



# KENYA ROADS BOARD

## CONSULTANCY SERVICES FOR AXLE LOAD MONITORING IN KENYA (WESTERN PACKAGE)

### FINAL REPORT



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## **LIST OF ACRONYMS**

ALC	Axle Load Control
FTCC	Full Traffic Control Centre
HSWIM	High Speed Weigh in Motion Equipment
KeNHA	Kenya National Highways Authority
KeRRA	Kenya Rural Roads Authority
KRB	Kenya Roads Board
KURA	Kenya Urban Roads Authority
LCC	Lay-by Control centre
SPSS	Statistical Software for Social Scientists
TCC1	Traffic Control Centre Type 1
TCC5	Traffic Control Centre Type 5
Serg.	Sergeant
Corp.	Corporal
Const.	Constable
Snr Supt	Senior Superintendent
SGS	Sales Group Scandinavian

## **EXECUTIVE SUMMARY**

### **Ex1: Introduction**

Kenya Roads Board (KRB) commissioned CAS Consultants Ltd to carry out Consultancy Services for study of Axle Load Monitoring in Western Region of Kenya. The Western Region covers the former Rift Valley, Western and Nyanza Provinces.

Road Transport is the main mode of transport in Kenya carrying the largest share of freight and passenger traffic. The roads are designed to bear a given traffic loading over their lifetime and the damaging effect depends on the axially applied loads by the vehicles using the roads.

In order to address the problem of overloading of HGVs on the roads, Axle Load Control is currently being undertaken by Kenya National Highways Authority along International and National Trunk Roads through static and mobile weighbridge sites. In the Western Region, there are 4 static weighbridges (Gilgil, Webuye, Busia and Rongo) currently existing. Previously, there were additional weighbridge sites at Maai Mahiu, Kisumu and Eldoret. These were removed as part of Kenya Government's commitment to facilitate cargo movement from the Port of Mombasa to the neighbouring countries of destination.

Additionally, the Kenya Urban Roads Authority and the Kenya Rural Roads Authority are conducting periodic Axle Load Monitoring on the urban and rural networks respectively, using mobile weighbridges.

Currently, Kenya National Highways Authority have privatized the management of their weighbridges but still independently carry out periodic monitoring using mobile weighbridges to assess the operations.

### **Ex2: Objectives of Consultancy**

The objectives of this Consultancy are to:-

- Independently review the effectiveness of the enforcement of axle load control measures being undertaken by the Roads Authorities of the Ministry of Transport and Infrastructure and to make recommendations to enhance compliance.
- Using collected axle load statistical data establish historical trends at major trunk roads and critical rural and urban links and recommend a suitable ALC control regime.

### **Ex3: Scope of Works**

The axle load monitoring covers the Western Region under the name western package. The Consultancy shall also cover the major urban areas of Kisumu, Nakuru and Eldoret including data capture for critical urban and rural links and the recently completed bypass roads.

The tasks to be undertaken by the Consultant under Western package will include, but not necessarily be limited to the following;

- a) In liaison with the Police department, undertake monthly field visits by one field team to independently weigh all heavy goods vehicles, using mobile weighbridge equipment to be provided by KRB at 4 No. sites to be agreed beforehand with KRB.
- b) Undertake monthly monitoring visits to existing KeNHA static and mobile weighbridges at 4 No. sites for 24 hours on random days.
- c) Review, collate and analyze weighing data prepared by road authorities and correlate with independent data collected by the Consultant under task (a) and (b) above.
- d) Assess the maintenance and calibration status of the weighbridge equipment at the established weighbridge stations.
- e) Develop software for storage and analysis of weighing data and prepare customized weigh measurement reports.
- f) Train selected KRB staff to use the axle load database developed by the Consultant.
- g) The Consultants shall carry out independent ad-hoc visits quarterly with the Finance and Planning Committee of the Board as advised.

- h) Review the current Axle Load Regime and Implementation measures currently being undertaken by the Roads Authorities to enhance ALC operations during reporting period in line with the recommendations of the “Best Options” Study.
- i) Prepare and submit monthly progress briefs, quarterly and annual axle load monitoring reports to KRB in both hard and soft copy.
- j) Prepare and present to a stakeholder’s workshop, annual report on axle load monitoring. Two workshops shall be held during project duration.

#### **Ex4: Commencement of Services**

The consultancy services commenced on 10<sup>th</sup> September 2012 via letter Ref. KRB/PP/32.21/A.Vol. III (17). The Contract duration is 27 months.

#### **Ex5: Rationale for Axle Load Control**

Overloading has been identified as one of the major causes of road deterioration along Kenyan roads and imposes an extra cost onto society in terms of future costs of road maintenance and rehabilitation which must be financed by the Government.

The following benefits are expected from axle load control:

- Control of the “consumption” of the road pavement in a balanced and cost effective manner;
- Provision of a safe framework within which the vehicles concerned may operate and the road pavements can be protected in accordance with the design standards used for the road and the vehicle;
- Efficient operation of the road transport system;
- Promotes fair and efficient competition in the trucking industry by not giving unfair advantage to operators who do not comply with rules and regulations pertaining to loading of vehicles.
- Reduction in road hazard imposed by overloaded vehicles, and

- Reduced congestion and inconvenience to public caused by road repairs necessitated by overloading.

### **Ex6: Key Findings by the Consultant**

#### **KeNHA Weighbridges Findings on Equipment, Facilities, Personnel and Management**

- All the weighbridges have been privatized and are managed by SGS.
- All the Weighbridges are calibrated every three months.
- At all the weighbridges; new security measures have been undertaken with installation of Biometric readers at the entrances to the Managers' offices and the weighing rooms. This is intended to restrict access to unauthorised persons.
- At the Weighbridges; CCTV Cameras have now been fully installed and the Managers are now able to monitor weighing operations from their offices.
- At Busia Weighbridge; the new static weighbridge is complete and operational.
- At Busia Weighbridge; lack of a holding bay has been affecting operations mostly in cases where the trucks are required to re-distribute their load.
- At Gilgil Weighbridge; the approaches and exits are still in a poor condition.
- At Gilgil Weighbridge; the Multi-deck weighbridge has been breaking down now and then, though operations are not adversely affected since the Static Weighbridges are operational and one is always on standby.
- At Gilgil and Webuye Weighbridges; the constant problem faced by the Multi-deck weighbridges has been failure of the loading cells and mostly the front loading cells.
- At Gilgil and Webuye Weighbridges: The High Speed Weigh-in-motion weighbridges were now operational and congestion at the weighbridges has been substantially reduced. Only overloaded or nearly overloaded vehicles are directed into the static weighbridges inside the stations for confirmatory weighing. Otherwise the trucks are allowed to pass.
- At Gilgil and Webuye Weighbridges: A policeman and an SGS staff have been stationed at the start of the screening lane to divert trucks into the screening lane.

- At Webuye Weighbridge; the entrance and exit to the station and the holding bay have been fully rehabilitated. The location of the mobile weighbridge has also been rehabilitated.

### **KeNHA Weighbridges Monitoring Data**

- A total of **41,550** vehicles were weighed during the period of monitoring. Average Overloading per axle is **49.24%** while overloading per GVW is **1.96%**
- Average un-diverted HGV traffic is **46.55%**. The highest quarterly average un-diverted traffic of **56.63%** was recorded in the **2<sup>nd</sup> Quarter** while the lowest average un-diverted traffic of **34.40%** was recorded in the **1<sup>st</sup> Quarter**.
- The **highest** Quarterly Average **Axle** Overload is **78.08%** recorded during the **4<sup>th</sup> Quarter** while the **lowest** Quarterly average of **31.21%** was recorded during the **6<sup>th</sup> Quarter**.
- The **highest** Quarterly Average **GVW** Overload is **3.35%** recorded during the **1<sup>st</sup> Quarter**. The lowest Quarterly average GVW overload is **0.79%** recorded during the **7<sup>th</sup> Quarter**.
- For the entire monitoring period, **Webuye** Weighbridge recorded the highest average **Axle** Overloads of **56.06%** while **Rongo** Weighbridge recorded the lowest at **33.67%**.
- For the entire monitoring period, **Rongo** Weighbridge recorded the highest average **GVW** overloads at **3.69%** while **Gilgil** Weighbridge recorded the lowest at **1.34%**.
- **6C** was the most overloaded axle type during monitoring at **4.62%** GVW overload. Other top overloaded Axle types include **6G, 2A** and **3A** at **4.03%, 1.95%** and **1.36%** respectively.
- **Container** was the most overloaded cargo type at 0.55% GVW overload. Other top overloading cargo types include **Clinker, Cement, Fuel** and **Maize** at **0.39%, 0.30%, 0.22%** and **0.20%** respectively.

- **Multiple** was the top overloading Transporter at 0.37% GVW overloads. Other top overloading Transporters include **Scooby, Tornado, Anwaali** and **Motrex** at **0.29%, 0.26%, 0.18%** and **0.16%** respectively.  
**Motrex, Anwaali** and **Multiple** are the top recurring overloaders at **6, 5** and **4 Quarters** of monitoring respectively.

### Key Findings on Independent Monitoring

- A total of **25,009 vehicles** were weighed during the entire Independent monitoring period. **Average** overloading for the whole period per axle was **66.76%** while overloading per GVW was **19.91%**.
- The **highest** Axle and GVW overloads were recorded during the **1<sup>st</sup> Quarter** at **81.36%** and **28.44%** respectively.
- The **lowest** Axle Overloads were recorded during the **final 8<sup>th</sup> Quarter** at **53.98%** while the lowest GVW overloads were recorded during the **5<sup>th</sup> Quarter** at **11.94%**.
- **Kanduyi- Malaba (A104)** road (monitoring ahead of **Webuye** weighbridge) recorded the **highest** average Axle and GVW overloads for the **entire monitoring period** at **75.95%** and **24.02%** respectively for roads where monitoring was done more than twice.
- The other **top overloaded roads** during monitoring included **Gilgil-Nakuru (A104), Narok- Maai Mahiu, Kericho-Mau Summit, Bungoma town, Kisumu- Ahero** and **Ahero-Kericho**.
- **6G** was **the most overloaded Axle Type** during monitoring at **22.38%**. Other top overloading Axle Types included **6C, 5D, 2A** and **3A** at **20.08%, 3.27%, 2.84%** and **2.03%** respectively.
- **Container** was the most overloaded cargo type **in terms of GVW** during monitoring at **5.93%**. Other top overloaded Cargo types include **Clinker, Fuel, Cereals** and **Cement** at **2.73%, 1.89%, 0.96%** and **0.6%** respectively.

### Key Findings on Comparison between Static and Independent Monitoring



- There exists a large variance between the data from the KeNHA weighbridges and the data obtained from independent monitoring ahead of the mentioned weighbridge stations. Throughout the year, the variation between weighbridges data and that recorded during independent monitoring has been a major problem. The following are possible reasons for the variation:
  - Some of the HGVs not being weighed at the weighbridge even after being diverted into the weighbridge
  - Wrong loads being recorded by weighing operators.
  - Reported incidences where transporters add loads after passing the weighbridges.
- The Average GVW overloads for all the roads independently monitored (19.91%) is slightly higher than the average for the roads ahead of the weighbridges only (16.47%) which shows the need for increased monitoring and coordinated approach on other road networks.

### **Key Findings on Calibration Status of the Equipment**

- All Weighbridge stations had their equipment calibrated on a quarterly basis. Frequent breakdowns affected the new multi-deck weighbridges at Gilgil and Webuye during their year of operations although they were both operational at the end of the final Quarter of monitoring. The new single axle weighbridges at Rongo and Busia have been in very good condition since they were installed and have not experienced any breakdown.

### **Key Findings on Court Fines**

- A total of Kshs. **224,995,020** was collected in the Western Region weighbridges as fines during the entire period of monitoring from the 2<sup>nd</sup> Quarter- 8<sup>th</sup> Quarter. 1<sup>st</sup> Quarter (November 2012- December 2012) fines were not available to the Consultant.
- The highest total fines for the weighbridges were collected in the 6<sup>th</sup> Quarter (January- March 2014), a total of **Kshs. 48,213,490**.

- **Gilgil** Weighbridge Station collected the highest total fines per weighbridge station during monitoring period at **Kshs. 114,455,220** with the highest Quarterly amount of fines of **Kshs. 31,044,490** collected during the 6<sup>th</sup> Quarter (January- March 2014).
- During the first 3 Quarters of monitoring, Rongo Weighbridge court fines were being combined with Busia Court fines and the Busia values during that period includes both weighbridges.

## **Key Findings on Overloading Trends**

### **1<sup>st</sup> – 8<sup>th</sup> Quarter Overloading Trend (KeNHA Weighbridges)**

- The axle overloads percentages ranged in the **60s** over the first 3 quarters before rising to **70s** in the 4<sup>th</sup> quarter. However, there was considerable reduction in the recorded axle overloads during the 5<sup>th</sup> quarter. This was attributed to the 5% operational allowance on axle loads and the increase in Axle load limits (Amendments to the traffic Act) taking effect. As a result HGVs which would have earlier been axially overloaded were now safe due to the operational allowance.
- During the 6<sup>th</sup> Quarter, the axle overloads declined further to an average of **31.21%** from the previous lows recorded in the 5<sup>th</sup> Quarter of **34.2%**.
- During the 7<sup>th</sup> Quarter, the axle overloads rose slightly to an average of **32.92%** which was higher than the previous average of 6<sup>th</sup> Quarter after the 5% operational allowance and increase in load limits. However, during the final 8<sup>th</sup> Quarter, the axle overloads rose further to 35.67%. This can be attributed to the absence of an incentive to adhere to the required axle load limits. The full effects of the amendments to the traffic act have been felt and there is nothing new to cause a big variation especially positively in the axle overloads.
- While there have been fluctuations in the GVW overloads recorded during the entire monitoring period, there has been considerable decline in GVW overloads over the last 4 quarters of monitoring from the highs recorded at the start of the monitoring to a low of **0.79%** in 7<sup>th</sup> Quarter. This was attributed to improvement in the management of the weighbridges, increased awareness amongst transporters and new regulations that increased Axle load limits and GVW limits. There was a slight

rise in 8<sup>th</sup> Quarter to GVW overloads of **0.97%**. However, the point of concern still remains the large disparities between the KeNHA weighbridges data findings and those of the independent monitoring.

### **1<sup>st</sup> -8<sup>th</sup> Quarter Overloading Trend (Independent Monitoring)**

- The Axle Overloads fell from a high of **81.36%** during the **1<sup>st</sup> Quarter** to a low of **69.04%** during the **3<sup>rd</sup> Quarter** before fluctuating in the **70s** during the following 2 Quarters. The Axle Overloads eventually fell to the lowest recorded during the final Quarter of monitoring at 53.98%, although this was still substantially higher than those recorded during static monitoring as shown in the first graph in the next page.
- The GVW Overloads fluctuated during the entire monitoring period from a high of **28.44%** recorded in the **1<sup>st</sup> Quarter** to a low of **11.94%** recorded in the **5<sup>th</sup> Quarter** before independent monitoring was suspended for 2 Quarters. When it resumed in the **8<sup>th</sup> Quarter**, the GVW Overloads evidently rose to the **2<sup>nd</sup> highest** Quarterly average GVW Overloads of **22.31%**. This was partly attributed to the long period of suspension of independent monitoring and subsequent laxity by transporters who took advantage of the absence of independent weighing. Additionally, it is attributed to inadequate monitoring of other road networks by related roads authorities.

### **Key Findings on Institutional Arrangements**

#### **KeNHA Headquarter Management**

- Whereas Kenya National Highways Authority has contracted a management Contractor to manage its weighbridges, it undertakes supervisory and ad hoc monitoring exercises on its network.
- The supervisory and ad hoc monitoring exercises are funded through Road Maintenance Levy Fund.
- The KeNHA Axle Load Control Unit is headed by a Manager and includes one Senior Engineer and 7no. Inspectors.

- One inspector with a team of technicians is involved in carrying out quarterly ad hoc monitoring exercise with a mobile weighbridge covering the entire KeNHA road network.
- Two inspectors are stationed at each of the three supervisory clusters namely; Coast (Mariakani, Mtwapa), Nairobi (Juja, Isinya, Athi River, Gilgil) and western (Webuye, Busia, Rongo) clusters. The inspectors based at the supervisory cluster have a major task of supervising (or even accompanying) the private weighbridges management as they undertake their mobile weighbridge monitoring exercise within their networks. They also carry out monthly site meetings to iron out any arising issues.

### **KURA Management**

- Kenya Urban Roads Authority, a roads authority responsible for the Urban Roads Network has two mobile weighbridges which are used to carry out monitoring exercise in various municipalities.
- Axle load control program within KURA is under the Traffic Department, headed by the Manager (Traffic) assisted by a Senior Engineer, an Assistant Engineer and a Senior Inspector.
- During the monitoring exercise the KURA personnel are accompanied by two traffic police officers from the traffic headquarters, Nairobi.
- The exercise is funded through Road Maintenance Levy Fund and there is monthly reporting of the monitoring exercise to the Manager (Traffic) for further action.
- The Traffic Department in KURA prepares an annual work plan indicating the Municipalities and the links to be monitored with preference given to the municipalities prone to heavy goods vehicle traffic like Mombasa. About twelve (12) municipalities are included in the schedule.
- The KURA (mobile) weighing is for 2 to 24 hours per critical link. The varying times is due to the fact that the traffic flow changes upon realization of the exercise by the transporters forcing the KURA personnel to move to another link or even municipality.

## **KeRRA Management**

- Kenya Rural Roads Authority, a roads authority responsible for the Rural Roads Network has one mobile weighbridge which is used to carry out monitoring exercise in various rural links.
- Axle load control program within KERRA is under the Traffic Division, headed by the Manager Traffic assisted by an officer in charge of the weighbridge and a team of technicians.
- During the monitoring exercise the KeRRA personnel are accompanied by three traffic police officers from the traffic headquarter, Nairobi.
- The exercise is funded through Road Maintenance Levy Fund.
- Each region is visited at least once a year with priority being given to regions prone to heavy goods vehicle traffic at given times of the year.
- The KeRRA (mobile) weighing period varies from a few hours to 24hours per critical link. The varying times is due to the fact that the transporters uses alternative routes upon realization of the exercise forcing the KeRRA personnel to move to another link or even region.

## **Key Findings on Legislative and Operational Challenges**

1. KURA and KeRRA lack funds to extensively carry out more regular ALC on their networks.
2. Lack of parking/ holding bay especially at Busia and Rongo Weighbridges which limits effective operation of the weighbridges especially during high HGV traffic.
3. Weighing does not take place during rainy periods due to the short circuiting effects on the weighing scales for the mobile weighbridges in use as back-up to the multi-deck weighbridge in Webuye.
4. Some of the courts are far from the weighbridge stations and the court processes lead to delayed justice and loss of revenue due to long time taken.
5. Malpractices at the weighbridges hindering effective Axle Load Control

6. The Overloading Fines currently in place (Legal Notice No. 65, 2008) are not commensurate with the cost of the damages caused by overloading on the roads and do not discourage overloading among transporters.
7. Overloading Fines go to the general coffers of the government where they can be used for any other government expenditure with no benefits to weighbridges operations/ road maintenance.
8. Lack of a clear command structure at weighbridges is a hindrance to efficiency at weighbridges since the Police report to the Traffic Commandant while management contractor's staff report to SGS.
9. KeNHA is unable to monitor the weighbridge operations in real time due to lack of an ALC Information Monitoring System.
10. Axle Load Monitoring in Kenya is not coordinated for the entire roads network and each roads authority is working independently.

### **Key Findings on Axle Load Software Development**

- The Axle Load Software was installed at KRB in September 2013 (4<sup>th</sup> Quarter) and successful training was conducted in October 2013.
- The training was given to the Axle Load Monitoring project staff and KRB IT staff at KRB offices.
- The system was rolled out on the KRB corporate network in February 2014.
- Due to changes that were made in the Computer system at the weighbridges whereby the Axles were being grouped and the groups numbered 1, 2,3 and 4, KRB asked the Consultant to update the software to recognize the new Axle groups and to be able to carry out analysis in line with the changes to the system. This is still on-going and expected to be finalized in January 2015.

### **Ex7: Recommendations**

#### **Overall Management and Coordination**

- Axle Load Oversight Committee should be established by Ministry of Transport and Infrastructure to co-ordinate axle load control measures for all the

authorities' to ensure efficient approach in Axle Load Control for the entire road network in Kenya.

- Movement, over time, to the development and use of a special section of the Kenya Police as a HGV Traffic Police Force under the control of KeNHA, for the purpose of axle load enforcement and heavy vehicle safety enforcement with clear command structures.
- Performance monitoring of the Management Contractor to ensure that coverage of other KeNHA networks is increased.
- Enhance Stakeholder Participation in order to create more awareness on the dangers of overloading and the responsibility of the public, importers, transporters, drivers, roads authorities, management contractors, etc. This can be done through consultative meetings, workshops, billboards and television adverts.

In the absence of a central body, the Ministry of Transport and Infrastructure should spearhead the efforts to undertake this initiative.

### **Facilities and Technology**

- Review of weighbridge station layouts at Gilgil and Webuye with a view to improving flow and control of vehicles at the station through possible re-arrangement of facilities.
- Rehabilitation of entrance and exit at Gilgil Weighbridge.
- Installation of tracking systems in HGV to monitor their movement and easy identification in case verification is required at any time. The information should be available to KRB and Road Agencies
- Webuye Weighbridge, with high truck traffic should have a more reliable weighbridge backup than the weather sensitive and error prone mobile weighbridge available.
- Acquisition of land and Construction of holding bay at Busia and Rongo Weighbridge Stations to enhance efficiency at the weighbridges.

- Implementation of ALC Information Monitoring System with the capability of transmitting the live weighing data and images from the weighbridges to a central system to enhance transparency at the weighbridges.
- All weighbridges on the regional road network to be linked electronically to a regional data centre to facilitate sharing of information on overload control.

### **Operational Specifications**

- Establishing Links to the vehicle register in order to verify vehicle ownership and licensing details.
- Monitoring operations ahead of the stations targeting transporters who re-load after passing the weighbridge stations, which is one of the reasons for high overload values recorded during independent monitoring ahead of the stations.
- More regular Axle Load Monitoring by KURA in major municipalities such as Nakuru, Kisumu, Eldoret and Kakamega.
- Development by KeRRA of a comprehensive Axle Load Control Program for its rural network that considers economic activities in various parts of the country and harvesting times among other considerations.
- Promotion of self-regulation by Transporters through accredited Transporters Associations especially at points of Origin.

### **Legislative Framework**

- Ratification of the East Africa Community Vehicle Load Control Bill (2012) by all member states in order to become community law. Burundi is the only one currently pending.
- Further Amendments to the Traffic Act to include the following regulations:-
  - Overloading charges should be decriminalized and overloading charges are to be collected administratively.
  - Overloading Charges should be set based on the principle of recovering road damage cost. Not only routine and periodic maintenance costs but



also rehabilitation and reconstruction costs to cover the road damage caused by overloading are to be included in the overloading charges

- Possible cancellation of licenses for repeat offenders
- Clear definition of who a loader is for clarity during prosecution.