick Fuchs
Member
Surface Transportation Board

Hon. Michelle Schultz
Member
Surface Transportation Board

Hon. Karen Hedlund
Member
Surface Transportation Board

Via electronic mail

RE: ACC member survey on supply chain and freight transportation challenges.

Dear Chairman Oberman, Vice Chairman Primus, and Members, Fuchs, Schultz and Hedlund:

The American Chemistry Council (ACC) recently conducted a member survey about ongoing supply chain and freight transportation issues. I am pleased to share the attached report summarizing the survey results with Surface Transportation Board members.

ACC conducted this survey to gain a better understanding of the scale of supply chain and freight transportation challenges across all modes, and how these challenges have impacted chemical industry operations. These are critical issue for ACC, since chemical and plastics shipments represent a large share of the total volume for marine, truck, and rail transportation. We share this information to further inform the Board's understanding of chemical shipper experiences and perspectives on these critical issues.

Sixty-seven companies participated in the ACC survey. Nearly all reported impacts to their U.S. manufacturing business, including shipping delays (94%), shortages of raw materials (94%), and increased transportation costs (93%). These disruptions proved costly, with more than one-third of companies reporting additional costs exceeding \$20 million over a one-year period.

Specific to rail transportation, the survey showed the following.

- Companies that ship by rail generally reported "moderate delays and service challenges" across Class I railroads during Q3 of 2021.
- The most significant impacts were reported on CSX, with 44% of customers reporting "severe" delays and service challenges.

- Most rail users reported longer transit times (78%), typically about 8 days longer with some companies reporting an increase of more than three weeks.
- A large number of rail users reported missed switches (60%), reduced service days (46%), increased demurrage charges (43%) and higher rates (42%).
- Only 11% of companies reported that railroad delays and service challenges were improving. 25% said conditions were getting worse and 64% said they were about the same.

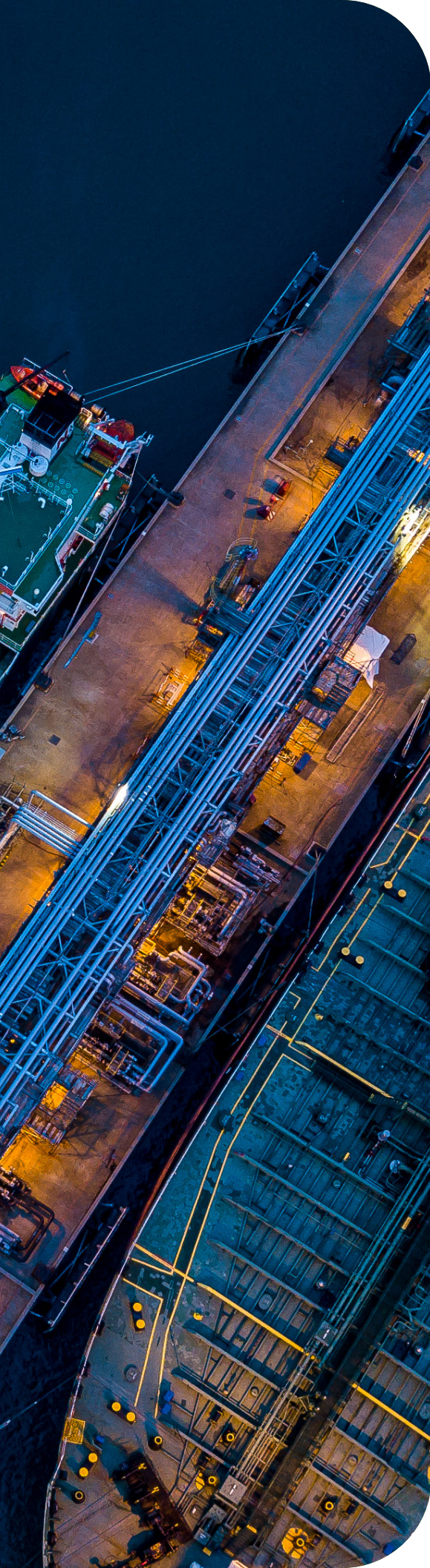
More detailed findings are provided in the survey report.

ACC appreciates the Board's longstanding interest in service and operational challenges impacting rail shippers. If you have any questions, or would like to discuss the survey findings, please contact me at 202/249-7710 or jeffrey_sloan@americanchemistry.com.

Sincerely,

A handwritten signature in dark ink, appearing to read "Jeffrey Sloan", with a stylized, flowing script.

Jeffrey Sloan



Survey Report: Supply Chain & Freight Transportation Constraints for Chemical Manufacturers

SURVEY BACKGROUND

The American Chemistry Council conducted a survey of chemical manufacturers doing business in the U.S. in November and December of 2021. The purpose of the survey was to gain insight regarding chemical manufacturers' challenges in efficient movement of freight across transportation modes and to understand how the challenges are impacting ACC members. Sixty-seven chemical manufacturers participated in the survey.

Every effort has been made in the preparation of this publication to provide the best available information. However, neither the American Chemistry Council, nor any of its employees, agents or other assigns, makes any warranty, expressed or implied, or assumes any liability or responsibility for any use, or the results of such use, of any information or data disclosed in this material.

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).

January 2022

KEY SURVEY FINDINGS

General

- Supply chain and freight transportation disruptions are harming U.S. chemical producers. Among respondents, 99% of companies reported impacts to their U.S. manufacturing business.
- Two thirds reported lost production and nearly all reported shipping delays (94%) and increased transportation costs (93%).
- Among respondents, 85% of companies reported being impacted by shortages of raw materials/inputs and 88% reported increased raw material/inputs costs.
- Supply chain disruptions are reported across U.S., with more than three quarters of companies identifying the South as the most impacted region.
- Over the last year, more than one third of companies experienced or declared *force majeure* as a result of supply chain/freight transportation issues.
- Supply chain and freight transportation disruptions were costly to companies. Nearly all (93%) companies reported costs into the several millions of dollars. While estimates ranged from \$100,000 to \$250 million, nearly a quarter reported costs in the \$1 million to \$3 million range. More than a third of companies reported costs higher than \$20 million.

Ports and Ocean Shipping

- Most companies reported longer transit times (94%), cancelled bookings (84%), and shortages of available shipping containers (73%).
- Port congestion and delays led to increased costs from higher ocean shipping rates (91%), increased detention and demurrage charges (78%) and re-routing (63%).
- By far, the port with the most severe delays/service challenges was Los Angeles/Long Beach. After Los Angeles/Long Beach, the ports with high shares of severe delays were Savannah, Vancouver/Seattle, New York, New Jersey, Houston, Charleston and Great Lakes ports (Chicago and Cleveland).
- Nearly half of companies reported port delays of 4-6 weeks.
- Only 8% of companies reported that port-related delays and congestion are improving. 37% said conditions are getting worse and 55% said they are about the same.

Inland Waterways

- Companies that use inland waterways generally reported fewer impacts than seen in other modes. Still, moderate to severe congestion/delays were experienced by 50% of companies depending on the Intercoastal Waterway, 48% depending on Mississippi River, 38% depending on Illinois River and 19% depending on the Ohio River.

- Companies reported longer shipment times, with shipments taking an average of 6 days longer.
- Most companies (77%) reported that waterways congestion and delays have not changed significantly. Thirteen percent reported that conditions are improving and 10% say they are getting worse.

Railroads

- Companies that ship by rail generally reported “moderate delays and service challenges” across Class I railroads.
- The most significant impacts are reported on CSX, with 44% of customers reporting “severe” delays and service challenges.
- Most rail users reported longer transit times (78%), typically about 8 days longer with some companies reporting an increase of more than three weeks.
- A large number of rail users reported missed switches (60%), reduced service days (46%), increased demurrage charges (43%) and higher rates (42%).
- Only 11% of companies reported that railroad delays and service challenges are improving. 25% said conditions are getting worse and 64% said they are about the same.

Trucking

- Nearly all companies reported either moderate (48%) or severe (48%) delays and capacity constraints in the trucking industry.
- Nearly all companies (98%) reported increased trucking rates.
- 77% of companies reported longer transit times and 68% of companies reported additional delays for shipping hazardous materials.
- Only 5% of companies reported that trucking delays and capacity constraints are improving. 42% said conditions are getting worse and 54% said they are about the same.
- More than one-third of companies indicated an average delay of one week. Estimated delays ranged from 0.5 days to 30 days with an average of 7.9 days.
- However, as one manufacturer put it, the key challenge in trucking was not transit times but availability of equipment and drivers, which impacted costs.
- Additionally, not being able to hire carriers resulted in lost business.

EXAMPLES OF SUPPLY CHAIN DISRUPTIONS AND FREIGHT TRANSPORTATION ISSUES IMPACTS

Chemical manufacturers shared examples about how supply chain disruptions and freight transportation issues are impacting their business. The most frequent examples related to delivery delays, increased costs, production impacts, longer lead times, raw material/input shortages and customer relations. One respondent said, “This situation is absolutely unsustainable.”

*Examples of **Long Lead Times, Delivery Delays** (to customers and from suppliers)*

- Extremely long lead times for bulk shipping resulting in late customer deliveries as well as deliveries of raw materials to our production facilities.
- These unplanned delays make production planning and committed delivery dates difficult.
- Truck deliveries have been impacted by driver and chassis shortages and have resulted in incoming raw material deliveries and outgoing finished goods shipments being late.
- We have missed numerous committed delivery dates to customers.
- Higher in-transit inventories due to longer lead times.

*Examples of **Increased Costs***

A number of respondents noted that increased costs were incurred because they had to change shipping method, such as from rail to truck or air. Companies also noted increased costs due to storage time and/or demurrage.

- Containers stranded in ports for no fault of consignee or shipper yet there are hundreds of thousands of dollars that need to be paid in demurrage charges to the steam ship lines.
- Extra costs because we used more back up carriers to cover loads where preferred carriers were used before.
- Extra costs because supplier inability to provide transportation has resulted in needing to take over inbound transportation routing at spot rates.
- Additional manhours spent than normal following up on delivery / shipment dates as well as crisis management for critical material shortages.
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*Examples of **Impacts on Production and Sales***

Companies noted various impacts on production, from reduced capacity and shutdowns to the need to add additional production (either domestic or abroad) in order to meet demand. Some companies also noted that they have had to increase inventory on hand.

- Supply chain disruptions caused major changes to the production schedule and thus increased operational costs.
- We have increased offshore production to shorten lead times and logistics costs for sales to Asia.
- Constraining production due to late arrival of raw materials or lack of transport equipment to load product, resulting on lost sales and reduced profitability.
- Reducing production rates because raw materials stuck somewhere in the supply chain.
- Non-standard raw materials received requiring extra measures to utilize the raw material.
- Significant amount of business at risk due to increased costs for logistics.
- We are losing business because not able to hire carriers.

*Examples of **Impacts on Customers***

Delayed (or cancelled) orders negatively impacted companies' relationships with their customers. Several companies indicated that the supply chain disruptions caused customers to slow or shut down production.

- Lost customer confidence in our ability to deliver on time due to higher drop rates on loads.
- Shipment delays lead to customer shutdowns.
- The long port delays have impacted our overseas customers' ability to plan production and absorb expediting costs.

DETAILED SURVEY FINDINGS AND COMPANY RESPONSES

Based on 67 responses

1. Overall, have the ongoing supply chain and freight transportation disruptions impacted your company's US chemicals manufacturing business?		
Yes	66	99%
No	1	1%
2. Has your company needed to modify your operations because of supply chain issues and/or transportation disruptions and delays?		
Yes	65	98%
No	1	2%
3. How have the ongoing supply chain and freight transportation disruptions impacted your company's business? Check all that apply.		
We have not experienced any impacts to date	0	0%
Lost US production/ shipments	45	67%
Lost US sales	37	55%
Lost export sales	32	48%
Reduced shipping reliability	63	94%
Delays in shipping to customers	63	94%
Delays in receiving raw materials/inputs	63	94%
Shortages of raw materials/inputs	57	85%
Increased raw material/input costs	59	88%
Increased transportation and logistics costs	62	93%
OTHER: Eight companies mentioned increased labor costs and/or increased transportation labor costs. Other impacts mentioned include increased manufacturing costs due to production schedule variability caused by logistics related constraints; increased steel pricing for capital projects; increased workload/ stress; lead time expansion; need to change freight mode to reduce impact; delays in drop shipments to Mexico and Canada; and deterioration in on-time delivery impacting customer experience.		
4. In which regions of the U.S. has your company been most impacted by supply chain issues and disruptions?		
Northeast	42	63%
South	52	78%
Midwest	40	60%
West	32	48%

5. Please provide your best estimate (in USD \$) of how much your company has been impacted due to the supply chain and freight transportation disruptions from Q4 2020 through Q3 2021. Include historical costs such as lost revenue, higher input costs, higher rates and surcharges, lost downstream business, increased resources required in logistics, etc.		
Quantitative estimates ranged from \$100,000 to \$250 million. The largest share of companies (24%) identified a range of \$1-3M. Seventeen percent of companies estimated losses between \$50M and \$250M.		
Less than \$1M		7%
\$1-3M		24%
\$3-6M		21%
\$6-\$12M		10%
\$12-\$20M		0%
\$20M-\$50M		21%
\$50-\$100 M		12%
\$100-\$250M		5%
6. From Q4 2020 through Q3 2021, did your company experience or declare force majeure as a result of supply chain/freight transportation issues?		
Yes	23	35%
No	42	65%
COMMENTS: One company mentioned the FM was partial (on some business lines). Another company clarified: "Not directly. We were already in force majeure due to lingering effects from Winter Storm Uri, and the current supply chain issues forced us to remain on FM longer than we would have been without the supply chain situation."		

7. Does your company utilize ocean shipping for importing materials?						
Yes				64	96%	
No				3	4%	
8. Does your company utilize ocean shipping for exporting products?						
Yes				59	88%	
No				8	12%	
9. Provide the name/location of the primary ports your business depends on and indicate the severity of delays/congestion experienced in using that port in Q3 2021.						
The Port of Los Angeles/Long Beach experienced most severe delays and service challenges followed by Savannah, Vancouver/Seattle, New York, New Jersey, Houston, Charleston and Great Lakes.						
Port	No Delays/ Service Challenges	Moderate Delays/ Service Challenges	Severe Delays/ Service Challenges		No Delays/ Service Challenges	Severe Delays/ Service Challenges
Los Angeles/Long Beach	2	3	43		4%	90%
Houston	3	24	7		9%	21%
New York/New Jersey	4	14	8		15%	31%
Charleston	1	13	7		5%	33%
Savannah	0	11	10		0%	48%
Norfolk	4	10	4		22%	22%
New Orleans	4	8	1		31%	8%
Vancouver/Seattle	2	3	3		25%	38%
Mobile	4	3	0		57%	0%
Montreal/Halifax	2	4	1		29%	14%
Other Southeast	3	3	2		38%	25%
Other Northeast	3	2	1		50%	17%
Great Lakes	0	1	4		0%	80%
Notes: • Other Southeast includes Jacksonville, Wilmington, Charlotte, and Port Everglades • Other Northeast includes Philadelphia, Baltimore, Chester, Red Hook and Eddystone • Great Lakes includes Chicago and Cleveland						
10. Overall, are port related delays and congestion getting worse?						
Worse				24	37%	
Improving				5	8%	
About the same				36	55%	
11. How are delays and congestion at the ports impacting your business?						
Longer transit times				63	94%	
Cancelled bookings				56	84%	
Shortages or imbalance of shipping containers				49	73%	
Shortages or imbalance of specialized containers (e.g., refrigerated containers, ISO tanks)				44	66%	
Carriers restricting/rejecting specific hazmat commodities				37	55%	
Increased costs from diverting shipments to alternative ports				47	70%	
Increased demurrage/detention charges				52	78%	
Increased rates				61	91%	

Higher costs due to rerouting	42	63%
Security/theft risks for loaded containers stored outside of ports	7	10%
OTHER: • Deterioration in on-time delivery impacting customer experience • Higher costs and capacity shortages, with respect to marine trucking • Late deliveries due to rolled export bookings • severe shortages of dray truck capacity causing shipment delays/rolled bookings • Shortages in raw materials • Truck/driver shortages due to port delays and/or refusal to carry loads in/out of congested ports		
12. If supply chain disruptions related to ocean shipping have resulted in longer shipment times, please provide an estimate of how much longer (in days/weeks), on average.		
The quantitative answers to this question varied from 1 week to 12 weeks, with the largest group of responses (46%) falling within the 4-6 week range.		
2 weeks or less	10	19%
3 weeks	5	9%
4 weeks	16	30%
4-6 weeks	5	9%
3 weeks	5	9%
6 weeks	4	7%
12 weeks	1	2%
Other durations	19	24%
OTHER: • Several months in many cases • 2 - 4 additional weeks on booking, 2 to 4 weeks delay to port of arrival, depending on transloading ports. • Four to six weeks increased shipment times for containers arriving on the West Coast (Long Beach, Los Angeles), Three to five weeks increased shipment times for containers arriving in Vancouver, Canada • Longer transit times to various regions – 2 – 4 weeks ocean • Containers – export – 2 - 3 months delays due to port congestions, delay in loading, inability to book • Containers – import – 3 – 4 months additional lead time required due to booking availability and inland transportation capacity shortage		

13. Does your company utilize inland waterways shipping?		
Yes	31	48%
No	34	52%
14. Consider the primary inland waterways your business depends on and indicate the severity of delays and congestion experienced with inland waterways transportation in Q3 2021.		
<i>Intercoastal Waterway</i>		
No Congestion/ Delays	10	50%
Moderate Congestion/ Delays	8	40%
Severe Congestion/ Delays	2	10%
<i>Mississippi River</i>		
No Congestion/ Delays	12	52%
Moderate Congestion/ Delays	9	39%
Severe Congestion/ Delays	2	9%
<i>Illinois River</i>		
No Congestion/ Delays	10	63%
Moderate Congestion/ Delays	6	38%
Severe Congestion/ Delays	0	0%
<i>Ohio River</i>		
No Congestion/ Delays	13	81%
Moderate Congestion/ Delays	3	19%
Severe Congestion/ Delays	0	0%
15. How are delays and congestion in inland waterways transportation impacting your business?		
<i>Note: frequencies presented are a percent of companies using inland water transportation</i>		
Longer transit times	19	61%
Increased rates	12	39%
Labor shortages	5	16%
OTHER:		
• Deterioration in on-time delivery impacting customer experience • Financial impacts at sites associated with delays in supplying material • minimal impact		
16. Overall, are inland waterways transportation related delays and congestion challenges getting worse?		
Worse	3	10%
Improving	4	13%
About the same	23	77%
17. If supply chain disruptions related to inland waterways transportation have resulted in longer shipment times, please provide an estimate of how much longer (in days/weeks), on average.		
Companies are facing longer shipment times from 2 days longer to as much as 14 days longer. Across companies, shipment times are an average 6 days longer.		

18. Does your company utilize rail shipping?								
Yes				63		95%		
No				3		5%		
Considering companies utilizing rail to receive materials, some companies are receiving less than 10 carloads on average annually while other are receiving as many as 30,000 carloads. Together, survey respondents are receiving about 170,000 carloads annually.								
Considering companies utilizing rail to receive materials, some companies are shipping out less than 10 carloads on average annually while other are shipping out as many as 70,000 carloads. Together, survey respondents are shipping out 565,000 carloads annually.								
19. Please provide the name of the Class I railroads your business depends on and indicate the severity of delays/service challenges experienced with each in Q3 2021.								
Count of Companies dependent on Railroad	RR	No Delays/ Service Challenges	Moderate Delays/ Service Challenges	Severe Delays/ Service Challenges		No Delays/ Service Challenges	Moderate Delays/ Service Challenges	Severe Delays/ Service Challenges
39	UP:	5	30	4		13%	77%	10%
38	CSX:	5	16	17		14%	42%	44%
35	NS:	6	26	3		17%	74%	9%
27	BNSF:	8	17	2		30%	63%	7%
24	CN:	8	13	3		33%	54%	13%
14	KCS:	4	9	1		29%	64%	7%
10	CP (/CPR, CPRS):	6	4	0		60%	40%	0%
20. How are delays/service challenges in rail transportation impacting your business?								
Longer transit times						52	78%	
Missed switches						40	60%	
Reduced service days						31	46%	
Increased demurrage/detention charges						29	43%	
Increased rates						28	42%	
Other: • additional railcar leases • Cost for special switches - more due to PSR • Delays in raw materials; having to ship half loads to customers • Deterioration in on-time delivery impacting customer experience • Less flexibility in storage								
21. Overall, are rail transportation related delays/service challenges getting worse?								
Worse						15	25%	
Improving						7	11%	
About the same						39	64%	
22. If supply chain disruptions related to rail transportation have resulted in longer shipment times, please provide an estimate of how much longer (in days/weeks), on average.								
Companies are facing longer shipment times – typically a week longer (about 8 days). While some companies are facing only a day or so longer other are facing shipment times over 3 weeks longer and as much as 45 days longer.								

23. Does your company utilize truck shipping?		
Yes	65	98%
No	1	2%
23a. If your company utilizes truck shipping, on average: how many truckloads of materials are received annually?		
47 (70%) companies provided data. - Responses ranged from 50 truckloads to 105,000 truckloads with an average of 11,842. 87% of companies receive less than 20,000 truckloads annually. 11 companies (23%) receive 50-500 truckloads annually 13 companies (28%) receive 501-2,000 truckloads annually 13 companies (28%) receive 2,001-10,000 truckloads annually 10 companies (21%) receive more than 10,000 truckloads annually		
23b. If your company utilizes truck shipping, on average: how many truckloads of products are shipped out annually?		
54 companies (81%) provided data. - Responses ranged from 18 truckloads to 180,000 truckloads with an average of 28,489. 34 of 54 companies (63%) ship 20,000 or less truckloads annually 9 companies (17%) ship 1,000 truckloads or less annually 13 companies (24%) ship 1,001-5,000 truckloads annually 12 companies (22%) ship 5,001-20,000 truckloads annually 11 companies (20%) ship 20,001-50,000 truckloads annually 9 companies (17%) ship more than 50,000 truckloads annually; of those, more than half ship 100,000+ truckloads.		
24. Indicate the severity of delays and capacity constraints experienced with truck transportation in Q3 2021.		
No Delays/ Capacity Constraints Experienced	2	3%
Moderate Delays/ Capacity Constraints Experienced	31	48%
Severe Delays/ Capacity Constraints Experienced	31	48%
25. How are delays and capacity constraints in truck transportation impacting your business?		
Longer transit times	50	77%
Additional delays or challenges shipping hazardous materials	44	68%
Increased rates	64	98%
Labor shortages	48	74%
OTHER: - capacity shortage - Carrier no show for appt - Delays in receiving raw materials; having to ship half loads to customers - Deterioration in on-time delivery impacting customer experience - equipment availability, longer lead times, high demurrage/detention costs (import/export drayage) - hours of service - Long lead time to secure bulk trucking - lower delivery performance - Production interruptions - Simply finding a carrier		

26. Overall, are truck transportation related delays and capacity constraints getting worse?		
Worse	27	42%
Improving	3	5%
About the same	35	54%
27. If supply chain disruptions related to truck transportation have resulted in longer shipment times, please provide an estimate of how much longer (in days/weeks), on average, for each mode your company's business depends on.		
43 companies (64%) provided estimates of delay times. - Responses ranged from 0.5 days to 30 days with an average of 7.9 days. - More than one-third of respondents indicated average delays of one week (7 days). 42% of respondents experienced estimated delays between 0.5 days and 3 days 31% of respondents experienced estimated delays of 4-9 days 14% of respondents experienced estimated delays of 10-15 days 14% of respondents experienced estimated delays of 21-30 days Comments: - FTL/LTL: volume can be covered with at least 48 hours lead time, shorter lead time can be covered but with much higher rates. - Bulk Truck: Regular business can be covered with 3 days lead time. Volume increases need 2-3 weeks lead time at least (and higher rates). - Regular business can be covered with 2-3 days lead time. Volume surge needs 4-5 weeks lead time at least (and higher rates). - The issue is getting the orders confirmed by the carriers. Once the trucks are in transit, there are no delays vs historical performance. - The key challenge here is not transit times but availability of equipment and drivers, which is driving increased costs. - We went for 5 to 7 days to secure a truck to at least 21 days lead time. Rate of dropped loads went from 10% to 25%.		

28. Please provide some examples about how supply chain disruptions and freight transportation issues are impacting your business.	
Two-thirds of the respondents provided examples about how supply chain disruptions and freight transportation issues are impacting your business. The most frequent examples related to delivery delays, increased costs, production, raw material/ input shortages and customer relations. One respondent said, "This situation is absolutely unsustainable." <i>Examples of Delivery Delays (to customers and from suppliers)</i> - Extremely long lead times for bulk shipping resulting in late customer deliveries as well as deliveries of raw materials to our production facilities. - Increase in delayed customer deliveries due to rolled bookings, lack of equipment, lack of manpower. - These unplanned delays make production planning, committed delivery dates, etc. difficult. - Truck deliveries have been impacted by driver and chassis shortages and have resulted in incoming raw material deliveries and outgoing finished goods shipments being late. - Unable to accurately project shipment dates. - We have missed numerous committed delivery dates to customers.	

*Examples of **Increased Costs***

A number of respondents noted that increased costs were incurred because they had to change shipping method, such as from rail to truck or air. Companies also noted increases in costs due to storage time and/or demurrage.

- Containers stranded in ports for no fault of consignee or shipper yet there are hundreds of thousands of dollars that need to be paid in demurrage charges to the steam ship lines.
- Extra costs because we used more back up carriers to cover loads where preferred carriers were used before.
- Extra costs because supplier inability to provide transportation has resulted in needing to take over inbound transportation routing at spot rates.
- Higher freight costs pinching margins (both from traditional modes of transport and increase in air freight demand to compensate for late ocean shipments).

*Examples of **Impacts on Production***

Companies noted various impacts on production, from reduced capacity and shutdowns to the need to add additional production (either domestic or abroad) in order to meet demand. Some companies also noted that they have had to increase inventory on hand.

- Supply chain disruptions caused major changes to the production schedule and thus increased operational costs.
- We have increased offshore production to shorten lead times and logistics costs for sales to Asia.
- Higher carrying costs – we need to hold more inventory to compensate for poor ocean carrier reliability.
- Constraining production due to late arrival of raw materials or lack of transport equipment to load product, resulting on lost sales and reduced profitability.
- Reduced operational productivity (same/lower volumes require as much or more resources).
- Reducing production rates because raw materials are stuck somewhere in the supply chain.
- Non-standard raw materials received requiring extra measures to utilize the raw material.

*Examples of **Impacts on Customers***

Delayed (or cancelled) orders negatively impacted companies' relationships with their customers. Several companies indicated that the supply chain disruptions caused customers to slow or shut down production.

- Lost customer confidence in our ability to deliver on time due to higher drop rates on loads.
- Decreased customer satisfaction.
- Shipment delays lead to customer shutdowns.
- The long port delays impacted our overseas customers' ability to plan production and absorb expediting costs.

A number of companies indicated the impact of supply chain disruptions on sales, including **lost sales opportunities**:

- [Supply chain issues have] led to sub-optimal production and break-ins with our technology teams versus working on growth opportunities.

- Organizational opportunity costs driven by resources focused on managing the impacts of raw material delays versus working on value added activities.
- Significant amount of business at risk due to increased costs for logistics.
- We are losing business because not able to hire carriers.

Supply chain disruptions also **affected company personnel**:

- Constant rework lead[ing] to higher resource requirements to manage the supply chain.
- Additional manhours spent than normal following up on delivery / shipment dates as well as crisis management for critical material shortages.
- Significant organizational workload increased due to constant disruptions, schedule changes, fire-fighting of issues.
- Very stressful for employees.

*Examples of **Impacts due to Issues with Labor***

- Rail: no crews to move trains; labor shortages on railroad resulted in missed switches or increased hold time at interchanges, production unit cut rates and customer deliveries impacted.
- Truck: booking of hazmat drivers increasingly difficult and in many cases requires a longer (e.g. 1-2 week) lead time; truck/driver shortages due to port delays and/or refusal to carry loads in/out of congested ports; higher demurrage costs due to driver/chassis shortages.