PHA AXLE LOAD CONTROL REPORT

Reporting Period: October, November, December 2025 and January 2026

Location: Bosaso Axle Load Control Station

Prepared By: **Puntland Highway Authority** | Website: www.pha.pl.so

Executive Summary

Axle load control is essential for protecting road infrastructure, enhancing safety, and extending the lifespan of pavements. Overloaded vehicles accelerate pavement deterioration, increase maintenance costs, and elevate the risk of traffic accidents. The monthly monitoring at Bosaso station aims to control vehicle overloading, enforce axle load regulations, and safeguard road infrastructure. During the reporting period (October 2025 – January 2026), 5,898 vehicles were weighed at Bosaso station, with trucks representing 89.3% of the total. Medium to heavy trucks, particularly three-axle vehicles (55.5%) with tandem axle configurations (60.5%), dominated the traffic. Most vehicles were outbound (93.3%) and destined for Puntland regions (75.87%), with smaller shares heading to Ethiopia and other Somali regions. The vehicle overloading analysis at the Bosaso station revealed that 3,994 out of 5,894 vehicles weighed (67.8%) exceeded legal axle load limits, indicating widespread non-compliance and significant risk to road infrastructure. Medium and heavy trucks, particularly three-axle vehicles, were the main contributors, with an average measured weight of 45,277 kg—20,204 kg above the legal limit—and a total quarterly excess load of 66,108,268 kg. Six-axle vehicles with trailers were the most overloaded category, exceeding permissible weights by an average of 23,310 kg, with a maximum excess of 50,100 kg recorded during the period. Overloading was most prevalent among tandem axle vehicles, which accounted for 80.3% of all overloaded vehicles, while trucks represented 86.7% of overloaded vehicles, emphasizing the need for targeted enforcement to protect roads and enhance transport safety. The recommendations focus on strengthening axle load enforcement and improving compliance by targeting high-risk trucks, especially tandem and multi-axle vehicles, through regular spot checks, stricter penalties, and awareness campaigns for drivers and freight operators on legal weight limits and overloading risks. Additional measures should include optimizing monitoring during peak traffic periods, maintaining detailed data collection to track trends and evaluate enforcement effectiveness, and coordinating with neighboring regions on cross-border regulations.

Soo-koobid (Executive Summary)

Xakamaynta culayska axle-ka (Axle Load Control) waa arrin muhiim u ah ilaalinta kaabayaasha waddooyinka, kor u qaadista badbaadada, iyo kordhinta cimriga laamiyada. Gaadiidka xad-dhaafka ah ee culayska saaraa waxay si degdeg ah u dedejiyaan burburka laamiga, kordhiyaan kharashaadka dayactirka, isla markaana sare u qaadaan khatarta shilalka gaadiidka. Kormeerka bille ah ee saldhigga Bosaso waxaa loogu talagalay in lagu xakameeyo culayska gaadiidka, lagu dhaqan-geliyo xeerarka axle-ka, isla markaana lagu ilaaliyo kaabayaasha waddooyinka.

Intii lagu jiray muddada warbixinta (Oktoobar 2025 – Janaayo 2026), waxaa la miisaamay 5,898 gaari saldhigga Bosaso, iyadoo baabuurta xamuulka qaada (trucks) ay ahaayeen 89.3% wadarta guud. Gaadiidka dhexdhexaadka ilaa kuwa culus, gaar ahaan baabuurta saddex-axle leh (55.5%) iyo kuwa leh tandem axle (60.5%), ayaa ahaa kuwa ugu badan ee isticmaalayay waddada. Inta badan gaadiidka waxay ahaayeen kuwa ka baxaya Bosaso (93.3%), iyagoo u socda gobollada Puntland (75.87%), halka boqolkiiba yar ay u socdeen Itoobiya iyo gobollada kale ee Soomaaliya.

Falanqaynta culayska gaadiidka ee saldhigga Bosaso waxay muujisay in 3,994 ka mid ah 5,894 gaari ee la miisaamay (67.8%) ay dhaafeen xadka sharci ee culayska axle-ka, taasoo tilmaamaysa in aan si buuxda loo raacin shuruucda isla markaana ay jirto khatar weyn oo ku wajahan kaabayaasha waddooyinka. Gaadiidka dhexdhexaadka iyo kuwa culus, gaar ahaan saddex-axle, ayaa ahaa kuwa ugu badan ee culayska xad-dhaafka ah sameeya, iyadoo celceliska miisaankoodu ahaa 45,277 kg — taasoo ka badan xadka sharci ee la oggol yahay 20,204 kg — isla markaana wadarta culayska xad-dhaafka ah ee saddexda bilood gaadhay 66,108,268 kg. Gaadiidka lix-axle leh ee wata trailer-ro ayaa ahaa qaybta ugu badan ee culayska dhaaftay, iyagoo celcelis ahaan ka badnaa culayska la oggol yahay 23,310 kg, halka xad-dhaafka ugu sarreeya uu gaaray 50,100 kg muddadaas.

Culayska xad-dhaafka ah ayaa si gaar ah ugu badnaa gaadiidka tandem axle leh, kuwaas oo ka dhigay 80.3% dhammaan gaadiidka culayska dhaafay, halka trucks-ku ay ahaayeen 86.7% gaadiidka xad-dhaafka sameeyay. Tani waxay muujinaysaa baahida loo qabo adkeynta fulinta shuruucda si loo ilaaliyo waddooyinka loona kordhiyo badbaadada gaadiidka.

Talooyinka waxaa ka mid ah xoojinta dhaqan-gelinta xeerarka axle-ka iyadoo si gaar ah loo bartilmaameedsanayo gaadiidka halista sare leh, gaar ahaan kuwa tandem iyo multi-axle, iyadoo la sameynayo kormeerro joogto ah (spot checks), ganaaxyo adag, iyo olole wacyigelin ah oo loo sameeyo darawallada iyo shirkadaha xamuulka qaada si ay u fahmaan xadka sharci ee culayska iyo khataraha culayska xad-dhaafka ah. Sidoo kale waxaa muhiim ah in la hagaajiyo kormeerka xilliyada gaadiidku ugu badan yahay, la joogteeyo ururinta xogta si loo falanqeeyo isbeddellada iyo waxtarka tallaabooyinka la qaaday, isla markaana lala shaqeeyo gobollada deriska ah si loo waafajiyo xeerarka gaadiidka ee xuduudaha ka gudba.

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1.0 Introduction

Axle load control is a critical mechanism for protecting road infrastructure, enhancing road safety, and extending the lifespan of pavements. When heavy vehicles exceed prescribed weight limits, they exert excessive pressure on road surfaces, accelerating pavement deterioration and causing structural damage such as cracks, rutting, and potholes. This results in frequent maintenance requirements, increased rehabilitation costs, and a significantly reduced service life of transport networks. Effective axle load regulation minimizes pavement damage, lowers maintenance expenditure, and reduces the likelihood of traffic accidents associated with overloaded trucks. Proper enforcement of axle load limits also promotes fair competition among transport operators and preserves public investment in road infrastructure, thereby supporting sustainable transport systems and regional economic connectivity.

The Puntland Highway Authority (PHA) is the government agency mandated to develop, maintain, and regulate road infrastructure within Puntland. As part of its regulatory function, the Authority oversees axle load control to ensure compliance with transport regulations and to protect public roads from premature deterioration caused by overloading. Prior to the full implementation and strengthening of the Axle Load Act, the PHA undertook systematic data collection to assess existing loading practices, generate evidence-based insights, and inform policy improvements and effective enforcement strategies.

Through its Bosaso Axle Load Control Station, the PHA plays a central role in monitoring vehicle axle loads and enforcing compliance with established regulations. The station serves as a strategic checkpoint for vehicles transporting goods within and beyond the region, ensuring adherence to permissible weight limits. Regular inspections, weighing procedures, and enforcement measures, supported by collected data, help curb overloading practices, safeguard road infrastructure, and enhance safety and efficiency within the transport sector.

This report presents an analysis of vehicle characteristics and overloading patterns at the Bosaso station for the four-month reporting quarter covering October, November,

and December 2025, and January 2026. It examines the distribution of vehicles weighed by month, vehicle type, number of axles, axle group type, movement patterns in Bosaso, and vehicle loading destinations. The report further focuses on vehicle overloading analysis, including axle load compliance, comparison of legal weight versus measured weight and excess load, maximum excess load, total quarterly excess load by number of axles, and the relationship between vehicle type and axle group type with axle load compliance. This analysis provides insights into enforcement effectiveness, identifies overloading trends, and highlights patterns critical for improving road safety and protecting infrastructure.

2.0 Objectives of the Monthly Monitoring

The main objectives of axle load monitoring at Bosaso station are:

- To control and reduce vehicle overloading
- To protect road infrastructure from premature damage
- To enforce axle load regulations
- To collect reliable traffic and axle load data
- To improve compliance among freight operators

3.0 Objectives of the Study

1. To assess the extent and patterns of vehicle overloading at the Bosaso Axle Load Control Station through the analysis of axle load compliance.
2. To develop and strengthen axle load policies and improve the implementation of the Axle Load Act based on the prevailing vehicle load conditions and identified overloading trends.
3. To review and align existing legal axle load limits with regional standards, particularly those applied in East African countries such as Kenya and Ethiopia, in order to ensure consistency and competitiveness in cross-border transport operations.

4.0 Survey Results

The section presents the findings obtained from the collected data. It provides a detailed analysis of participants' responses across key variables, highlighting trends, patterns, and relationships relevant to axle load monitoring. This section is organized into two main parts: Vehicle Characteristics and Vehicle Overloading Analysis. Presenting the data using tables, figures, and descriptive statistics allows for a clear understanding of the results.

4.1 Vehicle Characteristics

This covers the analysis of vehicle characteristics, including the distribution of vehicles weighed by month, vehicle type, number of axles, axle group type, movement patterns in Bosaso, and vehicle loading destinations.

4.1.1 Distribution of Vehicles Weighed by Months

During the reporting period, a total of 5,898 vehicles were weighed at the Bosaso station, averaging 1,474 vehicles per month. The highest traffic was observed in October and November, with 1,990 (33.7%) and 1,499 (25.4%) vehicles respectively, while December and January recorded lower counts of 1,219 (20.7%) and 1,190 (20.2%) vehicles. This distribution indicates that vehicle movement was heaviest at the start of the quarter (October and November), gradually declining towards January.

Table 1: Distribution of Vehicles Weighed by Months

	Frequency	Percent
October	1990	33.7
November	1499	25.4
December	1219	20.7
January	1190	20.2
Total	5898	100.0

4.1.2 Vehicle Type

The data on vehicle types, as shown in **Figure 1**, indicates that trucks accounted for the majority of vehicles weighed at the Bosaso station, representing 89.3% of the total, while trailers made up only 10.7%. This suggests that standard trucks dominate the

traffic flow, highlighting that axle load monitoring and enforcement efforts primarily focus on trucks, with trailers forming a smaller proportion of vehicles using the road network.

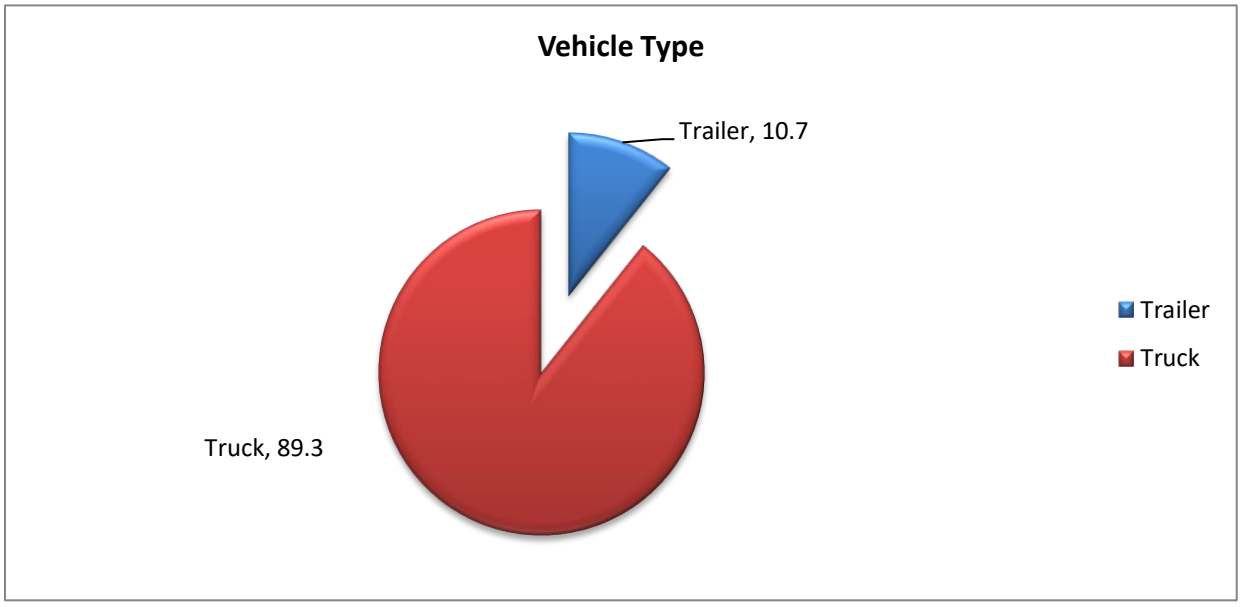

Figure 1: Vehicle Type

4.1.3 Number of Axles

The distribution of vehicles by number of axles, as presented in **Table 2**, shows that most vehicles weighed at the Bosaso station were 3-axle vehicles, accounting for 55.5% (3,273) of the total. Two-axle vehicles were the next most common, representing 31.2% (1,839), while six-axle vehicles accounted for 11.5% (681). Vehicles with four or five axles, including combinations with trailers (Rimoor), were comparatively rare, totaling less than 2% of the sample. This distribution indicates that medium-sized trucks dominate traffic at the checkpoint, with heavier multi-axle trucks forming a smaller proportion, which has implications for axle load monitoring and the potential impact on road infrastructure.

Table 2: Number of Axles: Please select the number of axles of the vehicle

Number of Axles	Frequency	Percent
2 (gaari leh 2 Cadho) Max 24,000	1839	31.2
3 (gaari leh 3 Cadho) Max 26,000	3273	55.5
4 (gaari leh 4 Cadho) Max 28,000	34	.6
4 gaari 4 cadho + Rimoor =34,000	5	.1
5 gaari 5 cadho + Rimoor =42,000	65	1.1
6 gaari 6 cadho + Rimoor =48,000	681	11.5
Total	**5897**	**100.0**

4.1.4 Axle Group Type

The distribution of vehicles by axle group type, as shown in **Figure 2,** indicates that tandem axles were the most common, representing 60.5% (3,568) of all vehicles weighed at the Bosaso station. Single-axle vehicles accounted for 31.1% (1,831), while tridem-axle vehicles were the least common at 8.4% (496). This suggests that the majority of vehicles on the road are medium to heavy trucks with tandem axle configurations, which are likely to carry heavier loads. The predominance of tandem axles highlights the importance of targeted axle load monitoring to prevent overloading and protect road infrastructure from accelerated wear and damage.

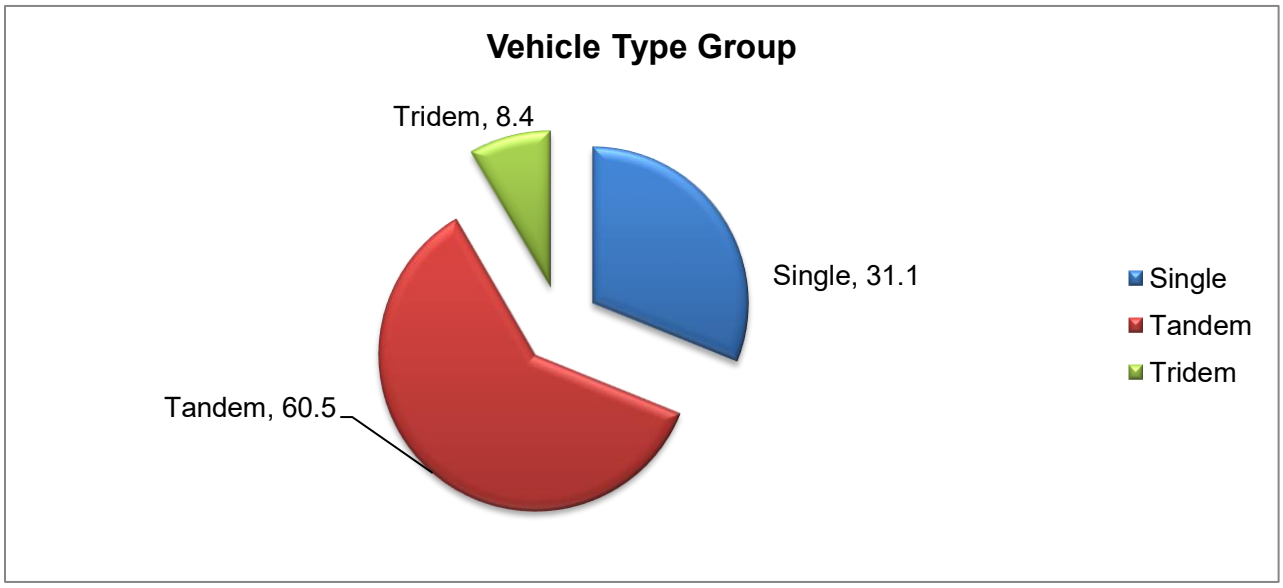

Figure 2: Axle Group Type

4.1.5 Movement of Vehicles in Bosaso

The movement of vehicles in Bosaso, as shown in **Figure 3**, indicates that the vast majority of vehicles, 93.3%, were outbound, while only 6.7% were inbound. This suggests that Bosaso serves primarily as an exit point for goods and transport vehicles, highlighting the station's strategic role in monitoring outbound traffic. The high proportion of outgoing vehicles also emphasizes the importance of axle load enforcement at this checkpoint to prevent road damage and ensure safety for the heavier traffic leaving the region.

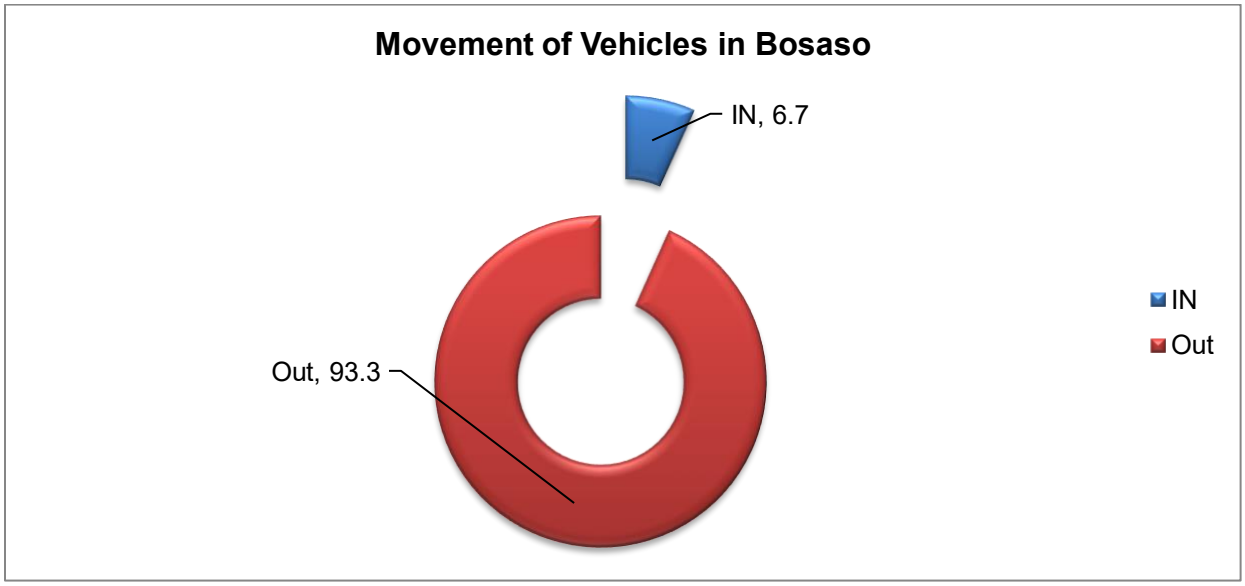

Figure 3 : Movement of Vehicles in Bosaso

4.1.6 Vehicle Loading Destination

The data on Vehicle Loading Destination, as shown in **Figure 4**, indicates that the majority of vehicles weighed at the Bosaso station were loaded for destinations within Puntland regions (75.87%). A smaller proportion were headed to Ethiopia (14.50%), Southern Somalia (7.94%), Northern Somalia (1.55%), and other regions of Somalia (0.14%). This distribution highlights Bosaso's role as a central transport hub for intra-regional trade within Puntland, while also serving as a key point for cross-border transport to Ethiopia and other parts of Somalia. The data underscores the need for effective monitoring of vehicle loads to safeguard roads that support both domestic and regional trade flows.

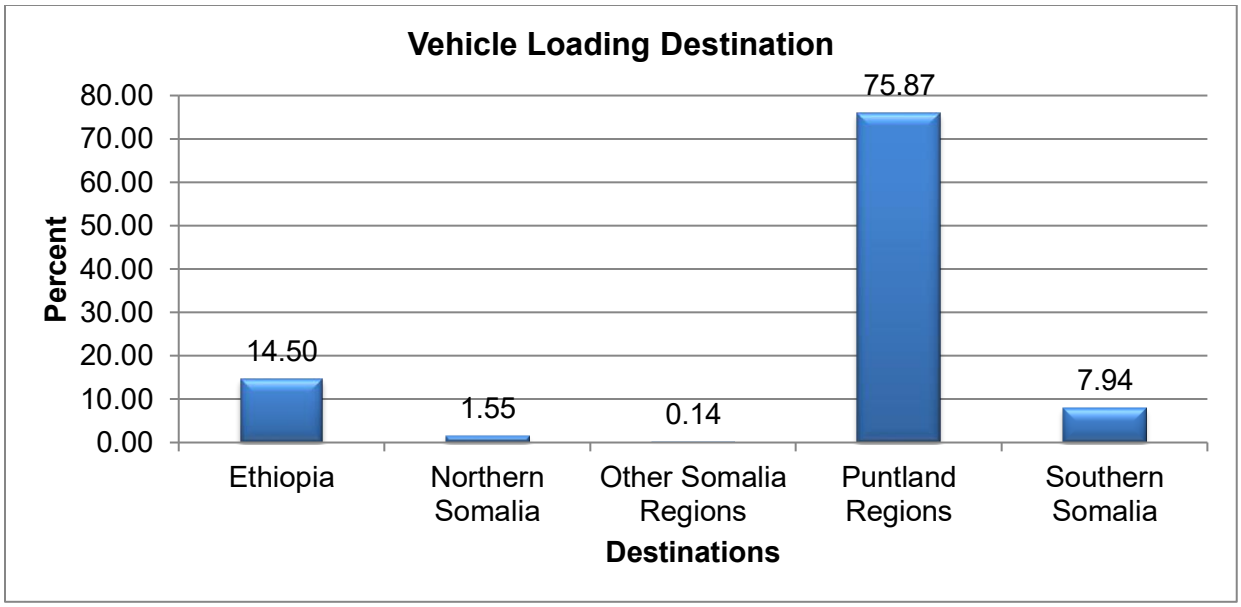

Figure 4: Vehicle Loading Destination

4.2 Vehicle Overloading Analysis

This section focuses on vehicle overloading analysis, covering axle load compliance, comparison of legal weight versus measured weight and excess load, maximum excess load, total quarterly excess load by number of axles, and the relationship between vehicle type and axle group type with axle load compliance.

4.2.1 Axle Load Compliance

The data on axle load compliance, as illustrated in **Figure 5**, indicates that out of 5,894 vehicles weighed at the Bosaso station, 3,994 (67.8%) were overloaded, while only 1,900 (32.2%) complied with the legal weight limits. This shows that more than two-thirds of vehicles exceeded permissible axle loads, highlighting widespread non-compliance. Such high levels of overloading pose significant risks to road infrastructure, accelerate pavement deterioration, and increase the likelihood of accidents, underscoring the urgent need for stricter enforcement and monitoring of axle load regulations to protect the transport network and ensure safer, more sustainable road usage.

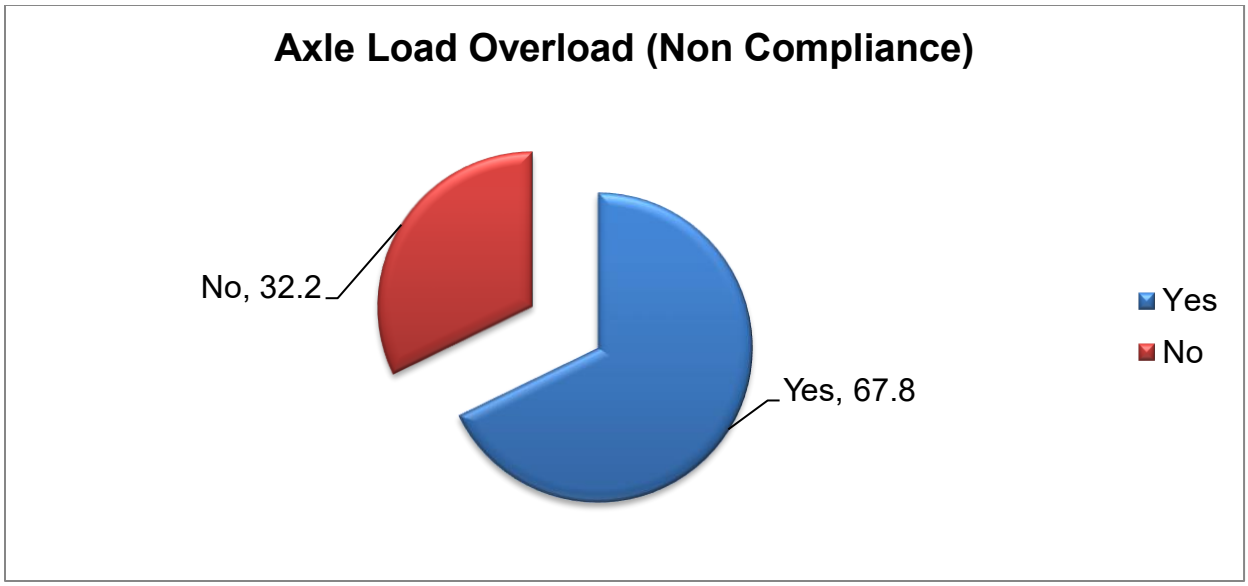

Figure 5: Axle Load Compliance

4.2.2 Comparison of Legal Weight Allowed, Measured Weight and Excess Load

The comparison of legal weight allowed and total measured weight, as presented in **Table 3**, shows that all vehicle categories exceeded the permissible weight limits on average. Two-axle vehicles averaged 17,671 kg, slightly above the limit by 985 kg, while three-axle vehicles were substantially overloaded, averaging 45,277 kg—20,204 kg above the legal limit. Four-axle vehicles exceeded their limit by 15,438 kg, and four-axle vehicles with trailers were over by 7,836 kg. Five-axle vehicles with trailers surpassed the limit by 16,857 kg, and six-axle vehicles with trailers were the most overloaded, exceeding the allowed weight by 23,310 kg. These findings highlight persistent overloading across all vehicle types, posing serious risks to road infrastructure and emphasizing the need for stringent axle load control measures.

Table 3: Comparison of Legal Weight Allowed, Measured Weight and Excess Load

Number of Axles	Legal Weight Allowed (Average) (in KGs)	Total Measured Weight (Average) (in KGs)	Excess Load (Average) (in KGs)
2 Axles (Gaari leh 2 Cadho)	24000	17670.96	985.24
3 Axles (Gaari leh 3 Cadho)	26000	45277.08	20204.24
4 Axles (Gaari leh 4 Cadho)	28000	42930.59	15438.24
4 Axles Axles + Trailer	34000	30436	7836.00
5 Axles + Trailer	42000	53537.85	16856.92
6 Axles+ Trailer	48000	68295.86	23309.68

4.2.3 Maximum Excess Load

Figure 6 illustrates the maximum excess load recorded for vehicles by axle category. Two-axle vehicles exceeded the legal limit by as much as 29,300 kg, while three-axle vehicles reached a maximum overload of 38,200 kg. Four-axle vehicles recorded 43,820 kg, and four-axle vehicles with trailers were overloaded by up to 17,000 kg. Five-axle vehicles with trailers had a maximum excess of 44,380 kg, and six-axle vehicles with trailers recorded the highest overload at 50,100 kg. These extreme values indicate severe overloading among heavy vehicles, which can significantly damage road infrastructure, accelerate pavement deterioration, and increase safety risks on the transport network.

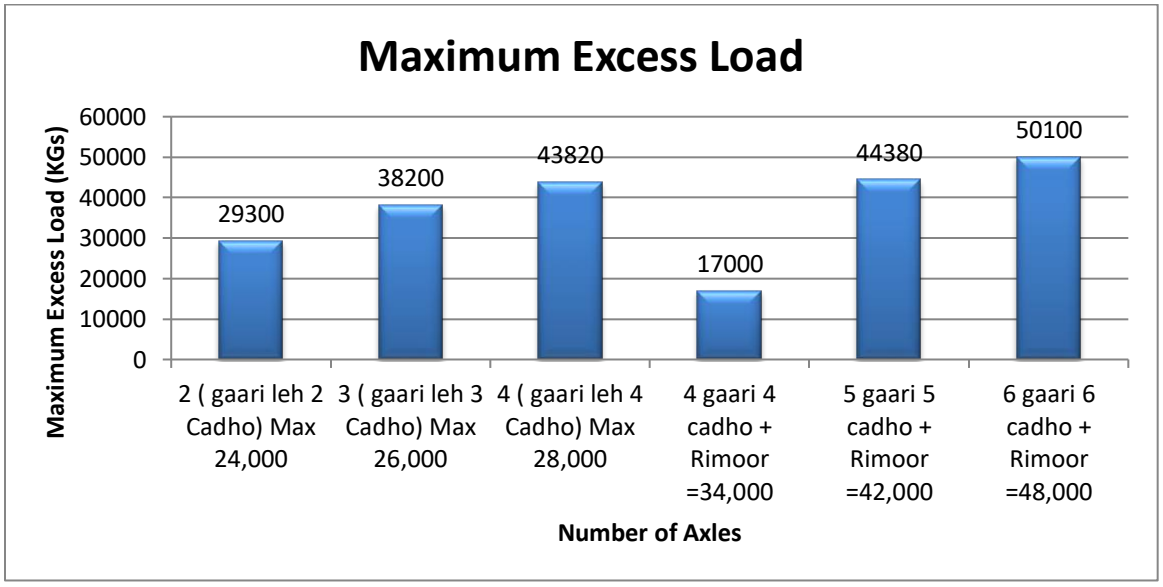

Figure 6: Maximum Excess Load

4.2.4 Total Quarterly Excess Load by Number of Axles

Figure 7 presents the total excess load recorded by number of axles. Three-axle vehicles contributed the highest cumulative overload, totaling 66,108,268 kg, followed by six-axle vehicles with trailers at 15,850,580 kg. Two-axle vehicles had a total excess of 1,809,880 kg, while five-axle vehicles with trailers contributed 1,095,700 kg. Four-axle vehicles without trailers added 524,900 kg, and four-axle vehicles with trailers had the lowest total excess at 39,180 kg. These figures highlight that medium and heavy trucks, particularly three-axle and six-axle vehicles, are the main contributors to overloading, posing significant risks to road infrastructure and emphasizing the need for effective axle load enforcement.

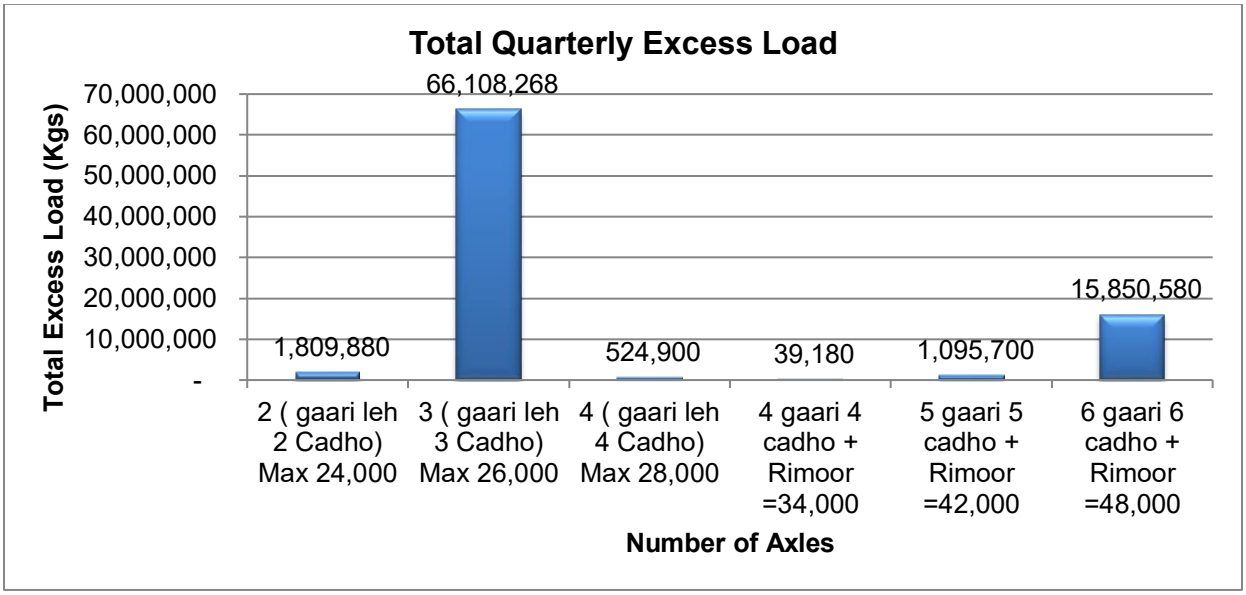

Figure 7: Total Quarterly Excess Load by Number of Axles

4.2.5 Vehicle Type and Axle Load Compliance

The cross-tabulation in **Table 4** illustrates how axle load compliance varies by vehicle type, highlighting differences in overloading between trucks and trailers. Among the 3,990 overloaded vehicles, the majority were trucks (3,458; 86.7%), while trailers accounted for 532 (13.3%). For vehicles that complied with legal limits, 1,797 trucks (94.7%) and 100 trailers (5.3%) were within weight regulations. Overall, trucks represent the largest share of both overloaded and compliant vehicles, reflecting their dominant role in cargo transport and their higher likelihood of overloading due to greater carrying

capacity. These findings emphasize the need to target trucks in axle load enforcement to reduce road damage and enhance safety across transport networks.

Table 4: Crosstabulation of Vehicle Type and Axle Load Compliance

			Overloaded		Total
			Yes	No	
Vehicle Type	Trailer	Vehicles	532	100	632
		% within Overloaded	13.3%	5.3%	10.7%
	Truck	Vehicles	3458	1797	5255
		% within Overloaded	86.7%	94.7%	89.3%
Total		Vehicles	3990	1897	5887
		% within Overloaded	100.0%	100.0%	100.0%

4.2.6 Axle Group Type and Axle Load Compliance

The crosstabulation of axle group type and axle load compliance, presented in **Table 5**, shows that overloading is most common among tandem axle vehicles, with 3,207 (80.3%) of the overloaded vehicles in this category. Single-axle vehicles make up 356 (8.9%) of the overloaded total, while tridem-axle vehicles account for 430 (10.8%). Among vehicles that complied with legal limits, the majority were single-axle vehicles (1,474; 77.7%), followed by tandem (358; 18.9%) and tridem (66; 3.5%). Overall, tandem axle vehicles represent the largest share of both overloaded and compliant vehicles, highlighting their higher risk of overloading due to heavier cargo capacity and emphasizing the need for targeted enforcement measures to protect road infrastructure and ensure transport safety.

Table 5: Crosstabulation of Axle Group Type and Axle Load Compliance

			Overloaded		Total
			Yes	No	
Axle Group Type	Single	Vehicles	356	1474	1830
		% within Overloaded	8.9%	77.7%	31.1%
	Tandem	Vehicles	3207	358	3565
		% within Overloaded	80.3%	18.9%	60.5%
	Tridem	Vehicles	430	66	496
		% within Overloaded	10.8%	3.5%	8.4%
Total		Vehicles	3993	1898	5891
		% within Overloaded	100.0%	100.0%	100.0%

5.0 Conclusion

The survey results highlight critical insights into vehicle characteristics and their implications for axle load monitoring at the Bosaso station. Analysis of vehicle distribution shows that the majority of vehicles weighed were trucks (89.3%), predominantly medium to heavy vehicles with three axles (55.5%) and tandem axle configurations (60.5%). Vehicle movement patterns indicate that Bosaso serves primarily as an outbound transport hub, with most vehicles destined for Puntland regions (75.87%) and a smaller share heading to Ethiopia and other Somali regions.

The vehicle overloading analysis at the Bosaso station reveals a widespread challenge in axle load compliance, with 67.8% of the 5,894 vehicles weighed exceeding legal weight limits. Three-axle and six-axle vehicles contributed the largest total and maximum excess loads, highlighting that medium and heavy trucks are the primary sources of overloading. Maximum overloads reached as high as 50,100 kg, showing the severity of the problem and the potential damage to road infrastructure, accelerated pavement deterioration, and increased safety risks. The results clearly indicate that overloading is not only prevalent but also concentrated among vehicles with higher axle capacities, emphasizing the need for targeted enforcement interventions.

6.0 Recommendations

1. **Enhance Targeted Enforcement for High-Risk Vehicles:** Focus axle load monitoring and enforcement on trucks, particularly those with tandem and multi-axle configurations, as they represent the majority of overloaded vehicles and contribute the largest excess loads. Implement periodic spot checks and stricter penalties for repeat offenders to deter overloading.
2. **Strengthen Compliance Awareness Among Freight Operators:** Conduct regular training and awareness campaigns for truck drivers, transport companies, and freight operators on legal weight limits, the risks of overloading, and the benefits of compliance for road safety and infrastructure preservation.
3. **Optimize Monitoring Resources by Traffic Patterns:** Use the monthly distribution data to schedule monitoring and enforcement more intensively during peak months (October and November) and target outbound traffic, which constitutes over 93% of vehicles at Bosaso.
4. **Maintain Comprehensive Data Collection and Reporting:** Continue collecting detailed axle load and vehicle characteristic data to monitor trends over time. Use this data to evaluate the effectiveness of enforcement measures and inform policy adjustments to improve compliance.
5. **Promote Regional Coordination for Cross-Border Traffic:** Given that a significant portion of vehicles are destined for Ethiopia and other Somali regions, coordinate with regional transport authorities to harmonize axle load limits and enforcement practices, reducing overloading risks across borders.
6. **Introduce Incentives for Compliance:** Consider implementing incentive programs for transport operators who consistently comply with axle load regulations, such as reduced inspection times, recognition awards, or priority access to key routes.