THE EAST AFRICAN TRADE AND TRANSPORT FACILITATION PROJECT
(EATTFP)

STUDY FOR THE HARMONIZATION OF VEHICLE OVERLOAD CONTROL IN THE EAST AFRICAN COMMUNITY

DRAFT FINAL REPORT

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PADECO Co., Ltd.

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List of Abbreviations and Acronyms

AASHTO	American Association of State Highway and Transport Officials
AC	Asphalt Concrete
ADT	Average Daily Traffic
ADTT	Average Daily Truck Traffic
ALM	*Agence de Location du Matériel* (Equipment Leasing Company), Burundi
BIF	Burundi Franc
BOT	Build, Operate and Transfer
BS	British Standards
CBR	California Bearing Ratio
COMESA	Common Market for Eastern and Southern Africa
CSIR	Council of Scientific and Industrial Research
DBST	Double Bituminous Surface Treatment
DGR	*Direction Générale des Routes* (General Directorate of Roads), Burundi
DMRB	Design Manual for Roads and Bridges
DOT	Department of Transportation
EAC	East African Community
EATTFP	East African Trade And Transport Facilitation Project
EEA	European Economic Area
EN	European Norm (European Standards)
ESA	Eastern and Southern Africa
ESAL	Equivalent Single Axle Load
EU	European Union
EUR	Euro
FER	*Fond d'entretien routier* (Road Maintenance Fund), Rwanda
FESARTA	Federation of East and Southern Africa Road Transport Associations

FRN	*Funds Routier National* (National Road Fund), Burundi
FTCC	Full Traffic Control Centre
FY	Fiscal Year
GCM	Gross Combination Mass
GVM	Gross Vehicle Mass
GVW	Gross Vehicle Weight
HA	Highways Authority
HB	Highways Bridges
HDM	Highway Development and Management
HSWIM	High-Speed Weigh-In-Motion
ILMO	International Legal Metrology Organization
IRI	International Roughness Index
ISO	International Organization for Standardization
JICA	Japan International Cooperation Agency
KES	Kenya Shilling
KRA	Kenya Revenue Authority
KRB	Kenya Roads Board
KURA	Kenya Urban Roads Authority
KWS	Kenya Wildlife Service
LCC	Lay-by Control Centre
LCVs	Longer Combination Vehicles
LRFD	Load an Resistance Factor Design
LSWIM	Low-Speed Weigh-In-Motion
MDR	Ministry of Rural Development, Burundi
MLIT	Ministry of Land, Infrastructure, Transport and Tourism
MLP	Model Legislative Provisions

MOF	Ministry Of Finance
MOM	Management, Operations and Maintenance
MOU	Memorandum of Understanding
MTPE	Ministry of Public Works and Equipment, Burundi
MTT	Ministry of Transport and Telecommunication, Burundi
NORAD	Norwegian Agency for Development Cooperation
NPVs	Net Present Value
NS	Not Specified
O&M	Operation and Management
OGV	Ordinary Goods Vehicle Class
OIML	International Organisation of Legal Metrology (Organisation Internationale de Métrologie Légale)
PC	Pre-stressed Concrete
PPP	Public-Private Partnership
REC	Regional Economic Community
RMLF	Road Maintenance Levy Fund, Kenya
RTDA	Rwanda Transport Development Agency
RTMS	Road Transport Management System
RWF	Rwanda Franc
SACU	Southern African Customs Union
SADC	Southern African Development Community
SATCC	Southern African Transport and Communications Commission
SSATP	Sub-Saharan Africa Transport Policy Program
TICAD	Tokyo International Conference On African Development
TL	Total Length
TRA	Transport Development Agency, Rwanda
TWG	Transport Working Group

TZS	Tanzania Shilling
UDL	Uniformly Distributed Load
UGX	Uganda Shilling
UNECA	United Nations Economic Commission For Africa
UNRA	Uganda National Roads Authority
URF	Uganda Road Fund
USD	United States Dollar

Executive Summary

Cross-border transport is 3–5 times more expensive in Africa than in Asia and Latin America. For example, truck transport from Mombasa to Kampala over a distance of 1,100 km takes 5 days, of which 19 hours is spent crossing borders and weighbridges. A conservative (low) estimate is that each one-hour reduction in such crossing time would bring USD 7 million per year in benefits to the EAC region. (See Appendix A for estimation details.) The current practice of different axle load and gross vehicle mass (weight) limits among the Partner States is one of the major factors impeding efficient transport within the region. Thus, the EAC approached JICA to assist in developing a harmonized framework for axle load and gross vehicle mass limits in the region.

This Study was launched in December 2010 to propose the harmonization of regional axle load and overload control region. Three task force meetings and three stakeholder meetings will be held to discuss the study findings and proposals. It is hoped that by the end of third stakeholder meeting in August 2011 a harmonized legal framework will be agreed among the Partner States.

As a basis for going forward, the report first includes an assessment of vehicle overload control regulations in each of the EAC Partner States. In addition, a cross-country comparison and analysis is presented, covering maximum axle load limits and gross vehicle mass and other issues (e.g., operational allowances, decriminalization, extent of cost recovery, responsibility for overloading). Also, various steps toward harmonization within the EAC and with the southern African Development Community (SADC) and the Common Market for Eastern and southern Africa (COMESA) are summarized.

The Study surveyed the regional trunk road network, including current conditions, maintenance, and costs. Axle load measurement data were collected and load distributions including overloading were examined as a basis for analysis. The design methods for roads and bridges in the region were surveyed. The funds required to maintain the regional trunk road network were estimated by means of the Highway Development and Management System (HDM) 4 model. Current practices by the Partner States for charging road users were also surveyed and issues identified. It is estimated that the elimination of overloading in the EAC Region would result in a reduction of 24 million USD per year in road maintenance cost. (See Appendix B for estimation details.)

At a regional tripartite meeting held in Nairobi in 2008, participants agreed in principle to adopt a single axle load limit of 8 tons and a gross vehicle mass (GVM) limit of 56 tons.

The Study carried out a series of model runs utilizing the HDM-4 model and found out that indeed under the prevailing environment and conditions within the EAC a single axle load limit of 10 tons would give the least total cost for road maintenance and vehicle operation (combined), an economically optimal solution.

Another detailed computer analysis was undertaken to examine the difference between GVM limits of 48 tons and 56 tons. It was found that the difference in terms of the resulting maximum stress in bridge structure and safety margin to ultimate structural failure is small enough (safety factor from 1.70 to 1.64) to allow such an increase in the GVM limit provided that the design and construction are done in compliance with the British Standards, which provide the prevailing engineering standards in the region. The above increase in GVM would give at least 12.5% increase in payload capacity of typical vehicles.

The Study Team offered recommendations concerning how to accommodate technological development in vehicles in regulations and their enforcement, with respect to vehicle combination types, super single tires, liftable axles, and self-regulation.

The issue of weighbridges and their operations and management was examined in detail. A number of recommendations are presented that also indicate that a harmonized approach throughout the region is necessary.

Finally, the report considers the legal mandate for an EAC legal instrument for the harmonization of vehicle overload control (from the Treaty for the Establishment of the East African Community); the preferred modality for such an EAC legal instrument (an EAC Act + EAC Regulations); and a recommended draft EAC Act, drawing upon the SADC Model Legislative Provisions and other good-practice examples.

Chapter 1 Introduction

1.1 Introduction

(1) Japan's Policy toward the Development of Africa

The Government of Japan has made a strong commitment to African Development through its Tokyo International Conference on African Development (TICAD) since 1993, now in its fourth round (TICAD IV). At the latest round held in Yokohama in May 2008, Japan committed to double its assistance to Africa over the period to 2012. Although some leaders in Africa had expressed concern about a possible decline in aid flows from donor nations due to the global financial crisis, Japan reiterated its support for Africa and stated that it will faithfully fulfill its commitments. This was reconfirmed in the Second TICAD Follow-Up Ministerial Meeting of TICAD IV held on 2–3 May 2010 in Arusha, Tanzania. About USD 2 billion equivalent had already been disbursed by the 2009 Japanese fiscal year (i.e., by the end of March 2010).

(2) JICA's Policy toward Corridor-Based Support

Cross-border transport is 3–5 times more expensive in Africa than in Asia and Latin America. Impediments to efficient road transport include not only inadequate infrastructure but also "soft" constraints related to policies and regulations. JICA considers a corridor-based approach as a key method to address these soft constraints and facilitate regional transport in Africa.

(3) Trade and Transport Facilitation Issues in the East African Community

The East African Community (EAC) is a regional economic community (REC) established in 1996 with its Partner States currently including Kenya, Tanzania, Uganda, Burundi, and Rwanda, and its Secretariat based in Arusha. The EAC's operations are governed by the Treaty for the Establishment of the East African Community, which was signed at the Summit of the Heads of States in 1999 and came in force in 2000. In November 2006, the Summit of EAC Heads of State admitted Rwanda and Burundi to the EAC. Their formal admission into the EAC became effective after the signing of Accession Treaties by the two countries in July 2007.

The EAC seeks to widen and deepen cooperation among the Partner States in political, economic, social, and other fields for their mutual benefit. To this end, the EAC countries established a customs union in March 2004 and have been working towards the establishment of common market (which was targeted for 2010), a monetary union by 2012, and ultimately a political federation of the East African States.

As a part of the effort to achieve these objectives, the EAC has strived to enhance the trade between and among its Partner States and with the rest of the world, to thereby improve the region's economy and competitiveness. Against this background, inefficient transport remains a problem, and particularly overloading of regional highways remains one of the major causes of the premature failure of the regional road infrastructure. This results in high transport costs and frequent maintenance requirements. Unfortunately, a balance between trade facilitation and the protection of the road infrastructure has not been achieved due to lack of a harmonized approach to this problem. The various countries and sectors concerned have continued to adopt independent rules and regulations, and this is affecting various sectors within the region and beyond.

The consequence of removing impediments due to conflicting regulations and procedures could indeed be large. The Study Team has made a preliminary estimation of the economic benefits of harmonizing regulations on axle load and vehicle mass limits. A one-hour reduction in truck travel time out of the current typical truck travel time of several days would result in total

savings of USD 6.7 million in the regional transport sector, which should cascade into other sectors of the regional economy. Appendix A presents the details of this estimation.

In order to reduce the cost of doing business in the region, the EAC Secretariat and Partner States with assistance from African Development Bank (AfDB) have since 2005 be en implementing the East African Trade and Transport Facilitation Project (EATTFP) including various subcomponents. The Transport Subcomponent of the project aims at removing impediments to smooth transport operations and services, including cumbersome weighbridge procedures, conflicting policies and regulations, and inefficient border procedures. As a complement to this project, the EAC has approached JICA for technical assistance to develop a harmonized framework for axle load regulations in the region.

1.2 Background of the Study

As noted, the harmonization of axle load controls in the EAC is one component of the EATTFP, the Transport Subcomponent of which seeks to promote implementation of the Tripartite Agreement on Road Transport, signed by the partner states in 2001 a nd ratified in 2004. Activities include provision of consultancy services and stakeholder workshops. This subcomponent is also to support the design and implementation of an institutional framework for implementation of the activities listed above. Execution is under the auspices of the Joint Technical Committee as established in the Tripartite Agreement, including experts drawn from the Partner States.

The current study will complement the transport studies under the EATTFP. Accordingly, the EAC Secretariat has requested JICA to fund specific studies on the technical and legal aspects of harmonizing axle load regulations, while the AfDB studies will focus on the legal aspects of harmonizing other related regulations.

The EAC Secretariat has indicated that most of the studies will be undertaken by an ongoing consultancy by the Bureau for Industrial Cooperation (BICO) of the University of Dar es Salaam but the EAC has demarcated the respective scopes of work to avoid duplication. BICO will develop the training curriculum for weighbridge personnel across the region and harmonized printout certificates for the region, while the JICA study will focus on axle load harmonization.

1.3 Objective of the Study

The objective of the study is to propose the harmonization of axle load and overload control and a legal framework for the purpose in all Partner States based on the result of research and analysis of existing initiatives by Partner States and other regions.

1.4 Study Area

The study area includes the EAC Partner States, i.e., Kenya, Tanzania, Uganda, Burundi, and Rwanda. In addition to the EAC, reference is made to other related RECs, i.e., the Common Market for Eastern and Southern Africa (COMESA, headquartered in Lusaka, Zambia) and the Southern African Development Community (SADC, headquartered in Gabarone, Botswana).

The EAC Partner States are (i) the areas subject to the field study directly, while (ii) the related RECs are considered not only for reference as sample cases, but also they are regional communities with which the EAC may consider harmonization of overload control and relevant laws/regulations. The counterpart agency for the study is the EAC Secretariat based in Arusha.

1.5 Progress of the Study

The following shows the progress of the Study to date.

3 December 2010:	Commencement of the Study in Japan
12 January 2011:	Submission of Inception Report to JICA.
18 January 2011:	First Task Force Meeting in Arusha, Tanzania to discuss the Inception Report and Study implementation. Participants included two representatives from each Partner State, EAC Secretariat officials and the Study Team. The list of participants is attached in Appendix M-1.
19 January–6 February 2011:	Information collection by the Study Team in all of the five Partner States. Interviews of stakeholders in the public as well as the private sector.
7–8 February 2011:	First Stakeholders Workshop in Arusha to discuss preliminary findings. Participants included about ten representatives from each of the Partner States, EAC secretariat officials, and the Study Team. The list of participants is attached in Appendix M-2.
9 February–21 April 2011:	Analysis and preparation of Interim Report in Tokyo and elsewhere.
22 April 2011:	Submission of Interim Report to JICA
10 May 2011:	Second Task Force Meeting in Arusha to discuss Interim Report.
30–31 May 2011:	Second Stakeholders Workshop in Nairobi to discuss Interim Report.
11 May–5 July 2011:	Analysis and preparation of Draft Final Report incorporating the results of Second Task Force Meeting and Second Stakeholders Workshop.
29–30 June 2011:	Special Task Force Meeting in Bujumbura to discuss outstanding issues still unresolved in the Second Stakeholders Workshop
6 July 2011:	Submission of Draft Final Report

The following activities are planned for the remainder of the Study period.

15 July 2011:	Third Task Force Meeting in Arusha to discuss Draft Final Report.
Mid-July–mid-August 2011:	Preparation for the Third Stakeholders Workshop

17–19 August 2011: Third Stakeholders Workshop to discuss all issues and to reach agreement on axle and vehicle weight limits harmonized throughout the EAC region.

1.6 Structure and Contents of the Report

This report presents the results of the information collection effort and subsequent analysis carried out by the Study Team between mid-January and June 2011, including work performed pursuant to two task force meetings and stakeholder workshops.

After the Executive Summary, Chapter 1 (this chapter) presents an introduction to the Study including its background and objectives .

Chapter 2 reviews existing laws and regulations concerning vehicle and axle weight limits in the EAC. Directions towards harmonization within the EAC and surrounding RECs are suggested.

Chapter 3 reviews the existing situation of the road sector in the EAC, particularly the international trunk road network and its design and operation, which provides the background of vehicle and axle weight limits and control.

Chapter 4 examines the issue of charges/fees/fines against overloading. The existing situation is assessed and the responsibility for overloading is considered against needs for road maintenance utilizing the Highway Development and Management System (HDM) 4 model. However, recommendations for an appropriate level of charges for overloading are left for the Draft Final Report.

Chapter 5 attempts to verify the recommended harmonized vehicle weight and axle load limits in the EAC by means of the HDM 4 model and bridge stress calculations.

Chapter 6 examines the issue of accommodating new vehicle technology in the control of vehicles and presents recommendations.

Chapter 7 deals with the issue of weighbridges and their operation, which is an essential part of vehicle and axle weight control together with laws and regulations.

Chapter 8 discusses the formulation of an EAC regional legal instrument for vehicle and axle weight control and presents a draft text for the legal instrument.

Chapter 2 Review of Existing Laws and Regulations

2.1 Country-by-Country Review

2.1.1 Burundi[1]

Burundi is still at the early stages of development of laws and regulations to control vehicle overloading, at least in part due to a lack of functioning weighbridges.

The main legal instrument regarding vehicle overload control in Burundi is *Ordonnance Ministerielle No. 720/70 du 12/08/93 Portant Regiementation de la Charge Maximum par Essieu des Vehicules Circulant en Territoire Burundais* [Ministerial Ordinance No. 720/70 of 12 August 1993 Regulating Maximum Axle Loads of Vehicles Operating in the Territory of Burundi]. This Ministerial Ordinance set axle load limits at 10 tons for a single axle, 16 tons for a double axle (tandem), and 24 tons for a triple axle (tridem)(Article 5). It also set maximum gross vehicle weight (gross combination mass) at 53 tons (Article 6).[2] However, these load limits are not in force because Burundi lacks (functioning) weighbridges.

Penalties are set out in Ordonnance du Ruanda-Urundi No. 660/206 regulating traffic police and circulation, dated 11 September 1958, Article 135, which provides for a fine of BIF 2,000 (less than USD 2) or imprisonment of two months, although not on a mandatory basis. While the Ministry of Justice of Burundi confirmed that this colonial-era ordinance/regulation is still valid law,[3] it is not enforced. The Penal Code provides for a BIF 50,000 (USD 40) fine if a road is damaged,[4] due to overloading or other reasons.[5]

In summary, an adequate law to protect the road infrastructure against overloading is not yet in force in Burundi, because they have no (functioning) weighbridges, they have not put much effort into developing the legal text(s).[6]

2.1.2 Kenya

Over the years Kenya has enacted laws and issued regulations to control vehicle overloading, but there is a continuing debate within the country on specific issues (e.g., decriminalization, axle spacing, super-single tires), with resolution of some issues requiring further research.

The *Integrated Transport Policy* (2009), Kenya's overarching transport policy, identified road damage and axle load regulation as key issue areas. Specific policies include: (i) the strict enforcement of axle load regulations, (ii) elimination of administrative and other weaknesses (e.g., corruption in law enforcement), (iii) privatization of axle load control operations, (iv) location of weighbridges only at major sources of freight and exit border points; (v) installation

[1] The countries are presented in this chapter in alphabetical order, following the style suggestion of Asian Development Bank, *Handbook of Style and Usage*, 2009, p. 13 ["when two or more members appear in sequence in a sentence, list, or table, present them in alphabetical order unless a reason is given for another order"].
[2] Burundi does not provide for separate load limits with detailed specification by type of axle/axle group or vehicle/combination type.
[3] Interview with Mr. Kayovera Nestor, Advisor in the Minister's Cabinet, Specialist in Multilateral Diplomacy, Mediation and Arbitration, Ministry of Justice, Burundi, on 1 February 2011.
[4] Interview with Mr. Niyongabo Prime, Chef de Service Judiciaire, Police Nationale du Burundi, 31 January 2011.
[5] Other legal instruments collected for Burundi include a 2002 law and a 2008 ministerial ordinance/regulation related to charges assessed cross-border traffic.
[6] Burundi will revise its road traffic code in March 2011; the revision is now with the parliamentary committee. The JICA study team has not reviewed this draft text.

of weigh-in-motion equipment together with modernization of existing; and (vi) freight transport operators to be sensitized on the need to adhere to axle load regulations.[7]

The main legal instruments regarding vehicle overload control in Kenya include *The Traffic Act (Chapter 403)*, *Rules 39 and 41*, and various legislative supplements including *Legal Notice No. 118 of 12 September 2008* (cited as the *Traffic (Amendment) Rules, 2008)*. Specifically, Legal Notice No. 118 (2008) includes provisions:

(i) amending Rule 41(2) to set the fines on the first conviction for overload offenses from KES 5,000 (USD 60 equivalent) for less than 1,000 kg of overloading (per axle or on excess vehicle weight), to KES 200,000 (USD 2,500) for overloading of 10,000 kg or more, and for second or subsequent convictions, from KES 10,000 (USD 120) for less than 1,000 kg of overloading, to KES 400,000 (USD 5,000)[8] for overloading of 10,000 kg or more;[9]

(ii) repealing the four-axle group;

(iii) limiting the maximum number of axles that may be fitted on any combination of a vehicle and a semitrailer or motor vehicle and drawbar trailer to six;[10]

(iv) limiting the maximum number of axles that may be fitted on a drawbar trailer or on a semitrailer to three;

(v) setting axle load limits at 8 tons for a single steering axle (whether controlled by drawbar or driver-operated steering mechanism), 10 tons for a single axle (4+ wheels, non-steering), 16 tons for a tandem (4 wheels on each axle), and 24 tons for a triple or tridem (4 wheels on each axle) (Legal Notice No. 118, 3(b));[11] and

(vi) reducing the maximum gross vehicle weight from 56 tons to 48 tons, which applies in the case of a vehicle + drawbar trailer with six axles.[12]

Other aspects of overload control in Kenya include the following:

(i) Legal Notice No. 145 (2007) banned lift axles on both the prime mover and trailers.

(ii) The Kenya National Highways Authority (KenHA), which is responsible for the management of weighbridges along trunk roads, has administratively provided an operational allowance of 5%, on axle load limits (only).[13]

(iii) While Section 58(2) of the Traffic Act provides for the prosecution of the driver, the owner of the vehicle, and the loader, in most cases only the driver and the owner of the vehicle are prosecuted, even though the loader is identified in the cargo manifest and/or

[7] Republic of Kenya, Ministry of Transport, *Integrated National Transport Policy: Moving a Working Nation*, May 2009, pp. 59–60, Section 4.10.5.
[8] Previously the maximum fine for overloading offenses was KES 20,000 (about USD 250 equivalent at the current exchange rate).
[9] Maximum imprisonment for overloading offenses had been increased from one to four years by amendments to the Traffic Act (Chapter 403) by the Kenya Roads Act (2007).
[10] Legal Notice No. 112 (1999) had permitted seven axles provided that the rear-most axles were steering axles. The repeal of this provision by Legal Notice No. 118 (2008) has been criticized by the private sector of neighboring countries. See Private Sector Federation – Rwanda, *Assessment of Non Tariff Barriers (NTBs) along the Northern and Central Corridors – EAC, Baseline Study*, 2008, p. 7.
[11] In the case of any axle or axle group (excluding a single steering axle) where one or more of the axles is fitted with only two wheels, the maximum allowable load is reduced by 25%. Legal Notice No. 118, 3(b).
[12] Revision of (vi) to be provided by Kenya.
[13] However, there is no statute or government policy document empowering KenHA to exercise any discretion on the legal limits. Email from Eng. Maurice Ndeda, Chief Superintendant Engineer, Kenya Ministry of Roads, 29 March 2011.

delivery note.[14]

(iv) Prosecution procedures for overloading violations in Kenya are set out in Box 2-1.

(v) Courts have been imposing fines below the minimum prescribed under Rule 41(2).[15]

(vi) Section 58(3) of the Traffic Act[16] provides for suspension of the vehicle license for vehicle overloading and other offenses, but the requirement for vehicles to have road licenses was rendered inapplicable by amendments made by the Minister of Finance under the Finance Act of 2006.[17]

Box 2-1: Prosecution Procedures for Overloading Violations in Kenya

Once a vehicle is found to be carrying a load in excess of the legal limits:

- The vehicle is prohibited from proceeding.
- The driver and owner, and in appropriate cases, the loader, are prosecuted under Section 55 and/or Section 56 of the Traffic Act.
- In cases of perishable loads or livestock that need to proceed without delay, cash bail is set, which must be paid immediately at the nearest police station, after which the driver must adjust the load on his/her vehicle;
- A court date is set, which except in the cases mentioned above, will usually be for the same day or on the day following the weighing of the vehicle.
- The accused may plead guilty or not guilty.
- If the accused pleads guilty, he or she will be fined, and if cash bail was paid, it will be refunded.
- If the accused pleads not guilty and cash bail is set and paid (if not paid previously), the case will be remanded for hearing.
- If the accused fails to show up for the hearing, the cash bail is forfeited and a warrant for arrest is issued.
- At the hearing of a case in which a not guilty plea has been entered, the case is decided on the evidence.
- The prosecution must prove beyond a reasonable doubt that the defendant is guilty of the offense charged. There is no presumption in the law that the weight stated on the weighbridge certificate is correct. The prosecution must still prove beyond a reasonable doubt that the weights recorded are accurate and that the vehicle was overloaded.
- The verdict of the court will be implemented thereafter.

Source: CAS Consultants Ltd, *Consultancy Services for Axle Load Monitoring in Kenya, 2nd Quarter Report*, Volume I, pp. 16–17.

[14] No provision is made for prosecuting the transport operator who does not own the vehicles that he or she operates. Stewart Scott International, *Axle Load Best Options Study*, funded by the Delegation for the European Union in the Republic of Kenya, 2006, p. 52.

[15] E.g., in one recent month (July 2009) at Mariakani, the courts imposed fines of KES 4.3 million (about USD 55,000 equivalent), but the fines should have been KES 14.7 million (about USD 185,000 equivalent). Eng. M.S.M Kamau, Permanent Secretary, *Protecting the Roads: Sustainable Approaches to Axle Load Control and Weighbridge Management*, Regional Conference on the NCTIP [Northern Corridor Transport Improvement Project and Trade Facilitation in Mombasa, PowerPoint presentation, 30 September–1 October 2009.

[16] Other relevant legal instruments in Kenya include The Weights and Measures Act (Revised 1993; Chapter 513, Section 17 of which provides for testing of standards and equipment used by other government departments (e.g., weighbridges); the Kenya Roads Board Act (1999); and The Kenya Roads Act (2007), which established that road authorities have a duty to control axle loads along their respective road networks.

[17] Republic of Kenya, *Inter-Ministerial Technical Committee on Axle Load Control, Technical Report on Axle Load Control*, submitted to the Permanent Secretaries of the Ministries of Roads, Transport, Energy, and Trade, November 2009, p. 38.

An Inter-ministerial Technical Committee on Axle Load Control (2009) made a number of proposals in response to a request by COMESA. Although these proposals have no formal status, they, among other things, called for:

(i) an increase the axle load limit for a tandem with single wheels from 12.0 to 13.5 tons, and with four wheels on each axle from 16 to 18 tons; and

(ii) an increase in the maximum gross vehicle weight limit for a vehicle and semi-trailer with a total of six axles from 48 tons to 50 tons, for a vehicle and drawbar trailer with a total of six axles from 48 tons to 52 tons, and for a vehicle and drawbar trailer with a double steering axle and a total of seven axles to 56 tons.[18]

Proposed policy changes included:

(i) decriminalization of overloading offenses and introduction of spot fines;[19]

(ii) institution of overloading fees based on the level of overloading covering damage to the road, enforcement, and administrative costs;

(iii) fees for overloading to be set at KES 10,000 (USD 125 equivalent), plus KES 20 (USD 0.25 equivalent) per ton-km traveled for overloading up to 2,000 tons, and plus KES 380 (USD 4.75) per ton-km traveled for overloading over 2,000 tons;

(iv) research on super-single tires and the spacing of tandem and triple axles to determine appropriate axle load limits;

(v) introduction of a points demerit system related to the severity of overloading, with suspension of driving and transport operator licenses for habitual offenders;

(vi) provision of common weighbridges at one-stop border posts to reduce delays of transit cargo; and

(vii) mutual (reciprocal) recognition of weighing certificates issued by accredited weighing stations in neighboring states.[20]

[18] Republic of Kenya, *Inter-Ministerial Technical Committee on Axle Load Control, Technical Report on Axle Load Control*, submitted to the Permanent Secretaries of the Ministries of Roads, Transport, Energy, and Trade, November 2009, p. 36.

[19] However, a 2006 "best options report" concluded that decriminalization was not an urgent priority, and that the full implications of moving towards an administrative justice system for traffic offenses including overloading needs to be assessed. Specifically, the study found that: (i) decriminalization has not greatly simplified the administration of traffic offenses in countries that have introduced it, but rather a parallel administrative justice system has been created alongside the criminal justice system; (ii) some countries that have decriminalized traffic offenses have excluded overloading from the decriminalization process, considering it serious enough to remain a crime; (iii) considerable expense is required to set up an administrative justice system to handle such offenses; and (iv) the priority that courts in Kenya accord overloading cases means that there is not a major problem at present in this regard. Stewart Scott International, *Axle Load Best Options Study*, funded by the Delegation for the European Union in the Republic of Kenya, 2006, p. 75.

[20] Republic of Kenya, Ministry of Roads, Executive Summary of the Report by the Inter-Ministerial Technical Committee on Axle Load Control, PowerPoint presentation, 14 December 2009.

2.1.3 Rwanda

Like Burundi, Rwanda is still at the early stages of development of laws and regulations to control vehicle overloading and therefore recognizes that "the present study is coming at the right time".

The main legal instrument on the subject in Rwanda is *Presidential Order No. 85/01 of 02/09/2002 Regulating General Traffic Police and Road Traffic* (Articles 60–68).[21] Key aspects of this Presidential Order include the following:

(i) The maximum weight for a truck (i.e., gross combination mass) is set at 53 tons (Article 67 1 A).[22] Rwanda does not provide for separate maximum mass/weight limits specified by vehicle/combination type.

(ii) On urban and national roads, legal load limits per four-wheel axle are 10 tons for a single axle, 16 t ons for a double axle (tandem), and 24 t ons for a triple axle (tridem)(Article 67 1.A).[23]

(iii) When a qualified officer "doubts … the total weight of a vehicle, the driver must accept and cooperate to effect a verification operation which cannot last more than two hours" (Article 68 (3)).

Fines for overloading are set in *Loi No. 34/1987 du 17 Septembre Relative A La Police Du Roualge Et De La Circulation Routiere* [Law No, 34/1987 of 17 September on the Police and Road Traffic].[24] Article 3 sets the maximum fines under the law at RWF 10,000 (USD 17) for a first offense and RWF 20,000 (USD 34) for a subsequent offense, although Article 42 provides that these amounts may be increased by as much as a factor of 9 (i.e., to RWF 90,000–180,000, or USD 150–300 equivalent).[25]

To address the vehicle overloading problem, a December 2009 technical assistance report funded by the European Development Fund, among other things, called for the Rwanda Transport Development Agency (RTDA) to "explore the possibility" of introducing an administrative fee schedule system to provide for simplified charges for overloading offenses without use of the criminal court system. Specific recommendations included: (i) according the RTDA with the statutory authority to enforce the 2002 Presidential Order on vehicle overloading (e.g., by requiring payment "on the spot" and allowing for the vehicle and cargo to be detained pending payment of the fee); (ii) providing a system to allow for appeals in cases in which correct procedures have not been followed of if weighbridge equipment is not functioning properly; (iii) installing electronic weighbridges with public display units showing axle load readings, to prevent manipulation of recorded readings by weighbridge operators; (iv)

[21] Interestingly, there is a colonial-era text (*Limitation de la charge du charroi routier empprutant la route Gitarama-Mabanza, No. Text: 2/T.P./1953, Vol. IV, p. 2081*), setting load limits on one route. Colonial standards are not necessarily appropriate for the present, however.

[22] The Minister responsible for Transport may reduce this maximum total weight on some highway sections as well as on bridges to "limits as dictated by the preservation of these ways or works". Article 68 (1).

[23] On other roads, maximum limits are: (i) 12 tons for two-axle vehicles, except for semi-trailers; (ii) 16 tons for vehicles with 3 or more axles, except for semi-trailers; (iii) 12 tons for three-axle articulated vehicles; (iv) 16 tons for four-axle articulated vehicles; and (v) 20 tons for a "train of vehicles" (Article 67 1.B).

[24] Other legal instruments collected for Rwanda include: (i) Law No. 02/2010 Establishing Rwanda Transport Development Agency (RTDA) and Determining Its Mission and Functioning; (ii) Law No. 52 bis/2006 of 12 December 2007 To Ensure Collection and Funding for the Maintenance of Road Networks in Rwanda. In addition, a draft law regulating the national road network was obtained.

[25] However, due to limited enforcement, overloading remains a serious problem in Rwanda (e.g., 64% of the heavy goods vehicles on National Route 2 at Gatuna were found to be overloaded). Jacques Detry, Transport Sector Meeting, Technical Assistance to Ministry of Infrastructure and the Road Transport Development Agency, PowerPoint Presentation, slide 14, 13 May 2010.

introducing a system to deal with habitual offenders, including the establishment of a national database to penalize such offenders; (v) introducing distance-related overloading fees; and (vi) allowing a tolerance of 5% (rounded down to the nearest 100 kg) when an axle or axle group is found to be overloaded.[26]

Government of Rwanda officials have confirmed that "the present study is coming at the right time"[27] and "there is no entrenched law that would need to be changed".[28]

2.1.4 Tanzania

Tanzania has a relatively modern legal instrument on vehicle overload control, the implementation of which has had positive effects, and a taskforce has been constituted to pursue improvements.

Tanzania's *National Transport Policy* includes the objective of "ensur[ing] that roads do not suffer unnecessary distress due to gross vehicle mass, axle mass loads or the combination of the two". It calls for: (i) effective enforcement procedures balancing "financial needs and [the] interest of preserving the trunk roads infrastructure"; and (ii) private-sector involvement (e.g., through self-regulation).[29]

The main legal instrument on vehicle overload control in Tanzania is *The Road Traffic (Maximum Weight of Vehicles) Regulations, 2001*, issued under Section 114(1)(p) of the *Road Traffic Act (No. 30 of 1973).*[30] Although there is a taskforce revisiting and recasting this legal instrument, it is the one that is currently applicable. Inspired by the SADC Model Legislative Provisions on Management of Vehicle Loading,[31] it is a relatively modern legal instrument on the subject. Key aspects of these Regulations include the following:

(i) Legal load limits include 56 tons for gross vehicle mass (for a vehicle and drawbar trailer with 7 axles), 10 tons for a single axle (4 tires, non-steering),[32] 18 tons for a tandem (non-steering, 8 tires),[33] and 24 tons for a triple or tridem (non-steering, 12 tires).[34] (First and Second Schedules)

(ii) It is stated that "for reasons of the distribution of the load on a vehicle", a tolerance of 5% on an axle or group of axles is allowed (but not on gross combination mass), after rounding down to the nearest 100 kg (Regulation 7-(2)). The 5% overload should be redistributed for compliance; if not, such overload shall either be offloaded or may be

[26] EgisBCEOM (Mission of Geroge Makajuma), Technical Assistance for Institutional Capacity Building in Road Maintenance and Auditing of Programmes, Lot 1: Technical Assistance to MININFRA and Road Agency, European Development Fund, December 2009, pp. 23–28.
[27] Statement of Rwanda at the 1st Task Force Meeting and the 1st Stakeholders Workshop for the current study.
[28] Interview with Mr. Frederick Addo-Abedi (Managing Director), Mr. Eric Ntagengeowa (Manager, Road Safety and Environment), and Mr. Garuka Diendonne (Axle Load Engineer), Rwanda National Transport Development Agency, 27 January 2010.
[29] United Republic of Tanzania, Ministry of Communications and Transport, *National Transport Policy*, 2003, Section 7.6.2.
[30] Other legal instruments collected for Tanzania include: (i) Road Act, 2007; and (ii) The Motor Vehicles (Tax on Registration and Transfer) Act, 2006.
[31] Chemonics International, Inc. [Advisor: Evans S. Marowa, Short-term Transport Operations Specialist], *Technical Report: Proposed Harmonized System for Vehicle Overload Control*, submitted to Regional Center for Southern Africa, U.S. Agency for International Development, September 2003, p. 2.
[32] 8 tons for single steering driver operated with 2 tires and 9 tons for single steering draw bar controlled with 4 tires.
[33] 12 tons for a tandem non steering with 8 tires, 15 tons for tandem non steering with 6 tires, and 16 tons for tandem steering (dolly) with 8 tires.
[34] 21 tons for a triple non steering with 10 tires and 24 tons for a triple with 6 super-single tires (i.e., "single mounted tires special[ly] designed for replacing the combination of dual mounted tires on axles with air suspension") (Second Schedule and Regulation 2).

carried further after paying surcharge fees for carrying it further four times the corresponding fees for the overload (Regulation 7-(3)).

(iii) Generally overloading fees, rather than fines, are imposed "on [the] spot" (Regulation 8-(1)).[35]

(iv) Overloading fees for an axle or group of axles range from USD 8 for 100 kg to USD 2,986 for 10,000 kg or above (Section 11(2)a and Third Schedule); for gross vehicle mass, overloading fees range from USD 22 for 500 kg to USD 35,000 for 31,500 kg or above (Regulation 11(2)b and the Fourth Schedule).[36]

(v) Liability/responsibility under the Regulations is imposed on the owner of the overloaded vehicle (Regulation 8-(2)).

(vi) To secure payment of fees, an overloaded vehicle is detained free of charge by the Road Authority for three days, after which a fee of USD 20 per day is charged until proof of payment is produced (Regulation 12-(1)(5)).

(vii) A fee of USD 2,000 is charged for bypassing or "absconding" from a weighbridge (Regulation 13.-3). If the fee is not paid within 90 days, the Road Authority may auction the vehicle and goods to pay the fee (Regulation 13(7)).

(viii) Vehicles overloaded with awkward loads are not offloaded at the weighbridge station unless special and legal safety precautions are taken. If the destination is further away than the starting point, the driver is to return to the starting point for offloading to legal limits after having paid the overload fee, and if the destination is nearer than the starting point the vehicle may proceed after having paid the overload fee plus a surcharge of four times the overloading fee (Regulation 9-(5) and (6), and Regulation 7(3)).

(ix) Officers authorized by the Road Authority have a number of listed powers (e.g., requiring drivers to stop, entering vehicles, inspecting vehicles, weighing vehicles, inspecting records), but they do not have the power to arrest or apprehend offenders (Regulation 14).

(x) Decisions by the Road Authority or its authorized officers may be appealed to the Minister, and the Minister's decisions may be appealed to the High Court under the provisions of the Criminal Procedure Act (Regulations 17-(1) and (2)).

At the 1st Task Force Meeting, the Tanzanian delegation reported that the percentage of overloaded trucks on the country's trunk roads decreased from about 40% around 2000 (i.e., prior to the promulgation of the 2001 Regulations) to about 5% in 2008, although it is now at 18%–20%.

There are some technical legal issues with the 2001 Regulations, including the following:

[35] However, Regulation 6 provides for criminal penalties, including a fine of at least USD 2,000 and/or imprisonment of up to six months, for offenses related to misuse of special permits issued by the Road Authority (Regulation 6 b), or seemingly "any person who … drives or uses or causes or permits to be driven … any motor vehicle or trailer on any road in contravention of any provision of these Regulations" (Regulation 6 a), although the application of criminal penalties in the latter case is not clear in the Regulations.

[36] When a vehicle is overloaded both with respect to axle load and gross vehicle mass limits, only the schedule giving the highest fee is applied Regulation 11(2)c).

(i) Regulation 13.-(1)–(3) on absconding or bypassing a weighbridge seems to require even empty trucks to go through the weighbridge, since it applies to vehicles "whether overloaded or not". In fact, all trucks and buses are weighed in Tanzania even if they are empty.[37]

(ii) Regulation 7-(1)(4) provides that if a vehicle is carrying a load in excess of the legal limit, the excess load is to be offloaded or redistributed, but offloading procedures are not specified.

(iii) Regulation 16-(1) allows the Roads Authority in consultation with the Minister to refrain from imposing a fee or to impose a reduced fee under grounds of national security, for bilateral agreements, or in the case of emergencies, but it has been reported that some permits have been issued ostensibly under this provision to blatantly overloaded vehicles.

Again, as noted, a taskforce has begun to address these issues.

2.1.5 Uganda

Uganda is moving toward modernization of its vehicle overload control legal instruments, with expected changes to include decriminalization and the setting of scientifically based fees.

The main legal instrument on vehicle overload control in Uganda is *Statutory Instruments Supplement 201 No. 25, under Section 178 of the Traffic and Road Safety Act* (1998), which provides *The Traffic and Road Safety (Weighbridges) Regulation*, 2010.[38] Key aspects of this Regulation include the following:

(i) Legal load limits include 56 tons for gross vehicle mass (for a truck trailer vehicle with 7 axles), 10 tons for a single axle (4+ wheels, non-steering), 16 tons for a tandem axle (non-steering, 4 wheels on each axle),[39] and 24 tons for a triple axle group or tridem (non-steering, 4 wheels on each axle)[40] (Sub-Regulations 4 and 6).

(ii) Police officers are authorized to direct the driver or other person in charge of an overloaded vehicle/trailer to remove the excess weight at the expenses of the owner[41] or other responsible person, or impound the vehicle/trailer until the excess weight is removed (Sub-Regulation 14(2) (a) and (b)).

(iii) Criminal penalties are provided for offenses under the Regulation, for a first offense up to 15 currency points (UGX 300,000, about USD 120 equivalent) and/or imprisonment not exceeding one year, and for second or subsequent offenses up to 30 currency points (UGX 600,000, about USD 250 equivalent, and/or imprisonment not exceeding two years) (Sub-Regulation 16(2)). An additional fine not exceeding 10 currency points (UGX 200,000, about USD 80 equivalent) applies for each day the offense continues. These provisions notwithstanding, a fine of 10–15 currency points (UGX 200,000–300,000, about USD 80–120 equivalent) applies when the axle overload is 500–2,000 kg for each overloaded axle; a fine not exceeding 20 currency points (UGX 400,000, about USD 180 equivalent) when the axle overload is 2,000–4,000 kg for each

[37] See Ministry of Trade and Industry (Rwanda), *Current Status of NTB [Non-Tariff Barriers] along the Northern and Central Corridors (including the Kigali–Bujumbura Route)*, 2010, p. 18.
[38] Previous Traffic and Road Safety (Weighbridges) Regulations were issued in 1993, 1998, and 2004.
[39] 12 tons for a tandem axle group having four wheels on one axle and two wheels on another, and 14 tons for a tandem axle group with two wheels on each axle.
[40] 18 tons for a triple axle group having four wheels each on two axles and two wheels on one axle.
[41] The "owner" is defined as the "legal owner, the person having custody or the person driving the vehicle, trailer or engineering plant" (Sub-Regulation 2).

overloaded axle; and up to 30 currency points (UGX 600,000, about USD 250 equivalent) where the axle overload exceeds 4,000 kg for each overloaded axle (Sub-Regulation 16).[42]

No percentage tolerance or operational allowance on axle loads and/or on maximum gross weight is allowed in Uganda.

A Cabinet Paper has been prepared as part of the process to formulate a standalone Weighbridges Act of 2011 (or 2012), which would set aside applicable provisions of the 1998 Act and the 2010 Regulation. The first main change would be to abolish the current court procedure for violators and replace it with an administrative procedure (to address corruption in the judicial system); in effect, violators will be issued a ticket at the weighbridge and would have to pay directly to the consolidated revenue fund of the government. The second main change included in the drafting principles for the new law is a move toward more realistic, scientifically based fee levels since the maximum and minimum fines set in the current law are too low compared to the damage caused by vehicle overloading.

A *Project for "Development of the National Axle Load Control Policy"*, which was commenced in October 2010 and is scheduled for completion in May 2011, was ongoing at the time this report was drafted.[43]

2.2 Cross-Country Comparison and Analysis

2.2.1 Maximum Permissible Axle Load Limits and Gross Vehicle/Combination Mass/Weight

Table 2-1 sets out maximum permissible axle load limits for the EAC countries, as well as COMESA [44] and SADC guidelines. Table 2-2 sets out maximum permissible vehicle/combination mass/weight for the EAC countries. Key findings follow:

(i) Generally, four of the five countries are (partially) implementing COMESA limits, while one (Tanzania) is implementing SADC limits.[45]

(ii) Within the EAC, the load limit for the single nonsteering axle group is already harmonized at 10 tons, and that for the triple nonsteering axle group is already harmonized at 24 tons. Kenya, Tanzania, and Uganda are also already harmonized at 8 tons for the single steering driver operated axle. There are differences in load limits among EAC countries for other types of axles and axle groups. For example, the load limit for the tandem with 4 wheels on an axle (nonsteering) is 16 tons in the EAC/COMESA countries and 18 tons in Tanzania.

(iii) Kenya, Tanzania, and Uganda have already harmonized gross vehicle/combination mass/weight for two-axle vehicles at 18 tons, and for a vehicle plus semitrailer with

[42] Other legal instruments collected for Uganda include relevant sections of the Traffic and Road Safety Act (1998), the Uganda National Roads Authority Act (2006), the Uganda Road Fund Act (2008).
[43] IDC and Associates, *Inception Report of the Project for "Development of the National Axle Load Control Policy"*, prepared for the Ministry of Works and Transport, Republic of Uganda, November 2010.
[44] Based on a communication received from COMESA on 26 April 2011, it was learned that COMESA adopted the same standards as SADC at the COMESA Infrastructure Ministers' Third Meeting held in Djibouti on October 2009. The references here to the more traditional (and now outdated COMESA standards) will be corrected in the Draft Final Report.
[45] See, e.g., East African Community Secretariat, *The East African Trade and Transport Facilitation Project, Meeting of a Technical Working Group (TWG) on the Axle Load Harmonization in East Africa, Report of the Meeting*, March 2009, p. 6.

three axles at 28 tons. The limits for other vehicle/combination types are not harmonized.

Table 2-1: Maximum Permissible Axle Load Limits for the EAC Countries, COMESA, and SADC

Type of Axle/Axle Group	Tires	Burundi	Kenya	Rwanda	Tanzania	Uganda	COMESA/ SADC
Single steering drive operated	2	10	8		8	8	8
Single steering drawbar controlled	4	10	8		9	8	
Single nonsteering	2	10	7.5		8		8
Single nonsteering	4	10	10	10	10	10	10
Two steering drive operated	4				14	14	
Tandem nonsteering	4	16	12		12		
Tandem nonsteering, 4 wheels on one axle and 2 wheels on another axle	6	16	16		15	12	
Tandem steering (dolly)	8	16			16		16
Tandem with 4 wheels on an axle (nonsteering)	8	16	16	16	18	16	18
Triple nonsteering, with 4 wheels per axle	12	24	24	24	24	24	24
Triple axle group with 4 wheels on 2 axles and 2 wheels on one axle	10	24			21	18	
Triple axle super- single tires	6	24		24	24		

Notes: (i) Burundi does not provide for separate axle load limits with detailed specification by type of axle/axle group; (ii) a blank means that the limit is not specified; and (iii) COMESA limits shown are those approved by the COMESA Infrastructure Ministers at their Third Meeting held in Djibouti in October 2009.

Sources: (i) Burundi: *Ordonnance Ministérielle No. 720/70 du 12/08/93 Portant Regiementation de la Charge Maximum par Essieu des Véhicules Circulant en Territoire Burundais* [Ministerial Ordinance No. 720/70 of 12 August 1993 Regulating Maximum Axle Loads of Vehicles Operating in the Territory of Burundi]; (ii) Kenya: *The Traffic Act (Chapter 403)*, *Rules 39 and 41*, and various legislative supplements including *Legal Notice No. 118 of 12 September 2008* (cited as the *Traffic (Amendment) Rules, 2008)*; (iii) Rwanda: *Presidential Order No. 85/01 of 02/09/2002 Regulating General Traffic Police and Road Traffic*; (iv) Tanzania: *The Road Traffic (Maximum Weight of Vehicles) Regulations, 2001; (v) Uganda: The Traffic and Road Safety (Weighbridges) Regulation, 2010*; (vi) COMESA and SADC: East African Community, *Meeting of the Technical Committee on Axle Load Limits Implementation in the East African Community, Report of the Meeting*, 30 August 2007, p. 12; (vii) email from Mr. Gilbert Maeti, Senior Transport Economist, Infrstrastructure Division, COMESA Secretariat, to the JICA Study Team, 26 April 2011; and (viii) "inspiration" for structure of the table: IDC and Associates, *Inception Report of the Project for "Development of the National Axle Load Control Policy"*, prepared for the Ministry of Works and Transport, Republic of Uganda, November 2010, p. 26

Table 2-2: Maximum Permissible Vehicle/Combination Mass/Weight for the EAC Countries

Vehicle/Combination Type	Maximum Gross Vehicle/Combination Mass/Weight (in Tons)				
	Burundi	Kenya	Rwanda	Tanzania	Uganda
Vehicle with 2 axles		18		18	18
Vehicle with 3 axles		24		26	24
Vehicle with 4 axles		28		28	30
Vehicle + semitrailer with 3 axles		28		28	28
Vehicle + semitrailer with 4 axles		34		36	32
Vehicle + semitrailer with 5 axles		42		44	40
Vehicle + semitrailer with 6 axles		48		50	48
Vehicle + drawbar trailer with 4 axles		36		37	38
Vehicle + drawbar trailer with 5 axles		42		45	42
Vehicle + drawbar trailer with 6 axles		48		53	50
Vehicle + drawbar trailer with 7 axles	53		53	56	56

Notes: (i) Burundi and Rwanda do not provide for separate maximum mass/weight limits specified by vehicle/combination type; and (ii) a blank means that the limit is not specified.
Sources: (i) Burundi: *Ordonnance Ministérielle No. 720/70 du 12/08/93 Portant Regiementation de la Charge Maximum par Essieu des Véhicules Circulant en Territoire Burundais* [Ministerial Ordinance No. 720/70 of 12 August 1993 Regulating Maximum Axle Loads of Vehicles Operating in the Territory of Burundi]; (ii) Kenya: *The Traffic Act (Chapter 403)*, *Rules 39 and 41*, and various legislative supplements including *Legal Notice No. 118 of 12 September 2008* (cited as the *Traffic (Amendment) Rules, 2008)*; (iii) Rwanda: *Presidential Order No. 85/01 of 02/09/2002 Regulating General Traffic Police and Road Traffic*; (iv) Tanzania: *The Road Traffic (Maximum Weight of Vehicles) Regulations, 2001; (v) Uganda: The Traffic and Road Safety (Weighbridges) Regulation, 2010*; (vi) COMESA and SADC: East African Community, *Meeting of the Technical Committee on Axle Load Limits Implementation in the East African Community, Report of the Meeting*, 30 August 2007, p. 12; and (vii) "inspiration" for structure of the table: IDC and Associates, *Inception Report of the Project for "Development of the National Axle Load Control Policy"*, prepared for the Ministry of Works and Transport, Republic of Uganda, November 2010, p. 26

2.2.2 Other Issues

Other key aspects that vary between and among the EAC Partner States include the following:

(1) Operational Allowances/Tolerances

The Kenya National Highways Authority has administratively provided an operational allowance of 5%, on axle load limits (only). Tanzania's *Road Traffic (Maximum Weight of Vehicles) Regulations, 2001* indicate a tolerance of 5% on an axle or group of axles allowed ("for reasons of the distribution of the load on a vehicle"), after rounding down to the nearest 100 kg. There is currently no law/regulation or policy in Burundi, Rwanda, or Uganda that allows any percentage tolerance or operational allowance on axle loads and/or on maximum gross weight.[46]

On the one hand, it may be argued that allowing small percentage allowances/tolerances in load limits may be justified due to various factors such as calibration, equipment age, and type, there will always be differences in readings for the same mass/weight at different weighbridges.[47] On

[46] However, as noted, a European Development Fund technical assistance in Rwanda in December 2009 recommended allowing a tolerance of 5% (rounded down to the nearest 100 kg) when an axle or axle group is found to be overloaded.
[47] See source in previous footnote, p. 7. Also, at the 2nd Stakeholders Workshop, JICA Study Team commented that a scale error (plus or minus, not only plus) is unavoidable even if the weighbridge has been verified. If the actual load is 56.00 tons, the measurement may be 56.00 plus or minus 1.12 tons (i.e., between 54.88 tons and 57.12 tons). No scale is 100% accurate and the manufacturers themselves accept a scale error. Therefore, zero tolerance on GCM is not recommended. East African Community, *Study on the Harmonization of Overload Control Regulations in the*

the other hand, it may be argued that such tolerances have already been taken into account when setting the legal load limits.[48] At the 1st Stakeholders Workshop, it was observed that for each country to arrive at their respective percentages, due consideration must have been given, so there must be "give and take".[49] In any event, even if legal load limits are harmonized, there is effectively no harmonization if there is no harmonization of operational allowances/tolerances. Accordingly, the March 2009 EAC Transport Working Group (TWG) meeting on axle load harmonization recommended an overload tolerance level "of a maximum of 5%" for individual axles and gross combination mass.[50] At the 2nd Stakeholders Workshop in Nairobi on 30-31 May 2011, Kenya and Tanzania stated that they prefer zero tolerance on gross vehicle/combination mass, while the other countries preferred 2% (all countries accepted 5% tolerance on axles).[51] Finally, at the Extraordinary Task Force Meeting held in Bujumbura on 29-30 June 2011, the Partner States agreed in principle that a 5% tolerance on axle weight be allowed and maximum limits for gross vehicle mass (GVM) or gross combination mass be inclusive of all tolerances.[52]

(2) Decriminalization[53]

Tanzania has at least to some extent decriminalized overloading,[54] while others have not. As noted, generally overloading fees, rather than fines, are imposed "on [the] spot" in Tanzania (Regulation 8-(1), *The Road Traffic (Maximum Weight of Vehicles) Regulations, 2001*), although also as noted, some criminal penalties are provided.[55] Fines rather than fees are charged in the other four Partner States. In addition, prison time for overloading is at least a theoretical possibility in Burundi (two months), Kenya (1–4 years), and Uganda (up to two years). As noted, the Inter-ministerial Technical Committee on Axle Load Control (2009) in

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EAC Region, 2nd Stakeholders Workshop to Review the Interim Report and Advise on Ways Forward, Report of the Workshop, May 2011, p. 10, item (xi).

[48] One delegate at the 1st Stakeholders Workshop argued that setting a limit and then allowing tolerances is tantamount to setting double limits. The East African Trade and Transport Facilitation Project, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 1st Stakeholders Workshop to Review the Inception Report and Initial Study Findings*, 7–8 February 2011, p. 18, Section 4, paragraph xxi. In South Africa, since a number of operators were deliberately exploiting the vehicle/combination mass tolerance to load beyond the 56 tons permissible maximum without being charged for overloading, a 5% tolerance on vehicle/combination mass was reduced to 2% although that on axles was retained at 5%. Michael Ian Pinard, *Overload Control Practices in Eastern and Southern Africa: Main Lessons Learned*, Sub-Saharan Transport Policy Program April 2010, p. 83.

[49] See source in previous footnote, p. 9, Section 2.9, paragraph xix.

[50] East African Community Secretariat, *The East African Trade and Transport Facilitation Project, Meeting of a Technical Working Group (TWG) on the Axle Load Harmonization in East Africa, Report of the Meeting*, March 2009, p. 7.

[51] East African Community, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 2nd Stakeholders Workshop to Review the Interim Report and Advise on Ways Forward, Report of the Workshop*, May 2011, p. 13. Tanzania suggested that there is a need to check the load distribution pattern among individual axles, as affected by the suspension system, and this should be included in vehicle roadworthiness tests. Previous source, p. 7, item (xi).

[52] East African Community, *Extraordinary Task Force Meeting for the Study on the Harmonization of Overload Control Regulations in the East African Community, Report of the Meeting*, June 2011, Sections 3.2 and 4.0 (iii) and (iv), pp. 4-5.

[53] "Decriminalization" is defined as "the reclassification of an activity so that it is no longer an offense". While it means that commission of the act is no longer prosecuted in a court of law and for which a fine or prison sentence may be imposed upon conviction, the activity may still be regulated through appropriate administrative controls and financial measures. Southern Africa Transport and Communications Commission (SATCC), *Enabling Legal Reform: Control of Vehicle Loading*, May 2009, Explanatory Memorandum, Section 7 (unpaginated).

[54] At the 2nd Stakeholders Meeting in Nairobi on 30-31 May 2011, there was some discussion of whether Tanzania had instituted decriminalization or just instant fines. The JICA Study Team clarified that decriminalization does not mean that there is no recourse to the courts (e.g., in Namibia a transporter challenged a fine claiming that the weighbridge had not been verified. East African Community, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 2nd Stakeholders Workshop to Review the Interim Report and Advise on Ways Forward, Report of the Workshop*, May 2011, p. 6, item (iv).

[55] See footnote 35 above.

Kenya proposed decriminalization of overloading offenses and introduction of spot fines.[56] Also as noted, there is an advanced proposal for decriminalization of vehicle overloading in Uganda, where judicial penalties have not deterred overloading. A standalone Weighbridges Act of 2011 (or 2012) would abolish the current court procedure for violators and replace it with an administrative procedure (to address corruption in the judicial system). The March 2009 EAC Transport Working Group (TWG) meeting on axle load harmonization observed that judicial fines in many cases were not deterring overloading due to "many layers of bureaucracy involved", which "could encourage corruption".[57] Zimbabwe is often cited as a historical good-practice example in which the decriminalization of vehicle overloading and the introduction of administrative adjudication procedures to deal with infringements led to more effective control.[58] Even under an administrative system, if the law imposes a duty on a driver to present a vehicle for weighing, a failure to do so is still treated as a criminal offense.[59]

(3) Extent of Cost Recovery

Good (or best) practice would require linking the level of charges/fines for overloading with the actual cost of road damage, i.e., imposing economic fees derived from consideration of such factors as pavement damage, travel distances, and a punitive element.[60] The SADC Model Legislative Provisions for Management of Vehicle Loading (Section 7(5)) call for the setting overloading charges taking into consideration costs related to (i) road use calculated on a weight-distance basis, (ii) enforcement activities, (iii) congestion factors, (iv) capital investment, and (v) any other expenditure borne by the national road authority relating to implementation of the provisions.[61] The SADC Model Legislative Provisions (Section 15) call for the transfer of overloading fees to the Road Fund, another good practice.[62]

The maximum fines/fees for vehicle overloading expressed in USD equivalent in the five Partner States are shown in Table 2-3:

[56] As noted in footnote 18, an earlier (2006) *Axle Load Best Options Study* in Kenya funded by the European Union had found that decriminalization was not an urgent priority, and that the full implications of moving towards an administrative justice system for traffic offenses including overloading needs to be assessed.

[57] East African Community Secretariat, *The East African Trade and Transport Facilitation Project, Meeting of a Technical Working Group (TWG) on the Axle Load Harmonization in East Africa, Report of the Meeting*, March 2009, p. 7.

[58] Prior to 1993, the incidence of overloading on Zimbabwe's roads was 35%–43%, but by 1996, following decriminalization and the introduction of administrative procedures, the incidence of vehicle overloading had decreased to 6%. Michael Ian Pinard, *Overload Control Practices in Eastern and Southern Africa: Main Lessons Learned*, Sub-Saharan Transport Policy Program April 2010, pp. 56–57. In 1998, South Africa adopted the Administrative Adjudication of Road Traffic Offenses Act, which provided for minor cases of overloading to be addressed administratively, although the offender may still judicial proceedings. Southern Africa Transport and Communications Commission (SATCC), *Enabling Legal Reform: Control of Vehicle Loading*, May 2009 [Explanatory Memorandum, Section 5 (unpaginated)].

[59] Africon Limited, *Consultancy Services for a Heavy Vehicle Overloading Control Study*, prepared for National Road Administration of Mozambique, Final Report, March 2007, Volume 1, p. 9.

[60] Michael Ian Pinard, *Overload Control Practices in Eastern and Southern Africa: Main Lessons Learned*, Sub-Saharan Transport Policy Program April 2010, p. 44.

[61] Southern Africa Transport and Communications Commission (SATCC), *Enabling Legal Reform: Control of Vehicle Loading*, May 2009 ["Model Legislative Provisions on Management of Vehicle Loading", pp. 8–9].

[62] At the 1st Stakeholders Workshop, a delegate from Kenya noted that a provision earmarking overloading fees for the Road Fund would be welcome. The East African Trade and Transport Facilitation Project, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 1st Stakeholders Workshop to Review the Inception Report and Initial Study Findings*, 7–8 February 2011, p. 13, Section 3.3, paragraph viii.

Table 2-3: Maximum Fines/Fees for Vehicle Overloading

Country	Maximum Fines/Fees in National Currency	Maximum Fines/Fees in USD
Burundi	BIF 2,000	2
Kenya	KES 200,000–400,000 (first and subsequent offenses, respectively)	2,500–5,000
Rwanda	RWF 90,000–180,000 (first and subsequent offenses, respectively)	150–300
Tanzania	–	35,000
Uganda	UGX 300,000–600,000 (first and subsequent offenses, respectively) + UGX 200,000 (for each day the offense continues) + UGX 600,000	(120–250) + (80/day) + 250

Source: JICA Study Team

Certainly in Burundi, Rwanda, and Uganda, and probably also in Kenya (where magistrates sometimes assess less than even the minimum fine), current fine levels are less than would be dictated by economic principles, while the fee levels in Tanzania may reflect economic levels to some extent. Also as noted, Uganda is currently considering a move toward more realistic, scientifically based fee levels.

While fines in Kenya are set per ton-km (i.e., on a weight-distance basis, a good practice), fines in Tanzania and Uganda are set per km (although the Uganda fine levels include a flat component), and fine levels in Burundi and Rwanda are not calibrated based on tons or ton-km.

Only in Tanzania are overloading charges paid to the road authority rather than the public treasury.

(4) Liability/Responsibility for Overloading

Liability/responsibility for vehicle overloading varies by country. In Burundi and Rwanda, liability/responsibility for vehicle overloading is not well-specified in the relevant legal instruments. In Kenya, Section 58(2) of the Traffic Act provides for the prosecution of the driver, the owner of the vehicle, and the loader, but as noted, in most cases only the driver and the owner of the vehicle are prosecuted, even though the loader is identified in the cargo manifest and/or delivery note.[63] In Tanzania, Regulation 8-(2) of The Road Traffic (Maximum Weight of Vehicles) Regulations impose liability/responsibility on the owner of the overloaded vehicle. In Uganda, the party responsible for overloading under The Traffic and Road Safety (Weighbridges) Regulation is perhaps less clear than in Kenya or Tanzania, although it seems to extend to the vehicle owner (Regulation 3), and the driver and operator (Regulation 6); as noted, the "owner" under the Uganda Regulation is defined as the "legal owner, the person having custody or the person driving the vehicle, trailer or engineering plant" (Regulation 2).

The SADC Model Legislative Provisions for Management of Vehicle Loading (Section 17(1)) imposes liability for overloading on the "person owning or operating" the vehicle. More "cutting edge" is the approach of South Africa's National Road Traffic Amendment Act (No. 64 of 2008), which assigns responsibility to managers, agents, or employees of a consignor or consignee with regard to actions and omissions, and shifts the burden of proof to these parties.[64]

[63] See footnote 13 above.

[64] Sections 74A and 74B of South Africa's National Road Traffic Act as amended in 2008 read as follows:

"Act or omission of manager, agent or employee of consignor and consignee
74A. (1) Whenever any manager, agent or employee of a consignor or consignee, as the case may be, does or fails to

(5) Additional Aspects

Certain additional aspects are addressed in some of the national legal instruments of the Partner States (e.g., Tanzania allows the use of super-single tires on air suspensions as substitutes for dual tires, Kenya banned lift axles in its Legal Notice No. 145 of 2007, Tanzania allows interlinks although only under controlled situations and conditions, Tanzania's The Road Traffic (Maximum Weight of Vehicles) Regulations of 2001 includes provisions on what happens when overloading fees are not paid).

Further aspects not covered adequately or at all in some or all of the existing legal instruments in the Partner States will be addressed in the proposed EAC legal instrument for the management of vehicle loading to be set out in Chapter 8 of this Interim Report, e.g., vehicle load control, abnormal loads, voluntary compliance, weighbridge facilities and operations, data management system, authorized officers, audits, offenses, payment procedures, official documents).

2.3 Toward Harmonization within the EAC and with SADC and COMESA

As outlined in the JICA Study Team's Inception Report and summarized in Table 2-4, a number of important steps have been taken toward harmonization of vehicle overload control within the EAC and among the Tripartite grouping of the EAC, SADC, and COMESA. As relevant, documents produced during these stages were cited earlier in this chapter.

One of the steps was the *Implementation of Studies for Improvement of Overload Control in the Eastern and Southern Africa (ESA) Region (2006)*. COMESA, SADC, and the Southern Africa Office of the United Nations Economic Commission for Africa (UNECA) working under the Regional Economic Communities Transport Coordinating Committee established under the Sub-Saharan Africa Transport Policy Program (SSATP) identified vehicle overload control as one of the priority areas to be addressed in their 2006/2007 Work Program. Key outputs of the project included: (i) Synthesis of Overload Control Practice and Main Lessons Learned; (ii) Case Studies on Emerging Good Practice; and (iii) Guidelines on Aspects of Overload Control.[65]

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do anything which, if the consignor or consignee had done or failed to do it, would have constituted an offence in terms of this Act, the consignor or consignee, as the case may be, shall be regarded to have committed the act or omission personally in the absence of evidence indicating—
(a) that he or she did not connive at or permit such act or omission;
(b) that he or she took all reasonable measures to prevent such act or omission; and
(c) that such act or omission did not fall within the scope of the authority of or in the course of the employment of such manager, agent or employee,
and be liable to be convicted and sentenced in respect thereof.
(2) In the circumstances contemplated in subsection (1) the conviction of the consignor or consignee shall not absolve the manager, agent or employee in question from liability or criminal prosecution.
Proof of certain facts
74B. (1) In any prosecution under this Act, a goods declaration or any other document relating to the load of a vehicle and confiscated from such vehicle shall be proof of the matters stated in such document unless credible evidence to the contrary is adduced.
(2) A copy of or extract from any document referred to in subsection (1), and certified as a true copy or extract by the officer in whose custody the original document is, shall, unless credible evidence to the contrary is adduced, be admissible as evidence and be proof of the truth of all matters stated in such document without the requirement of having to produce the original document from or of which such extract or copy was made."

However, such an approach may be a "bridge too far" for the Partner States.

[65] (i) Michael Ian Pinard, *Overload Control Practices in Eastern and Southern Africa: Main Lessons Learned*, Sub-Saharan Transport Policy Program, April 2010; (ii) InfraAfrica (Pty) Ltd, in association with Africon Limited, Council for Scientific and Industrial Research, and TMT Project (Pty) Ltd, *Preparation of a Synthesis Report and Guidelines on Overload Control, Report on Case Studies*, Sub-Saharan Transport Policy Program, December 2007;

Another important step was the *Meeting of the Technical Committee on Axle Load Limits Implementation in the East African Community (Arusha, August 2007)*. The SSATP study results on vehicle overload control were reported at this EAC technical committee meeting, which among other things recommended that:

(i) The Partner States should start charging economic fees commensurate with the damage caused by overloading rather than judicial fines. Overloading should be decriminalized, removed from the judicial system, and handled administratively.

(ii) The Partner States would adopt the 56-ton gross vehicle standard that is operational in the SADC region.

(iii) The Partner States should adopt an overload tolerance level of a maximum of 5% for individual axles and gross combination mass, and the vehicles should be able to proceed (subject to further consultations on the bridge formula).

(iv) Calibration of weighbridges is to be undertaken based on usage (i.e., number of vehicles weighed) but the interval should not exceed six months. Calibration standards should be linked to the EAC's harmonized Standards, Quality Assurance, Metrology and Testing guidelines.

(v) The EAC will make a proposal after analysis of technical information on super-single tires on air suspension.

(vi) Lift axles are acceptable in principle subject to further analysis of technical supporting data. Partner States were requested to examine the modalities of enforcing compliance of usage within their legal environments.

(vii) Kenya was to provide accident statistics to support the relationship between the tandem steering axle on drawbar trailer (dolly) and accident levels.

(viii) The EAC Secretariat was to explore ways of developing a uniform weighbridge certificate and overload reporting formats, and linking these weighbridges and regional data center to be established.

(ix) The EAC should develop a policy on the "chain or responsibility" for overloading.

(x) The EAC will institute a study on best practices regarding the treatment of abnormal and awkward loads with a view to developing a regional policy.[66]

Perhaps the most significant step was *Regional Workshop on Harmonization of Key Elements and Implementation of Best Practice in Overload Control* (Nairobi, July 2008). Box 2-2 sets out a "consolidation of the workshop resolutions reached by consensus at the final plenary session of the workshop". **Since the workshop report was neither signed nor initialed by representatives of the states attending, and since at least one of the EAC Partner States (Kenya) with delegates in attendance does not seem to concur with all of the workshop findings (and another, Rwanda, did not attend), it may be best viewed as guidance on the shape of future legal instruments governing vehicle load management in the EAC and other RECs rather than an agreement to be enshrined in an EAC-wide legal instrument on the subject. That said, the workshop report in many respects may be viewed as a statement of good practice or even best practice.**

and (iii) Michael Ian Pinard, *Guidelines on Overload Control in Eastern and Southern Africa: Main Lessons Learned*, Sub-Saharan Transport Policy Program, March 2010.

[66] East African Community, *Meeting of the Technical Committee on Axle Load Limits Implementation in the East African Community, Report of the Meeting*, 30 August 2007.

Box 2-2: Resolutions Reached Regional Workshop on Harmonization of Key Elements and Implementation of Best Practice in Overload Control (Nairobi, July 2008)

Legislation and Regulations

(i) ESA Inter-REC standardized vehicle and axle/axle unit load limits as follows:

Steering:	Single		8,000 kg
Non-steering	Single	Single tires	8,000 kg
		Dual tires	10,000 kg
	Tandem	Single tires	16,000 kg
		Dual tires	18,000 kg
	Tridem	Single tires	24,000 kg
		Dual tires	24,000 kg

(ii) Permissible maximum combination mass: 56,000 kg

(iii) Introduction of a common bridge formula as follows:
$P = 2{,}100 \times L + 18{,}000$
Where P = Permissible mass (kg), and
L = distance (m) between the centres of the outer axles of any group of consecutive axles

(iv) Mass tolerance: 5% on axle, axle unit, vehicle and vehicle combination mass;

(v) No quadrem axle units

(vi) Only one axle or axle unit per semi-trailer

(vii) Allowance of lift axles with vigilant enforcement coupled with punitive measures for noncompliance

(viii) Desktop study to be carried out to determine recommended load limits for axles fitted with "super single" (wide-based) tires based on tire width categories; e.g. <350 mm, 350 to 400 mm; >400 mm;

(ix) Tag axles should be treated as part of an axle unit, but should be weighed separately

(x) Interlinks (truck-tractor plus two semi-trailers) should be accepted throughout the region provided that they have no more than two articulation points and a maximum length of 22 m

(xi) Weighbridge verification intervals should be no longer than 12 months with interim routine checks

(xii) Auditing of weighbridge operations to be carried out at least annually

(xiii) Overloading offences should be decriminalized and replaced with an administrative system incorporating fees

(xiv) Level of fees to be based on the recovery of road damage costs

(xv) The three RECs to develop and facilitate the implementation of a harmonized data management system

(xvi) The three RECs to adopt the SADC MOU and MLP on Vehicle Loading and member states to review their overload control regulations and ensure compliance with the MOU and MLP

Weighbridge Infrastructure and Equipment

(xvii) The three RECs to develop a strategic regional network of overload control stations on the major transport corridors

(xviii) Member states should select appropriate weighbridge types based on traffic volumes, using the guidelines

Enforcement and Weighbridge Operations

(ixx) The private sector participates in the operations and maintenance of weighbridges

(xx) A cross-border overload control system linked to customs be introduced at all border posts along the regional corridors

(xxi) The three RECs to introduce harmonized regional weighbridge clearance certificates

(xxii) The three RECs to adopt a policy to promote self-regulation and accreditation and its introduction to member states

Institutional Arrangements

(xxiii) The three RECs to support the relevant subregional offices in their management and implementation of overload control programs

(xxiv) Member states to establish dedicated overload control enforcement units

Human Resources

(xxv) The three RECs to pursue the establishment of a regional training center for overload control utilizing existing training facilities where possible
(xxvi) The three RECs to adopt a common syllabus for overload control training
(xxviii) Member states to ensure that overload control personnel are adequately trained
(xxix) Member states to ensure that overload control personnel are accredited
(xxx) The three RECs to design and facilitate the implementation of anti-corruption programs.

Public Awareness

(xxxi) The three RECs, subregional offices, and member states to engender awareness of the importance of overload control, e.g., by publishing brochures, leaflets and installing information signs

Source: InfraAfrica (Pty) Ltd in association with Africon Limited, Council of Scientific and Industrial Research (CSIR), and TMT Projects (Pty), *Regional Workshop on Harmonization of Key Elements and Implementation of Best Practice in Overload Control, Workshop Report*, Nairobi, 10–11 July 2008

Chapter 3 EAC Regional Trunk Road Network and Its Maintenance

3.1 Existing Conditions and Status of Roads and Bridges Comprising the Regional Trunk Road Network

3.1.1 Road Authorities in the Region

The tasks of operation and maintenance of the region's international trunk road network are undertaken by the road authorities as shown in Table 3-1 below.

Table 3-1: EAC Partner State Road Authorities

Country	Responsible Organization for Roads and Highways		No. of Staff
	Ministry	Road Authority	
Kenya	Ministry of Roads	Kenya National Highways Authority (KeNHA)	300 (Engineers 102)
Uganda	Ministry of Works and Transportation	Uganda National Roads Authority (UNRA)	938 (Professionals 296)
Tanzania	Ministry of Infrastructure Development	Tanzania National Roads Agency (TANROADS)	719 (Engineers 218)
Burundi	Ministère des Transports, des Travaux Publics et de l'Equipement	Office des Routes	100
Rwanda	Ministry of Infrastructure	Rwanda Transport Development Agency (RTDA)	61 (37 Engineers, 4 experts)

Note: n/a indicates that the data has not been collected or is not available.
Source: Kenya: Information from Kenya National Highways Authority; Uganda: UNRA Business Plan 2010/11; Tanzania: Annual Progress Report for FY 2009/10, and interviews during field survey in January–February 2011; Burundi: Information from Road Agency of Burundi; and Rwanda: Information from RTDA,

3.1.2 Provision and Development of Roads and Bridges

The total road length by road class and extent of paving, and the number of bridges, by EAC country, are shown in Tables 3-2 and 3-3 respectively.

Table 3-2: EAC Partner States' Roads by Road Class

Country	Road Length (km)	Primary Road			Secondary Road		
		Type	Road Length		Type	Road Length	
Kenya	25,345.19	Paved	2,808.72	11%	Paved	5,617.25	22%
		Unpaved	809.59	3%	Unpaved	16,109.63	64%
Uganda	21,195.10	Paved	3,273.80	15%	Paved	n/a	n/a
		Unpaved	17,921.30	85%	Unpaved	n/a	n/a
Tanzania	33,012.00	Paved	5,130.50	16%	Paved	702.00	2%
		Unpaved	7,655.68	23%	Unpaved	19,523.82	59%
Burundi	4,473.13	Paved	1,006.43	22%	Paved	21.02	0%
		Unpaved	943.29	21%	Unpaved	2,502.39	56%
Rwanda	4,698	Paved	1,075.00	23%	Paved	0	0%
		Unpaved	1,785.00	38%	Unpaved	1,838	39%

Note: n/a indicates that the data has not been collected or is not available.
Source: Kenya: http://www.kenha.co.ke/index.php?option=comcontent&view=article&id=46 & Itemid=54; Uganda: UNRA National Road Network Condition as at end of quarter 4 of FY 2009/10; Tanzania: TANROADS Annual Progress Report for FY 2009/10; Burundi: Pepertoire des Routes Classees, Ministère des T.P.D.U. Direction general des Routes, Fevrier 1991; and Rwanda: Road Maintenance Strategy, Ministry of Infrastructure, May 2008

The number of bridges in the EAC Partner States is shown in the Table 3-3 below.

Table 3-3: Number of Bridges in EAC Partner States

Country	No. of Bridges	Primary Road		Secondary Road	
		Type	No. of Bridges	Type	No. of Bridges
Kenya	3,780	Concrete	862	Concrete	2,348
		Metal	114	Metal	456
Uganda	n/a	Concrete	94	Concrete	n/a
		Metal	138	Metal	n/a
		Timber	10	Timber	n/a
Tanzania	3,875	Concrete	1,146	Concrete	928
		Metal	1,065	Metal	585
		Timber	17	Timber	102
		Stone	13	Stone	29
Burundi	n/a	Concrete	n/a	Concrete	n/a
		Metal	n/a	Metal	n/a
Rwanda	478	Concrete and Metal	128	Concrete	n/a
		Timber	300	Metal	n/a

Note: n/a indicates that the data has not been collected or is not available.
Source: Kenya: Information from Kenya National Highway Authority; Uganda: Data from UNRA; Tanzania: Data from TANROADS; and Rwanda: Information from RTDA

3.1.3 Maintenance and Management of Roads and Bridges

(1) Roads and Bridges Maintenance and Management

Table 3-4 presents information on the availability of road and bridge maintenance manuals and data. Information on the availability of road operation and management manuals and inventories of road condition data are also shown.

Table 3-4: Availability of Road and Bridge Maintenance Manuals and Data

Name of Countries	Availability of Road Maintenance Manual	Availability of Road Condition Data	Remarks
Kenya	Road Maintenance Manual (May 2010)	Road condition data is not available at KeNHA.	The World Bank carried out a road condition survey in 2004.
Uganda	Road Maintenance Management Manual (July 2005)	Road condition data is managed and updated every year by UNRA.	–
Tanzania	Road Maintenance Management System (January 2010)	Road condition data is managed and updated every year by TANROADS.	–
Burundi	–	–	–
Rwanda	–	–	Road condition was surveyed in the Study of Road Maintenance Strategy in 2008.

Source: JICA Study Team

(2) Assessment of Road Conditions as Viewed from Available Road Condition Data

Table 3-5 presents an assessment of road conditions by class of roads undertaken by the respective EAC country's road authorities.

Table 3-5: Assessment of Road Conditions by Class of Roads

Country	Evaluation	Primary Road		Secondary Road		Overall Condition
		Paved	Unpaved	Paved	Unpaved	
Kenya	Good	64.60%	27.98%	64.02%	18.25%	47%
	Fair	30.65%	50.07%	31.84%	57.06%	41%
	Bad	4.71%	21.95%	4.15%	24.74%	12%
	Length (km)	3,100Km	4,757Km	4,463Km	1,770Km	14,087Km
Uganda	Good	35%	49%	n/a	n/a	47%
	Fair	44%	22%	n/a	n/a	26%
	Bad	21%	29%	n/a	n/a	28%
	Length (km)	3,273.80	17,921.30	n/a	n/a	21,195.10
Tanzania	Good	74%	50%	90%	47%	53%
	Fair	22%	37%	9%	38%	35%
	Bad	4%	12%	1%	15%	12%
	Length (km)	5,166.00	7,620.18	760.00	19,465.82	33,012.00
Rwanda	Good	9%	1%	n/a	1%	11%
	Fair	13%	18%	n/a	16%	47%
	Bad	0%	19%	n/a	22%	41%
	Length (km)	1,075.00	1,786.00	n/a	1,856.00	4,717.00
Burundi	Good	n/a	n/a	n/a	n/a	n/a
	Fair	n/a	n/a	n/a	n/a	n/a
	Bad	n/a	n/a	n/a	n/a	n/a
	Length (km)	1,350.00	781.00	131.00	325.00	2587.00

Note: n/a indicates that the data has not been collected or is not available.
Source: Kenya: Information from KeNHA; Uganda: UNRA National Road Network Condition as at end of quarter 4 of FY 2009/10; Tanzania: Annual Progress Report for FY 2009/10; Rwanda: Road Maintenance Strategy, The Ministry of Infrastructure, May 2008; and Burundi: Information from Road Agency of Burundi

(3) Bridge Condition Data

Inventories of bridge condition data in the respective Partner States were not available.

3.1.4 Outline of International Corridors in the EAC Region

(1) Location and Service Length of International Corridors

The EAC Region is served by eight international corridors as shown in Table 3-6 and Figure 3-1. The Northern and Central Corridors are of strategic importance for the region.

Table 3-6: Length of International Corridors

No.	Corridor	Countries	Cities/Towns Served by the Corridor	Length (km)
1	Central Corridor	Tanzania	Dar es Salaam → Dodoma → Isaka → Nyakanazi → Rusumo	1,190
		Rwanda	Rusumo → Kigali	170
2	Northern Corridor	Kenya	Mombasa → Nairobi → Eldoret → Malaba	900
		Uganda	Malaba → Kampala → Masaka → Gatuna	640
		Rwanda	Gatuna → Kigali → Kayanza	230
		Burundi	Kayanza → Bujumbura	110
3	Masaka–Bujumbura	Uganda	Masaka → Mtukula	n/a
		Tanzania	Mtukula →Lusahunga → Kobero	414.01
		Burundi	Kobero → Bujumbura	222
4	Iringa–Moyale	Tanzania	Iringa → Dodoma → Arusha → Namanga	691.4
		Kenya	Namanga → Nairobi → Moyale	900
5	Morogoro–Tunduma	Tanzania	Morogoro → Iringa → Tunduma	776.8
6	Malaba–Pakwach	Uganda	Malaba → Gulu → Pakwach	n/a
7	Gulu–Nimule	Uganda	Gulu → Nimule	n/a
8	Mtwara–Mbamba	Tanzania	Mtwara → Mbamba	821.4

Note: n/a indicates that the data has not been collected or is not available.
Source: Data from the road authorities of the EAC Partner States

Source: JICA Study Team

Figure 3-1: Trunk Road Network of the EAC Region

(2) Development and Maintenance of International Corridors

Table 3-7 summarizes the development and maintenance of Northern and Central Corridors, which are of strategic importance.

Table 3-7: Development and Maintenance of Northern and Central Corridors

			Outline of Improvement		
Corridor	**Country**	**Section**	**Type of Works**	**Length (km)**	**Completion Year**
Central Corridor	Tanzania	Dar es Salaam → Dodoma	(only Routine)	n/a	n/a
		Dodoma → Isaka	Pavement	127	2009
		Isaka →Lusahunga	Rehabilitation	242	2013
		Lusahunga→ Rusumo	(only Routine)	n/a	n/a
	Rwanda	Rusumo → Kigali	Periodic maintenance and routine maintenance	157	ongoing
Northern Corridor	Kenya	Mombasa → Nairobi	Rehabilitation	35.2	2008
		Nairobi → Eldoret	Rehabilitation	31	2008
		Eldoret → Malaba	Rehabilitation	120	2013
	Uganda	Malaba → Kampala	Routine Maintenance	146	2006–2010
		Kampala → Masaka	n/a	n/a	n/a
		Masaka → Gatuna	n/a	n/a	n/a
	Rwanda	Gatuna → Kigali	rehabilitation	78	Under procurement process
		Kigali → Kayanza (Kanyaru)	Rehabilitation Routine maintenance	158	2003–2005 Under procurement process
	Burundi	Kayanza → Bujumbura	Timely Maintenance	110	2010

Note: n/a indicates that the data has not been collected or is not available.
Source: Tanzania: Annual Progress Report for FY 2009/10 Annex D1; Rwanda: Information from RTDA; Kenya: Kenya National Highways Authority website http://www.kenha.co.ke/index.php?option=com_content &view=article&id=16&Itemid=24&limitstart=1; Uganda: Maintenance Expenditure on the Northern Corridor in the last five years (2011); and Burundi: Direction des Travaux Routiers, Tableau Synthétique des Actvites Réalisées au Cours de L'exercice 2010, Information from Road Agency of Burundi

(3) Road Condition Data of the International Corridors

Table 3-8 presents road condition indicators as represented by the International Roughness Index (IRI) and an assessment for the sections of the Northern and Central Corridors. These were extracted from road condition surveys conducted by Uganda and Tanzania.

Table 3-8: Road Condition Data on the Northern and Central Corridors

Corridor	Country	Sections	Road Condition	
			IRI	Evaluation
Central Corridor	Tanzania	Dar es Salaam → Dodoma	1.7–5.2	Good-Fair
		Dodoma → Isaka	1.7–5.4	Good-Fair
		Isaka → Nyakanazi	2.8–5.3	Good-Fair-Poor
		Nyakanazi → Rusumo	2.6–8.9	Good-Fair-Poor
	Rwanda	Rusumo → Kigali	2–6	Poor–Good
Northern Corridor	Kenya	Mombasa → Nairobi	3.11	Poor–Good
		Nairobi → Eldoret	5.6	Poor–Good
		Eldoret → Malaba	5.6	Poor
	Uganda	Malaba → Kampala	n/a	n/a
		Kampala → Masaka	n/a	n/a
		Masaka → Gatuna	n/a	n/a
	Rwanda	Gatuna → Kigali	2–10	Poor
		Kigali → Kayanza(Kanyaru)	2–6	Good
	Burundi	Kayanza → Bujumbura	2–6	Poor-Good

Notes: IRI = International Roughness Index; n/a indicates that the data has not been collected or is not available.
Source: Tanzania: Data from TANROADS; Rwanda: Transport Sector Meeting Material; Kenya: Regional Road Status September 2008, Ministry of Roads; and Burundi: Rapport sur la situation du réseau routier en 2010, Information from Road Agency of Burundi

(4) Traffic Volumes of International Corridors

Table 3-9 presents commercial traffic volumes along the Northern and Central Corridors, Traffic volumes for all vehicle categories is shown in Appendix B.1.

Table 3-9: Commercial Traffic Volumes along the Northern and Central Corridors

Corridor	Country	Sections	Traffic Volume (Trucks)			
			Light	Medium	Heavy	Total
Central Corridor	Tanzania	Dar es Salaam → Dodoma	3,248	1,298	512	5,058
		Dodoma → Isaka	297	277	338	912
		Isaka → Nyakanazi	395	280	236	911
		Nyakanazi → Rusumo	173	102	120	395
	Rwanda	Rusumo → Kigali	1,235	199	74	1,508
Northern Corridor	Kenya	Mombasa → Nairobi	1,965	1,630	1,067	4,662
		Nairobi → Eldoret	9,027	1,687	504	11,218
		Eldoret → Malaba	2,051	976	343	3,370
	Uganda	Malaba → Kampala	4,505	1,022	685	6,212
		Kampala → Masaka	3,527	1,210	161	4,898
		Masaka → Gatuna	971	471	140	1,582
	Rwanda	Gatuna → Kigali	616	276	107	999
		Kigali → Kayanza	1,138	214	29	1,381
	Burundi	Kayanza → Bujumbura	544	236	34	814

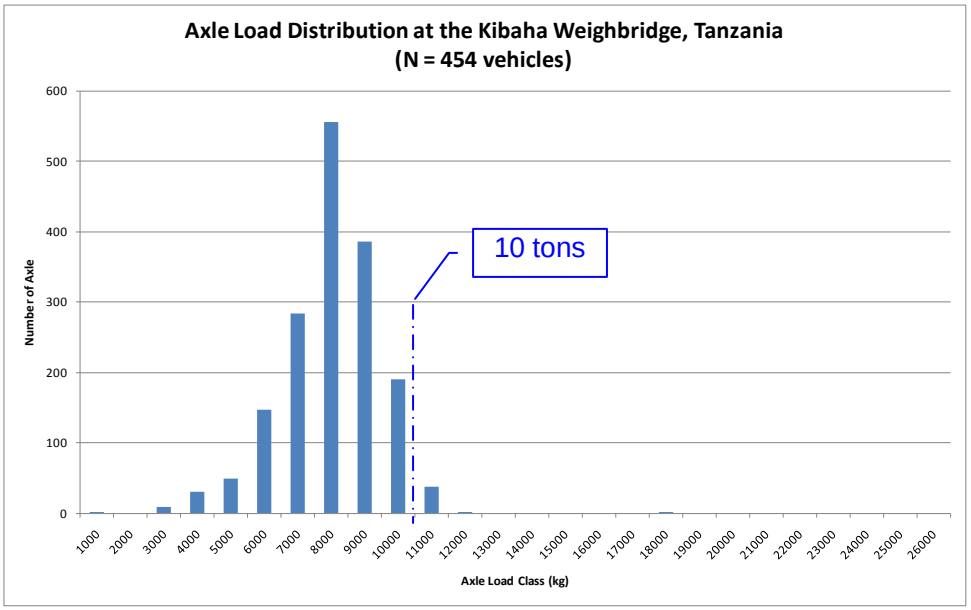
Source: Data from the road authorities in the EAC Partner States

(5) Axle Load Data

Axle load distributions measured at the weighbridge stations of Kibaha (located along the Tanzanian section of the Central Corridor), Masaka and Mbarara (located along the Ugandan sections of the Northern Corridor), and at the weighbridge stations N1, N6, N7, and N12

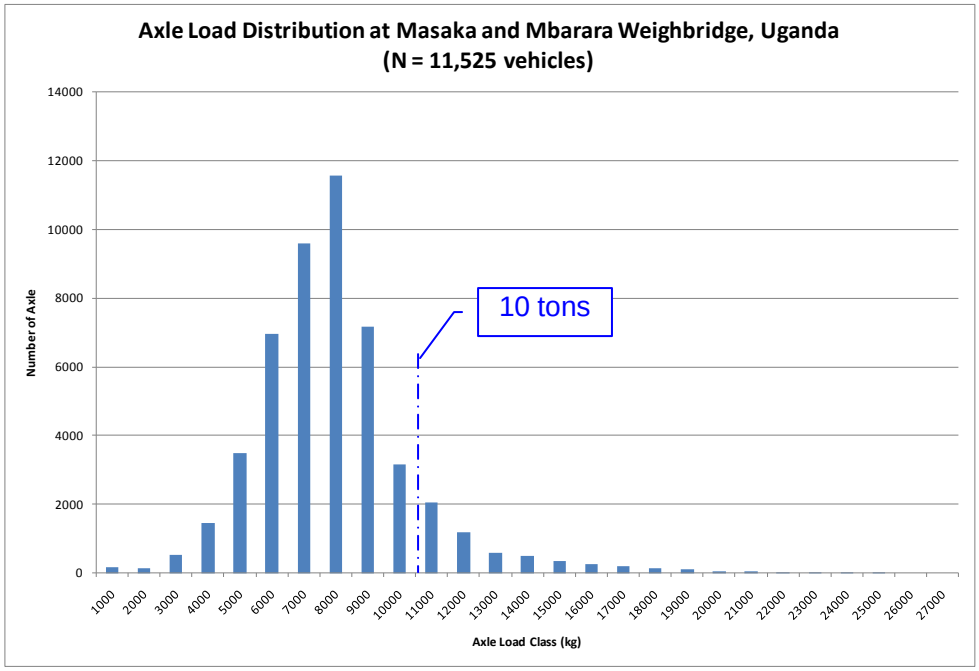
(located along the Burundi sections of the Northern Corridor) are shown in Figures 3-2 to 3-4, respectively. Details of the axle load measurement data are shown in the Appendix B.2.

As shown in these figures, the number of axles with loadings of more than 10 tons represents 2.4% of all the measurements, while the majority of axle loads are about 7–8 tons measured at the weighbridge station of Kibaha. Similarly, the number of axles with loadings of more than 10 tons increases up to 11.2% of all measurements, while the majority of axle loads are about 7–8 tons, measured at the weighbridge stations of Masaka and Mbarara. In addition, the number of axles with loadings of more than 10 tons represents 15.6% of all measurements, and the majority of axle loads are about 3–4 tons measured at weighbridge stations along National Highways N1, N6, and N7, and N12 in Burundi.



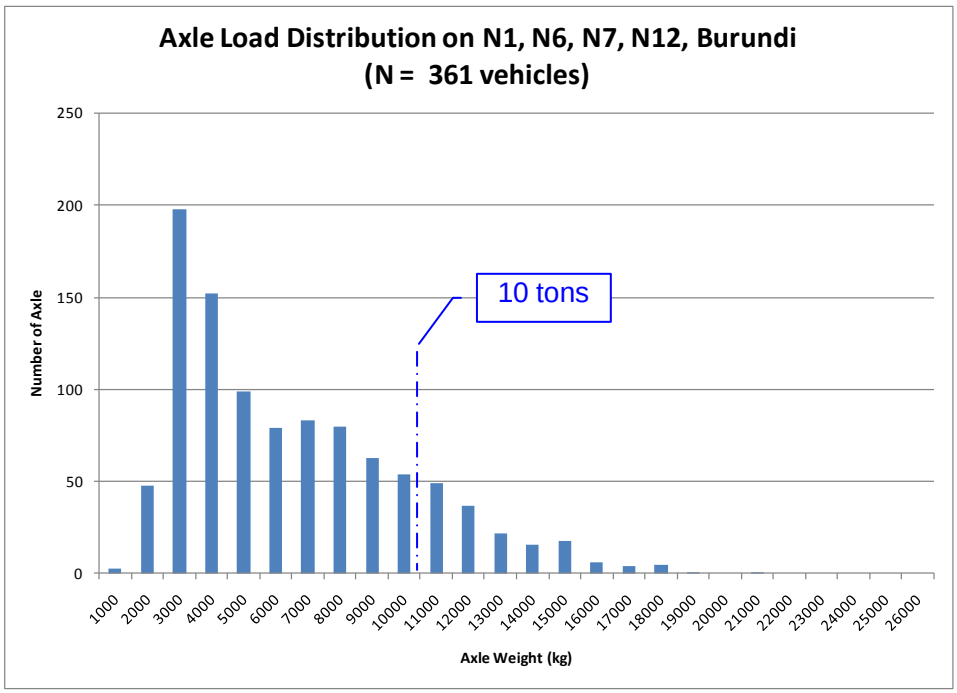
Source: JICA Study Team, Data from Tanzania

Figure 3-2: Axle Load Distribution at the Kibaha Weighbridge Station, Tanzanian Section of the Central Corridor



Source: JICA Study Team, Data from Uganda

Figure 3-3: Axle Load Distribution at the Masaka and Mbarara Weighbridge Stations, the Ugandan Section of the Northern Corridor



Source: JICA Study Team, Data from Burundi

Figure 3-4: Axle Load Distribution at Stations along National Highways N1, N6, N7, and N12 in Burundi

3.2 Maintenance Cost

3.2.1 Expenditures for Road Development and Maintenance

Table 3-10 presents data on expenditures on the development and maintenance of trunk roads by EAC Partner States.

Table 3-10: Expenditures for Road Development and Maintenance

Unit: Upper: USD, Lower: Local Currency

Country	Expenditures				Total
	Reconstruc-tion	Routine Maintenance	Periodic Maintenance	Rehabilita-tion	
Kenya	–	5,210,600.87 (442,901,074)	51,474,063 (4,375,295,430)	–	**33,957,489** (2,829,790,788)
Uganda	–	–	–	–	**73,696,000** (184,240,000,000)
Tanzania	–	–	–	–	**104,593,747** (149,419,639,000)
Burundi	–	–	–	–	**17,731,254** (22,164,068,057)
Rwanda	–	–	–	–	**17,202,210** (9,891,271,000) (01/07/2009-30/06/2010) **14,884,532** (8,826,528,000) (01/07-31/12/2010

Source: Kenya: Road Maintenance Payment Details for the Period 2009/2010, KeNHA (KES 1 = USD 0.012); Uganda: The FY 2010/11 National Road Maintenance Budget, UNRA (UGX 1 = USD 0.0004); Tanzania: Summary of Roads Fund Maintenance Programme, FY 2009/10 (Road Fund Component) TANROADS (TZS 1 = USD 0.0007); and Burundi: Programme d'Entretien Routier, Ministère des Travaux Publics et de l'Equipment Office des Routes FY2010 (BIF 1 = USD 0.0008). Data for Rwanda was not available (n/a); and Rwanda: Information from RTDA
* The Kenyan Budget for Rehabilitation and Reconstruction for the 2010/2011 Financial Year was KES 19,297,038,269.

3.2.2 Unit Costs of Road Maintenance Works

Table 3-11 presents the unit costs of road maintenance by the respective EAC Partner States, categorized by unpaved roads, surface treatment, and asphalt concrete.

Table 3-11: Unit Costs of Road Maintenance Works (Unit: USD)

Unpaved Roads

Country	Unit Cost			
	Routine	Recurrent		Periodic
	Grass cutting Drainage cleaning	Pothole repair	Grading regime	Regravelling plus pothole repair
Kenya	(Site Clearance) 46.7/1000m^2	n/a	259.2/1000m^2 heavy grading	16.8/m^3
Uganda	(Site Clearance) 385/1000 m^2	n/a	192/1000 m^2	260/1000 m^2
Tanzania	(Site Clearance) 83.7/1000 m^2	(Pothole filling) 5.3/m^2	(Light grading) 296/km	15/ m^2
Burundi	170/km	7/m^2	n/a	140/km
Rwanda	297/km	8.8/m^2	440/km	17.94/m^2

Surface Treatment

Country	Unit Cost			
	Routine	**Recurrent**		**Periodic**
	Grass cutting Drainage and signpost cleaning	**Pothole repair**		**No overlay, but upgrade to AC of 40mm thickness**
Kenya	46.7/1000m^2	232.1/m^3		331.7/m^3
Uganda	385/1000 m^2	n/a		(DBST surfacing) 7.3/m^2
Tanzania	(Site Clearance) 83.7/1000 m^2	14/ m^2		(Resealing) 5.0/m^2
Burundi	170/km	72/m^2		n/a
Rwanda	496/km	12.00/m^2		86/m^2

Asphalt Concrete

Country	Unit Cost			
	Routine	**Recurrent**		**Periodic**
	Grass cutting Drainage and signpost cleaning	**Pothole repair**	**Crack sealing**	**Overlay of 40mm thickness**
Kenya	46.7/1000m^2	232.1/m^3	0.13997m	331.7/m^3
Uganda	385/1000 m^2	13.88/m^2	n/a	Wearing course of 50 mm: 15.09/m^2
Tanzania	(Site Clearance) 83.7/1000 m^2	(Premix surfacing) 23.05/m^2	1.39/m	Bituminous Surfacing 4.89/m^2
Burundi	170/km	120/m^2	2.5/m	130/m^2
Rwanda	496/km	12.00/m^2	2.50/m^2	45/m^2

Source: Kenya: Information from KeNHA (USD 1 = 85.76; Uganda: Uganda National Roads Authority Maintenance Manual, Chapter 7, Annex 1 (USD 1 = UGX 2386); Tanzania: Data from TANROADS, September 2008 (USD 1 = TZS 1514); Burundi: Information from Road Agency of Burundi; and Rwanda: Technical Assistance for Institutional Capacity Building in Road Maintenance and Auditing of Programmers, Egis BCEOM International

3.3 Design Standards Adopted by EAC Partner States

3.3.1 Pavement Design (Design for Asphalt Concrete Pavement Structure)

(1) Pavement Design Standards Adopted by Respective EAC Partner States

Axle load represents one of the key elements in determining pavement structure by pavement design standards. Pavement design methods originate from two approaches – one from empirical American Association of State Highway and Transport Officials (AASHTO) road test based approach and the other from a French theoretical approach. One or the other of these pavement design standards have been adopted by the respective EAC Partner States, under the influence of former colonial regimes. Table 3-12 presents an overview of the pavement design standards of the EAC Partner States.

Table 3-12: Pavement Design Standards

Country	Pavement Design Standards	Year of Establishment	Remarks
Kenya	Road Design Manual, Part III, Material and Pavement Design for New Roads (Ministry of Transport and Communications)	1987	Follows the AASHTO standards
Uganda	Road Design Manual, Volume 3, Pavement Design Part I: Flexible Pavement	2005	• The Pavement Design Guide included in and adopted by this Design Manual is the Southern Africa Transport and Communications • Commission (SATCC) Draft • Code of Practice for the Design of Road Pavements, September 1998 (reprinted in July 2001), prepared by the Division of Roads and Transport Technology, Council of Scientific and Industrial Research (CSIR)
Tanzania	Pavement and Material Design Manual (Ministry of Works)	1999	The Government of Tanzania and the Norwegian Agency for Development Cooperation (NORAD) jointly developed this manual.
Burundi	French Standard: Conception et Dimensionnement des Structure de Chaussee Gude Technique	–	–
Rwanda	Same as above	–	Shift from French standards to AASHTO standards.

Source: JICA Study Team

(2) Pavement Design Standards in Developed Countries

As mentioned, there are two approaches to pavement design methods – an empirical approach and a theoretical design approach. Table 3-13 compares the design features of the United States, British, and French methods. Japan's Pavement Design Standards are also presented in Appendix D.

Table 3-13: Comparison of Pavement Design Methods of Developed Countries

Items	United Kingdom	France	United States
Design Standards	Design Manual for Roads and Bridges (DMRB)(1994)	Conception et Dimensionnement des Structures de Chaussee Guide Technique (December 1994)	AASHTO: Guide for Design of Pavement Structure (1993)
Principle of Design Method	Theoretical method is added to the results of the AASHTO Road Test.	Originally the French Design method was based on the data from the AASHTO Road Test; however, it shifted to a theoretical method, incorporating empirical data from the experience with road works.	Empirical method based on the AASHTO Road Test.
Outline of Design Method	(i) Evaluation of subgrade done by California Bearing Ratio (CBR), and thickness of capping layer and subbase are determined by this CBR (ii) The thickness of mixed asphalt layers is decided based on the accumulated design traffic volume and the strength of base course materials.	(i) Pavement is composed of a capping layer, subgrade, subbase, base course, binder, and surface (wearing) course. (ii) After the thickness of each layer is calculated based on the theoretical distortion of pavement layers, the section is determined by employing a formula for destruction of the subgrade.	(i) Basic formulas regarding traffic volume, the reliability of design and serviceability, bearing force, and pavement composition are used from the results of AASHTO Road Test. (ii) The composition of the pavement is determined so that the sum of the products of thickness and accumulated drain factor of each layer satisfies the required Structure Number.
Traffic Volume for Design	(i) Design traffic volume is determined by the ratio of ordinary goods vehicle class (OGV) 2 (trucks and trailers with 4 axles or more) to the total number of commercial vehicles in one direction per day. (ii) A chart is available to determine the design traffic volume based on the ratio of OGV2 vehicles for each type of pavement and design period.	(i) The design traffic volume is calculated by multiplying average daily commercial vehicles by a growth factor in the design period and other variables. (ii) Pavement composition is calculated by converting the above traffic volume into accumulated standard axle number (NE): NE=N × CAM N: Average Daily Commercial Vehicle CAM: Factor for converting Average Daily Commercial Vehicle to Standard Axle Number (NE)	Traffic volume (W18, one direction, one carriageway, 18kip ESAL) on the design carriageway is determined based on the by estimated traffic volume in both directions: W18=D0×DL×w18 D0: Distribution factor by direction (0.3–0.7) DL: Distribution factor by carriageway (0.5–1.0) w18: Converted 18kip (18 kip = 8.2 tons) ESAL from the estimated traffic volume in both directions

Source: Japan International Cooperation Agency, *Technical Standard Survey on Roads and Bridges in France, Seminar Documents*, 7 September 2010

3.3.2 Bridge Design (Live Loads Assumed in the Design Standards)

(1) Bridge Design Standards in the EAC Partner States

The bridge design standards of the EAC Partner States have been determined with reference to the former colonial regime's bridge design standards, as shown in Table 3-14. A design axle load of 8.1–12.2 tons for large vehicles is provided, by both British and French Standards.

Table 3-14: Bridge Design Standards in the EAC Partner States

Country	Bridge Design Standards	Live Load
Kenya	British Standards	120kN (one axle) is loaded as a truck load
Uganda	British Standards	
Tanzania	British Standards	
Burundi	French Standards	Bc: 60kN + 2 axles @ 120kN, Bt: 2 axles @ 160kN and Br: 100kN (1 axle) are loaded as a truck load
Rwanda	French Standards	

Note: 1[N]=1/9.8[kgf]=0.102[kgf], accordingly 120 kN=12,240 kgf.
Source: JICA Study Team

(2) Comparison of Bridge Design Standards in Developed Countries

In bridge design, assumed values for live load (GVM) exert a critical influence in determining the bridge structure. A comparison of live loads employed in bridge design in developed countries is shown in the Table 3-15. The Japanese Bridge Design Standards are shown in Appendix D.2 for reference.

Table 3-15: Comparison of Bridge Design Methods of the Developed Countries

Items	United Kingdom	France		United States
Design Standard	BD37/01: Loads for Highways Bridges (BS5400 Part 2)	Fascicule 61 Titre II	NF-EN 1991–92 (Eurocode 1)	AASHTO Load an Resistance Factor Design (LRFD, 1998)
Design Method	Partial Factor Design Method	Partial Factor Design Method	Partial Factor Design Method	-
Design Period	120 years	100 years	100 years	No rules
Live Load	Type HA loading (Type HB loading: special load)	Charge A Charge B (Bc Bt Br)	Traffic load model 1 (LM1)	HL 93 loding
Loading Carriage-way Width: B (m)	2.5 m <B < 3.65 m The number of lanes are determined by the width of the carriageway (W) 2 carriageways: 5 m < W < 7.5 m 3 carriageways: 7.5 m < W < 10.95m 4 carriageways: 10.95 m<W < 14.6m 5 carriageways: 14.6 m < W < 18.25m 6 carriageways:18.25m < W < 21.965 m	First class =3.5 m Second class = 3.0 m Third class = 2.75 m	3.0 m	3.6 m
Uniformly Distributed Load (UDL)	L < 50 m W = 336 × (1/L) (0.67) (kN) 50 m < L < 1600 m W = 36 × (1/L) (0.1) (kN) L=Loading length	A(l) = MAX [230+36,000/(L+12), (400-0.2L)](kg/m^2) L= Loading length	First carriageway: 9.0(kN/m^2) Second carriageway: 2.5(kN/m^2)	9.3(kN/m^2): Uniform value Distribution width: 3.0m
Truck Load	120kN (1 axle)	Bc: 60kN +2 axles@120kN Bt: 2 axles@160kN Br: 100kN (1 axle)	First carriageway: 2 axle@300kN Second carriageway: 2 axles @ 200kN	35kN + 2 axles @145kN
Impact Load	The impact load is included in uniform distribution load (UDL) and truck load.	The impact factor only considers the truck load.	The impact factor only considers the truck load.	The impact factor only considers the truck load.
Live Load for Slab Design	1@100kN (diameter = 34 cm circle)	Charge A Bc: Front wheel (20 cm × 20 cm) Rear wheel (25 cm × 25 cm) Bt: (25 cm × 60 cm) Br: (30 cm × 60 cm)	2@180kN (35cmkNcml.	2@72.5kN (51cm: length for calculation)

Source: Japan International Cooperation Agency, *Technical Standard Survey on Roads and Bridges in France, Seminar Documents*, 7 September 2010

Chapter 4 Existing Charges/Fees/Fines and Strategy for Harmonized Charging

4.1 Country-by-Country Review

4.1.1 Burundi

(1) Institutional Reform Status

The road sector in Burundi is administered by three ministries: (i) the Ministry of Public Works and Equipment (MTPE), which is responsible for the development and management of classified roads; (ii) the Ministry of Transport and Telecommunication (MTT), which is in charge of road transport delivery services and mobility; and (iii) the Ministry of Rural Development (MDR), which is responsible for rural road infrastructure comprising unclassified communal and feeder roads, supported by local government agencies and municipalities. Among these three ministries, the General Directorate of Roads (Direction Générale des Routes: DGR) of the Ministry of Public Works and Equipment (MTPE) was engaged in road planning and maintenance before the road sector reform described below.

In 2002, the Government of Burundi commenced road sector reform. The reform entailed the reorganization of MTPE with the aim of increasing sector efficiency. Under this reform, the former General Directorate of Roads (DGR) was split into two autonomous entities: (i) the National Road Agency (L'Office des Routes: OdR)[1]; and (ii) Equipment Leasing Company (Agence de Location du Matériel: ALM). Under this new structure, road planning and work supervisions were devolved to the National Road Agency (OdR) while the Equipment Leasing Company (ALM) was assigned responsibility for purchasing spare parts for the rehabilitation of all maintenance equipment in order to meet immediate needs in terms of mechanized road maintenance. In addition, another autonomous agency, the National Road Fund (Funds Routier National: FRN) was created in 2003[2] to mobilize and manage road maintenance financial resources, which had been jointly entrusted to the Ministry of Finance and MTPE. Thus, the role of the MTPE is now limited to policy making, sector coordination, and strategic planning, and the other regular duties that were initially performed by the ministry were devolved to the three autonomous entities.

Currently, the National Road Agency (OdR) is responsible for maintenance of the entire road network in Burundi including national roads and district roads.

(2) Current Charges Levied from Road Users

According to the National Road Fund Act (Act No 1/06 dated 10 September 2002), the following road user charges are theoretically levied by the National Road Fund:

(i) fuel levy;
(ii) foreign vehicle entrance fee;
(iii) fines for axle overloading;
(iv) national vehicle registration fee;
(v) driving license fee;
(vi) fines for gross weight overloading; and
(vii) fines for damage to roads.

[1] The National Road Agency (OdR) was formally established by Decree No 100/118 dated 27 October 2001. Most of the agency's staff came from the defunct General Directorate of Roads (GDR), which had long experience in the implementation of road projects.
[2] The National Road Fund (FRN) was formally established by Decree No 100/117 dated 27 October 2001.

However, the National Road Fund has never received revenue from (iv), (vi), and (vii) since its creation. The major reason enforcing and collecting these fines has been difficult is the lack of regulations to define, categorize, and fix fine amounts by category. On the other hand, all charges of (i), (ii), (iv), and (v) are collected by Revenue Authority and transferred to National Road Fund without taking out any commission.

Annual revenue sources of the National Road Fund over the last three years are shown in Table 4-1. The description of each category of revenue and expected revenue sources follows.

Table 4-1: Revenue of Burundi National Road Fund (2008–2010)

	2008	2009	2010
(1) Fuel Levy	3,802,534,337	5,542,921,695	5,072,369,160
(2) Foreign Vehicle Entrance Fee	384,140,961	401,681,614	362,290,956
(3) National Vehicle Registration Fee	1,361,441,589	2,351,235,521	2,109,666,835
(4) Driving License Fee	5,621,961,887	8,377,043,830	7,605,926,951
Total Expenditure	11,170,078,774	16,672,882,660	15,150,253,902

Source: Burundi National Road Fund

Fuel Levy: The level of the fuel levy has been BIF 80 per litter for both petrol and diesel since 2009. It has increased gradually to raise road maintenance resources.

Foreign Vehicle Entrance Fee: This fee is levied only on commercial vehicles registered in foreign countries. The level of the fees are USD 152 for vehicles designed to carry two containers (e.g., drawbar trailers and interlink trailers) and USD 72 for trucks and trailers to carry one container. It is charged at the border every time a foreign commercial vehicle enters Burundi.

National Vehicle Registration Fee: There are three categories of fees charged to national registered vehicles: (i) number plate fee; (ii) registration card fee; and (iii) vehicle annual registration fee. While (i) and (ii) are charged when a vehicle is imported and registered in Burundi, (iii) is charged for each vehicle every year. Among these fee categories, only (iii) is transferred to the National Road Fund while the others are incorporated into the general budget of the government.

The levels of national vehicle registration fees are indicated in Table 4-2.

Table 4-2: Level of National Vehicle Registration Fees

Category	Registration Fee Level (BIF)
(i) Number plate fee	100,000
(ii) Registration card fee	40,000
(iii) Vehicle annual registration fee	1,200

Source: Burundi Revenue Authority

Driving License Fee: The driving license fee in Burundi is BIF 5,000 for five years. The same fee is charged when the license is updated every five years.

Fines for Axle Overloading: The fines for axle overloading is to be paid for vehicles exceeding the maximum axle limits, which are defined as 10 tons for a single axle, 16 tons for a double axle, and 24 tons for a triple axle. Although the level of fines is defined as BIF 2,000 in Ordinance No. 660/206 dated 11 September 1958, it is not enforced since there are no weighbridges controlled by the police, who are responsible for collecting fines for axle overloading.

Fine for Gross Weight Overloading: Similar to the situation for fines for axle overloading, the fines for gross weight overloading are to be paid for vehicles exceeding the maximum gross weight limit, which is 53 tons in Burundi (as well as COMESA). The level of the fine is defined in the same way as fines for axle overloading in Burundi but payment is not enforced.

Fine for Damaging Roads: Although it is defined that a BIF 50,000 fine is charged if a road is damaged due to overloading or other reasons, this fine has not been collected because of the lack of weighbridges. However, this fine is charged by the police at the time of traffic accidents and transferred to the Revenue Authority budget. However, the National Road Fund has never received this budget from the Revenue Authority.

(3) Road Maintenance Budget Allocation from the Road User Charges

Of the total budget of the National Road Fund, about 95% is allocated to the National Road Agency for road maintenance while the rest (about 5%) covers administrative costs of the National Road Fund.

Annual expenditure of the National Road Fund for the last three years is shown in Table 4-3.

Table 4-3: Expenditure of Burundi National Road Fund (2008–2010)

	2008	2009	2010
(i) Administration Cost	248,382,372	257,602,137	280,889,662
(ii) Office Equipment	1,378,260	41,077,954	10,221,410
(iii) Budget for Road Maintenance	6,774,108,817	6,227,914,773	9,983,974,404
Total Expenditure	7,023,869,449	6,526,594,864	10,275,085,476

Note 1: "(i) Administration Cost" includes personnel and office-related costs such as telecommunications. The Road Fund has one office in Burundi but does not have any branch offices. The number of staff is 16.
Note 2: "(ii) Office Equipment" includes equipment such as tables and chairs necessary at the Road Fund office.
Note 3: "(iii) Budget for Road Maintenance" is wholly transferred to the Road Authority since it is responsible for the maintenance of the entire road network in Burundi including National Roads and District Roads.
Source: Burundi Road Fund

Although the budget allocated from the National Road Fund is the only revenue source for road maintenance by the National Road Agency, which is responsible for maintenance of the entire road network in Burundi, it covers only about 60% of the necessary budget for road maintenance demands of the country. The National Road Agency prepares the maintenance plan based on the budgets provided by the National Road Fund but does not estimate the budgets necessary for maintenance of the whole road network. On the other hand, the revenue sources of the National Road Agency for road rehabilitation and new construction are: (i) funds transferred from the Ministry of Finance directory and (ii) funds provided by development partners.

The revenue sources for the National Road Agency are summarized in Table 4-4.

Table 4-4: Revenue Sources of the National Road Agency

Category of Works	Revenue Source(s)
Road maintenance	Road maintenance budget (National Road Fund)
Road rehabilitation	General budget (Revenue Authority)/ Assistance (development partners)
Road construction (new construction)	General budget (Revenue Authority)/ Aassistance (development partners)

(4) Current System for Collecting Overload Charges

Currently, there is no practical system to collect overload charges. Although only the Revenue Authority owns weighbridge equipment at the major clearance points, it does not check if a vehicle is overloaded; the weight of commercial vehicles is checked only for declaration purposes.

4.1.2 Kenya

(1) Institutional Reform Status

In Kenya, the fuel levy fund, which is the major source of funding for road works in the country, was introduced under The Road Maintenance Levy Fund Act No. 9 of 1993 and has been mainly used for road maintenance. Afterwards, the Kenya Roads Board (KRB) was established in 2000 under Kenya Roads Board Act No. 7 of 1999, with the responsibility of presiding over planning, development, and maintenance of roads as well as administration of the fuel levy fund collected by the Kenya Revenue Authority (KRA). At the time, the following three main agencies disbursed funds for road rehabilitation and maintenance, allocated by KRA:

(i) the Roads Department of the Ministry of Roads and Public Works, dealing with Class A, B, and C road (international highways, national highways, and trunk roads);
(ii) the District Roads Committees (DRC), dealing with Class D, E, and other roads (rural access roads and feeder roads); and
(iii) the Kenya Wildlife Service (KWS), dealing with all the construction and maintenance of roads in the national parks and game reserves.

The Roads Department was established in 1956 and has been in charge of policy formulation, road development, maintenance, and rehabilitation. With the enactment of the Kenya Roads Act 2007, the following three new road agencies were established and took over the responsibility of direct implementation of road maintenance, rehabilitation, and development from the predecessor:

(i) Kenya National Highways Authority (KeNHA), responsible for Class A, B, and C roads;
(ii) Kenya Rural Roads Authority (KeRRA), responsible for Class D, E, and other roads; and
(iii) Kenya Urban Roads Authority (KURA), responsible for urban roads in 45 municipalities.

Since it took about a decade after the establishment of the KRB until KeNHA was created, KRB took responsibility of development of a road network database including development of road inventory and classification for the whole road network of 160,000 km at an earlier stage. They also ran the Highway Design and Management (HDM) 4 model for road maintenance, rehabilitation, and development planning. After the establishment of KeNHA, the responsibility of KRB to overall road planning was assigned to KeNHA. Although KRB assisted KeNHA in estimating road maintenance needs for the last road inventory development, KeNHA is now responsible for updating road inventory and evaluating road maintenance needs by itself.

(2) Current Charges Levied on Road Users

Currently, the following three categories of road user charges are levied for the budget of KRB:

(i) a Road Maintenance Levy Fund (RMLF);
(ii) a Transit Toll; and
(iii) an agricultural cess.

These charges are all used for the maintenance of the different categories of roads after deducting KRB administrative costs (2% of the RMLF). The projected budget of KRB in FY2010/11 by category of revenue sources is shown in Table 4-5.

Table 4-5: Expected Revenue of Kenya Roads Board (FY2010/11)

Description	Amount (KES)
RMLF (fuel levy)	26,258,000,000
Transit Toll	310,000,000
Agricultural Cess	80,000,000
Total	**26,648,000,000**

Source: Kenya Roads Board

In addition to these revenue sources of KRB, the following registration fees are also collected by the KRA from road users but transferred to the general budget of the government:

(i) Initial Registration Fee;
(ii) Number Plate Fee; and
(iii) Drivers' License Fee.

Although overloading fines are also collected, they are not categorized as road user charges in Kenya. The description of the road user charges and the overloading fines mentioned above is as follows.

Road Maintenance Levy Fund (RMLF): RMLF is the fuel levy in Kenya, which is KES 9.00 per liter for both petrol and diesel. It was KES 5.80 per liter but was increased by KES 3.20 per liter on 15 June 2006 because it was found that the commitments for the sector substantially outweighed the available resources. RMLF is collected by KRA and transferred to KRB.

Transit Toll: The transit toll is a levy chargeable on all foreign registered commercial vehicles transiting Kenya and is mainly meant to maintain the Northern Corridor. This charge is also collected by KRA and transferred to KRB. The levels of transit toll are set according to COMESA standards as shown in Table 4-6.

Table 4-6: Levels of Transit Tolls in Kenya (following COMESA Standards)

Region of Registration	Vehicle Type	Fee per 100 km (USD)
COMESA	Bus	5
	Truck/trailer up to 3 axles	6
	Truck/trailer more than 3 axles	10
Out of COMESA	Bus	8
	Truck/ trailer up to 3 axles	8
	Truck/ trailer more than 3 axles	16

Source: Kenya Revenue Authority

Agricultural Cess: This is a new funding source for road maintenance, used for the maintenance of a road in a specified district around a factory where a cess is levied in order to improve access to the factory. Coffee cess is charged on sales of coffee at a rate of 1% of sales proceeds. Section 192 A (1A) (2006) of the Agriculture Act stipulates that 80% of the cess of coffee and tea collected is to be transferred to the KRB Fund for road maintenance purposes. Coffee cess is withheld and deposited into the Board's bank accounts by coffee marketers. Currently, the transfer of coffee cess to KRB is effective while that of tea cess has not yet been implemented.

Initial Vehicle Registration Fee: This charge includes a fee for a logbook that indicates ownership of the vehicle. The levels of the fee are presented in Table 4-7. This fee is collected by KRA and transferred to the general budget.

Table 4-7: Levels of Initial Vehicle Registration Fee

Vehicle Size	Fee Amount (KES)
0 – 1,300 cc	2,195
1,300 – 1,500 cc	2,565
1,500 – 1,800 cc	3,195
1,800 – 2,000 cc	(information is to be collected)
2,000 – 2,500 cc	(information is to be collected)
2,500 – 3,000 cc	(information is to be collected)
over 3,000 cc	(information is to be collected)

Number Plate Fee: The number plate fee is KES 2,000 per plate. This fee is collected at the time of initial vehicle registration as well as the initial vehicle registration fee mentioned above. This fee is collected by KRA and transferred to the general budget.

Drivers' License Fee: The level of the driver's license fee is KES 600 for one year and KES 1,400 for three years. This fee is collected by KRA and transferred to the general budget.

Overloading Fines: Vehicle overloading is checked at the weighbridge stations along the major corridors by KeNHA. The police also work with KeNHA at the weighbridge stations and is responsible for taking drivers of overloaded vehicles to court. The overloading fines are ultimately charged and collected by the court and transferred to the general budget. The levels of the overloading fines are shown in Table 4-8.

Table 4-8: Levels of Overloading Fines in Kenya

Degree of Overloading per Axle or Excess Gross Vehicle Weight in Kilograms (kg.)	Fine (KES)	
	Fine on First Conviction	Fine on Second or Subsequent Conviction
Less than 1,000 kg	5,000	10,000
1,000 kg or more but less than 2,000 kg	10,000	20,000
2,000 kg or more but less than 3,000 kg	15,000	30,000
3,000 kg or more but less than 4,000 kg	20,000	40,000
4,000 kg or more but less than 5,000 kg	30,000	60,000
5,000 kg or more but less than 6,000 kg	50,000	100,000
6,000 kg or more but less than 7,000 kg	75,000	150,000
7,000 kg or more but less than 8,000 kg	100,000	200,000
8,000 kg or more but less than 9,000 kg	150,000	300,000
9,000 kg or more but less than 10,000 kg	175,000	350,000
10,000 kg or more	200,000	400,000

Source: The Traffic Act, Legal Notice No. 65, Kenya Gazette Supplement No. 65, 12 September 2008

(3) Road Maintenance Budget Allocation from the Road User Charges

While the only fund source for road maintenance in Kenya is the budget of KRB, construction and rehabilitation of roads are funded by the central government and development partners. The budget for road maintenance to different agencies is allocated according to the description in the Kenya Roads Act. The proportion of budget allocation and projected expenditure of KRB for FY 2010/11 is presented in Table 4-9.

Table 4-9: Projected Expenditure of Kenya Roads Board (FY2010/11) and Proportion of Budget Allocation

Description		Portion Description	Amount (KES)
(i)	KRB Operation	2% of RMLF	531,360,000
(ii)	KeNHA	40% of RMLF	10,503,200,000
(iii)	KeNHA transit toll	100% of transit toll	303,800,000
(iv)	KeRRA –Constituencies	22% of RMLF	5,776,760,000
(v)	KeRRA –Critical Links etc	10% of RMLF	2,625,800,000
(vi)	KeRRA –Agricultural Cess	100% of Agricultural Cess revenue	80,000,000
(vii)	KURA	15% of RMLF	3,938,700,000
(viii)	KWS	1% of RMLF	262,580,000
(ix)	To be allocated by KRB Boards	10% of RMLF	2,625,800,000
Total			**26,648,000,000**

Note 1: "(i) KRB Operation" means the administrative cost of KRB.
Note 2: "(iv) KeRRA –Constituencies" means the maintenance budget for rural roads.
Note 3: "(v) KeRRA –Critical Links etc" means the maintenance budget for inter-district roads.
Note 4: "(vii) KURA" means the maintenance budget for urban roads.
Note 5: "(viii) KWS" means budget for Kenya Wildlife Services (KWS).
Note 6: "(ix) To be allocated by KRB Boards" means budget used for specific needs. KRB decides on allocation of this budget depending on the proposals submitted by the target agencies.
Source: Kenya Roads Board

(4) Current System to Collect Overload Charges

There are four main weighbridge stations along the Northern Corridor: (i) Athi River Weighbridge; (ii) Mariakani Weighbridge; (iii) Gilgil Weighbridge; and (iv) Webuye Weighbridge. Heavy vehicles traveling from Mombasa to Uganda are weighed at all four weighbridge stations. There are also mobile weighbridges that are mostly used at the following specific locations: (i) Ruiru Weighbridge; (ii) Mtwapa Weighbridge; (iii) Busia Weighbridge; (iv) Mai Mahiu Weighbridge; and (v) Kisumu Weighbridge. This is because it is considered that mobile weighbridges achieve the greatest impact at those locations.

Both the static weighbridge stations and the mobile weighbridges operate 24 hours a day, seven days a week. In the case of the weighbridges operated by KeNHA, the procedure for weighing and overload fine collection is as follows:

(i) Traffic police officers lead heavy vehicles traveling on the major road to the weighbridge.
(ii) KeNHA officials operating weighbridges investigate origin, destination, and type of cargo of the heavy vehicles by asking questions to the drivers and obtaining the delivery note/weighbill papers if possible.
(iii) The heavy vehicles are guided onto the axle scales and are weighed one axle at a time.
(iv) The axle weights are recorded by hand at all the weighbridges, except at Mariakani, where one of the scales is connected directly to a computer.
(v) If a vehicle is overloaded, the scale printout is used as printed evidence. The heavy vehicle is parked at the weighbridge and the vehicle documents and keys are confiscated. Then, the matter is handed over from KeNHA to the traffic police office for prosecution.
(vi) The driver and owner, and the loader in appropriate cases, are prosecuted under Sections 55 or 56 of the Traffic Act.
(vii) In cases of perishable cargo or livestock, which need to proceed without delay, a cash bail is set, which must be paid immediately at the nearest police station.
(viii) A court date is set, usually the same day or the day after.
(ix) The accused may plead guilty or not guilty in court.

(x) If the accused pleads guilty, he/she is fined. If cash bail was paid, it is refunded;
(xi) If the accused pleads guilty, cash bail is set and paid (if not already paid) and a hearing follows later. At the hearing, the case is decided on the evidence and the decision of the court is implemented thereafter.
(xii) If the accused does not show up at court, the cash bail is forfeited and a warrant for arrest of the accused is issued.[3]

In Kenya, operation of some weighbridges has been outsourced to private operators. In that case, the responsibility of KeNHA above should be read as that of the private operator.

The level of fines was presented in Table 4-8.

4.1.3 Rwanda

(1) Institutional Reform Status

The Rwanda Road Maintenance Fund (FER) was established under the Rwanda Road Maintenance Fund Act, Law No. 6/2007" dated 15 March 2007. Its predecessor was the National Road Fund, established on 5 November 1998 under Law No. 14 bis/98, and when it was renamed the Rwanda Road Maintenance Fund a clear definition of its attributes and fund resources under the Act was determined. According to the Rwanda Road Maintenance Fund Act, the FER is to:

(i) collect and effectively manage funds received from sources specified in this Act;
(ii) collaborate with other relevant organizations in preparation of road maintenance programs that are FER-funded;
(iii) examine project studies and the bidding documents for road maintenance before launching tenders; and
(iv) monitor the technical aspects of activities and finance disbursed in order to ensure that activities are carried out as planned in the signed contract.

Until the Transport Development Agency mentioned below was established, the budget of the Road Maintenance Fund, allocated by Rwanda Revenue Authority, was disbursed to the following three categories of agencies for road maintenance:

(i) the Transport Development Agency (TRA), responsible for classified and national roads;
(ii) district governments,[4] responsible for district and rural roads; and
(iii) Kigali City Council, responsible for Kigali urban roads.

The Ministry of Infrastructure (MININFRA) is responsible for overall policy formulation for transport infrastructure including the road sector as well as implementation of road sector strategies. The Transport Development Agency (TRA), established recently under a law dated 26 December 2009, is a semi-autonomous body under MININFRA responsible for day-to-day activities in the transport sector including construction and maintenance of roads, airports, waterways, and railways in the country. The road maintenance budgets disbursed to the TRA and district governments are not directly allocated by FER but transferred by FER through MININFRA. Also, MININFRA finances the Development Budget for road reconstruction and rehabilitation works, while FER allocates budget for road maintenance including periodic

[3] Stewart Scott International, *Axle Load Best Options Study*, funded by the Delegation for the European Union in the Republic of Kenya, 2006.
[4] The fund is not directly transferred from the Road Maintenance Fund to the municipal government but through the Common Development Fund.

maintenance, routine maintenance, and emergency maintenance, which is called the Recurrent Budget.

It should be noted that currently there is no agency that corresponds to a Road Agency in Rwanda.

(2) Current Charges Levied from Road Users

According to the Rwanda Road Maintenance Fund Act, the following types of road budgets are theoretically levied by the Road Maintenance Fund (FER):

(i) state budget;
(ii) government/development partner subsidies;
(iii) funds from activities performed by FER;
(iv) interest on investments;
(v) fuel levy;
(vi) toad toll for foreign registered vehicles;
(vii) national vehicle annual registration fee;
(viii) overloading fines;
(ix) compensation for damage(s) caused to the road sector;
(x) fines paid by persons who contravene the road traffic law; and
(xi) donations and bequests.

Among the FER revenue sources listed above, (v), (vi), (vii), (viii), and (ix) correspond to road user charges. However, only (v), (vi), and (vii) are collected as road user charges and transferred to FER. In other words, (viii) and (ix) have never been collected as resources of FER.

The annual revenue of the Road Maintenance Fund (FER) for FY 2009/10 is shown in Table 4-10 followed by a description of each category of revenue.

Table 4-10: Revenue of Rwanda Road Maintenance Fund (FY 2009/10)

Description	Amount (M RWF)
(1) Fuel Levy	9,341,573,582
(2) Road Toll for Foreign Registered Vehicles	3,729,848,317
(3) National Vehicle Annual Registration Fee	3,054,972
(4) Others	135,576,973
Total	**13,210,053,844**

Source: Rwanda Road Maintenance Fund

Fuel Levy: The levy is at present RWF 62.37 per liter (EUR 0.076 equivalent) for both petrol and diesel. Although it was RWF 24.43 (EUR 0.034 equivalent) per liter for petrol and RWF 20.23 (EUR 0.029 equivalent) per liter for diesel before, it was increased to the current level in July 2009. The share of the fuel levy in the total FER budget is about 70%. It is collected by the Revenue Authority and transferred directly to FER.

Road Toll for Foreign Registered Vehicles: This toll corresponds to a Transit Toll under COMESA regulations. The level of the toll was presented in Table 4-6. It is collected by the Revenue Authority at border points and 99% of that revenue is transferred to the Road Maintenance Fund directly after 1% of the budget collection charge is taken by the Revenue Authority.

National Vehicle Annual Registration Fee: Previously, this fee was required by all vehicles registered in Rwanda, but it was abolished in 2010. Although there has been an initial registration fee, collected by the Revenue Authority at the same time as the vehicle import tax, this fee is not included in the budget of FER but in the general budget of the government.

(3) Road Maintenance Budget Allocation from the Road User Charges

Road user charges allocated to the Road Maintenance Fund are theoretically used for road maintenance including: (i) periodic maintenance; (ii) routine maintenance; and (iii) emergency maintenance. On the other hand, development budgets of MININFRA are allocated for road reconstruction and rehabilitation. Of the total expenditure of the Road Maintenance Fund, about 2% is for the administrative cost of the Road Maintenance Fund Secretariat, about 18% is transferred to Kigali Municipality for their road maintenance budget, and about 80% is transferred to MININFRA for the road maintenance budgets of the Road Transport Development Agency and the provincial governments. Both the Road Transport Development Agency and the provincial governments submit their annual road maintenance program to MININFRA, which decides on the budget allocation. At present, the Road Maintenance Fund covers only 60% of the total budget necessary for overall road maintenance in Rwanda, according to the Road Transport Development Agency. The expenditure of the Road Maintenance Fund for FY 2009/10 is as shown in Table 4-11.

Table 4-11: Expenditure of Rwanda Road Maintenance Fund (FY2009/10)

Description	Amount (M RWF)
FER: Wages and Salaries	84,171,023
FER: Other administration costs	50,402,333
MININFRA	6,715,814,828
Kigali Council	2,953,553,076
DISTRICTS	77,100,175
Subscription/ contribution to other budgets of the government	10,229,371
Total	**9,891,270,806**

Source: Rwanda Road Maintenance Fund

(4) Current System to Collect Overload Charges

Currently, there is no w eighbridge working functionally in Rwanda although there were weighbridges working until 2006–2007. There are only weighbridges belonging to the Rwanda Revenue Authority (the customs administration) to check the total weight of vehicles, but no weighbridge to check the weight of each axle. The Revenue Authority is responsible for checking the weight of the vehicles at border points and collecting both import/export taxes and overload fines, and then transferring the overload fines to the Road Maintenance Fund. However, the Road Maintenance Fund has never received any funds from overload charges collected by the Revenue Authority. The traffic police is responsible for checking if vehicles are overloaded or not and reporting to the Revenue Authority if they find an overloaded vehicle. However, since there is no weighbridge controlled by the traffic police, they have to determine if vehicles are overloaded by sight. Although the maximum overload fine is RWF 20,000,[5] the level of fines according to the level of overloading is not totally clear under the current regulations.

[5] As mentioned in Chapter 2, this may be multiplied.

4.1.4 Tanzania

(1) Institutional Reform Status

In Tanzania, the Roads Fund Board was established with clarification of its budget sources under the Roads Tolls Amendment No. 2 Act of 1998. According to this legal instrument, the functions of the Roads Fund Board are as follows:

(i) to advise the Minister on new sources of roads tolls, adjustment of rates of existing tolls, and on regulations for the collection of road tolls for the purpose of ensuring an adequate and stable flow of funds to road operations;
(ii) to apply the money deposited into the Fund for the purposes approved by the Parliament;
(iii) to set out procedures for agents with respect to the collection of road tolls for the purpose of the Fund;
(iv) to ensure full collection and transfer of collected road tolls to the Fund's account;
(v) to develop and review periodically the formula for allocation and disbursement from the Fund to TANROADS, local authorities, and other road agencies, and advise the Minister of Roads accordingly;
(vi) to recommend to the Minister of Roads an allocation of funds for TANROADS, local authorities, and other road agencies to undertake road management at a level that is sustainable and affordable;
(vii) to disburse funds from the Fund to TANROADS, local authorities, and other road agencies;
(viii) to ensure that the operations of TANROADS, local authorities, and other road agencies and the Fund are technically and financially sound;
(ix) to monitor the use of the funds disbursed to TANROADS, local authorities, and other road agencies so they are used according to the purpose of the Fund;
(x) to appoint the Road Fund Manager and Road Fund Accountant;
(xi) to appoint, subject to approval by the Controller and Auditor General, an auditor or auditors to carry out the audit of the Fund; and
(xii) to make any other recommendations to the Minister of Roads as considered necessary to enable the Board to achieve its objectives.

In July 2000, the road agency, TANROADS, was established under the Executive Agencies Act, 1997. Unlike road agencies in other EAC member countries, which were established after TANROADS, TANROADS is engaged in not only road maintenance and development works but also road development planning and administration at a very professional level with its own regional offices.

(2) Current Charges Levied from Road Users

According to the Roads Tolls Amendment No. 2 Act of 1998, the following four categories of road user charges are defined as revenue resources of the Road Funds Board:

(i) fuel levy;
(ii) transit fees;
(iii) heavy vehicle licenses; and
(iv) vehicle overloading fees.

However, (iii) was abolished around 2005 and current revenue sources of the Road Funds Board are (i), (ii), and (iv). The budget of the Road Funds Board in 2007 is presented in Table 4-12. Description of each category of charges follows.

Table 4-12: Revenue of Tanzania Road Funds Board (FY2007)

Description	Amount (TZS)
Fuel levy	200,400,000,000
Transit toll	2,700,000,000
Overloading fees	4,600,000,000
Total	**207,700,000,000**

Source: Tanzania Road Fund Board

Fuel Levy: The fuel levy is TZS 90 per liter at present (the same for both gasoline and diesel, equivalent to about USD 7.50). A total of TZS 135–207 is charged per liter depending on the type of fuel, including value added tax. The tax is charged by the central government and accrues to the national treasury. It is transferred to the Road Funds Board by the Revenue Authority.

Transit Toll: The transit toll is equivalent to USD 6 for 3-axle vehicles, and USD 16 for vehicles with 4 or more axles for 100 km. These are charged foreign vehicles transiting the country. In addition, foreign vehicles less than 2 tons are charged foreign vehicle permit fees, which are collected monthly at USD 20 per vehicle. These are charged by the central government and accrue to the national treasury, and are transferred to the Road Funds Board by the Revenue Authority.

Overloading Fees: The charge is described as a vehicle overloading fee, and not a penalty or fine. The overloading fee is charged according to two values (axle load when loaded and gross weight of the vehicle), depending on the excess weight. It is collected by TANROADS and directly transferred to the Road Funds Board.

(3) Road Maintenance Budget Allocation from the Road User Charges

After taking the administrative cost of the Roads Fund Board, the budget of the Roads Fund Board is used for: (i) road development and rehabilitation (about 10%); and (ii) both periodic and routine maintenance (about 90%). The administrative cost of the Roads Fund Board is covered by the budget of the Roads Fund Board while the administrative cost of TANROADS is covered by the Ministry of Works. The maintenance budget is transferred from the Roads Fund Board to TANROADS and local governments (provincial governments) directly. On the other hand, the road development and rehabilitation budget from the Road Fund is transferred to individual implementation bodies through the Ministry of Works, which decides the allocation of that budget.

(4) Current System to Collect Overload Charges

TANROADS is responsible for maintenance with funds that the Roads Fund allocates. There are weighbridges operated by TANROADS only on the paved networks but there is no control over unpaved networks, which is considered a problem. Overload fines are a part of the revenue of the Kenya Road Fund.

4.1.5 Uganda

(1) Institutional Reform Status

The road sector in Uganda has been undergoing reform over the last decade with the aim of commercializing road management and ensuring sustainable financing of works. With this aim, the Ministry of Works and Transport (MWT) was restructured to align its functions towards policy, monitoring, and regulatory roles in the road sector. In 2007, the Uganda National Roads

Authority (UNRA) was established in order to manage the development and maintenance of national roads. The Uganda Road Fund (URF) was established in 2008 through the Uganda Road Fund Act of 2008 to provide adequate and stable financing for maintenance of published roads in the country.

Uganda is the last country to launch a second generation road fund, which is engaged in managing the collection and disbursement of road user charges based on market principles. Its second generation road fund, URF, commenced operations in January 2010 by taking over responsibility for the disbursement of UGX 116 billion to provide for the routine and periodic maintenance needs of national roads, district roads, urban roads, and community access roads in the country in the second half of FY 2009/10. At present it has 23 staff members. Its mandate is to provide funds for the maintenance of all roads in Uganda including rural roads, and its board consists of public as well as private sector members with a private sector chairman. As it does not have an independent funding source yet, the budget comes from consolidated revenue as described below. In turn URF disburses funds to UNRA and 139 districts and communities. URF expects full operation in accordance with its establishment law in FY 2012–2013.

(2) Current Charges Levied from Road User

The Uganda Road Fund Act, in Section 21, provides the revenue sources of URF comprising road user charges and other stated incomes. The road user charges recognized by the Act include:

(i) a fuel levy;
(ii) transit fees, collected from foreign vehicles entering the country;
(iii) road license fees;
(iv) axle load fines;
(v) bridges tolls and road tolls; and
(vi) weight-distance charges.

Although the fuel levy has not been set as an isolated revenue source for URF, currently the government levies a fuel import duty of UGX 850 per liter for petrol and UGX 530 per liter for diesel. The estimated fuel import duty revenue in FY 2008/09 was about UGX 618 billion.[6] In addition, revenues from Traffic Act fees and other road user charges including driver permits and axle load were estimated to total about UGX 60 billion. Considering that the expected allocation of the road fund budget for FY 2010/11 is UGX 283.8 billion, the Uganda Road Fund's *Financing Road Maintenance Plan 2010/11* (June 2010) suggests setting the fuel levy at UGX 308 per liter for petrol and UGX 192 per liter for diesel, which would absorb 36.2% of the fuel import duty.

At present, the fuel import tax is collected at the border by the Uganda Revenue Authority (URA) on a vehicle-by-vehicle basis. Therefore, it is considered that URF would have the fuel levy collected by the URA simultaneously with the import tax. However, this is impossible under the current legal framework because the Uganda Revenue Authority Act of 1991 precludes deposit of any revenues collected by URA in any account other than the consolidated fund. This issue is being addressed in order to enable direct revenue collection by URF for FY 2011/12. On the other hand, since it was recognized that URF will not be able to levy road user charges directly for FY 2010/11 considering the legal background mentioned above, its budget of UGX 283.8 billion for FY 2010/11 has been identified for inclusion in the state budget.

[6] Uganda Road Fund, *Financing Road Maintenance Plan 2010/11—Performance Statement One-Year Road Maintenance Plan & Expenditure Programme*, June 2010.

(3) Road Maintenance Budget Allocation

The categories of expenditure to which the budget of URA is allocated are listed in the Uganda Road Fund Act of 2008 as follows: (i) maintenance of national roads, which is conducted by UNRA; (ii) maintenance of district, urban, and community access roads (DUCAR); and (iii) administration cost of URF. The government of Uganda is committed to funding the subsector in the foreseeable future with allocations from the annual budget. Currently, fund allocation is done by an old Ministry of Finance (MOF) formula that allocates funds in proportion to population and surface area. A new formula is being prepared that includes traffic level as a factor. The summary of the planned budget allocation of URF of FY 2010/11 is presented in Table 4-13.

Table 4-13: Summary of the Planned Budget Allocation of URF (FY 2007/08)

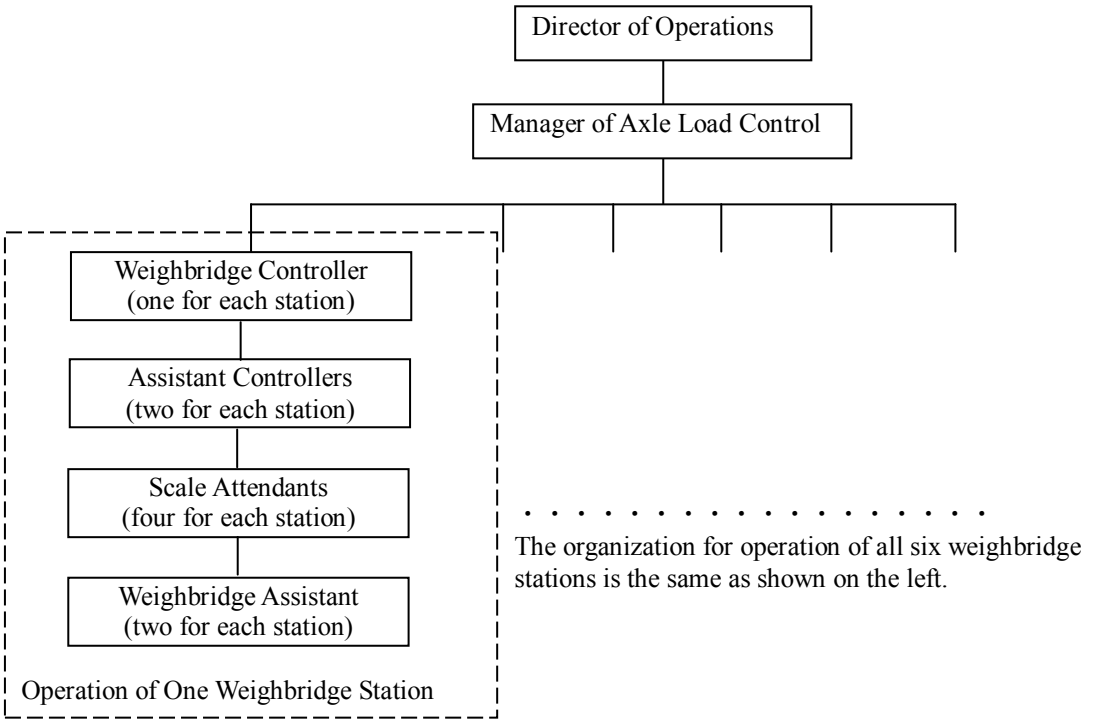
Description	Amount (UGX)
Maintenance of national roads (UNRA)	184,295,000,000
Maintenance of District, Urban and Community Access Roads (DUCAR)	92,658,000,000
Items administrated by the URF Secretariat	6,926,000,000
Total	**283,880,000,000**

Source: Uganda Road Fund

The road maintenance budget of UFR includes funds for routine and periodic maintenance of public roads in Uganda but it does not cover road rehabilitation and development cost (as is the case in other EAC Partner States). Funds for rehabilitation and development of national roads go straight from MOF to UNRA. It is further expected that assistance of development partners will continue to finance the rehabilitation and upgrading of existing infrastructure and the construction of new roads.

(4) Current System to Collect Overload Charges

The organizational chart for weighbridge management and the role of each position explained by interviewees is shown in Figure 4-1.



Roles of Each Position
Director of Operations (1 person): Directs the division
Manager of Axle Load Control (1 person): Oversees the overall management of the stations
Weighbridge Controller (1 person/station): Oversees overall activities at each weighbridge station; reports to the Manager of Axle Load Control of each station
Assistant Controller (2 persons/station): Oversees activities at each weighbridge station in shifts under the guidance of the Weighbridge Controller
Scale Attendants (4 persons/station): Conducts the actual weighing
Weighbridge Assistant (2 persons/station): Support staff for each station
Source: JICA Study Team

Figure 4-1: Weighbridge Operation Structure of Uganda

Under this operational structure, four police officers (two shifts) are working with weighbridge station staff, at each weighbridge station. The police take the driver of an overloaded vehicle to court and the court decides the fines according to guidelines. The guidelines for overload fines were prepared by the Ministry of Works. Currently, they have two shifts at each station so each staff member has to work 12 hours, which exceeds official maximum working hours in Uganda (eight hours). An allowance is paid for work exceeding official working hours. There is a plan to operate weighbridges in three shifts with eight working hours per staff member by hiring additional staff.

General maintenance is conducted every two months by UNRA staff members who are different from the staff of each station. They are considering outsourcing maintenance works to a private company. Calibration is conducted every four months by the Uganda National Bureau of Standards under the Ministry of Finance.

4.2 Cross-Country Comparison

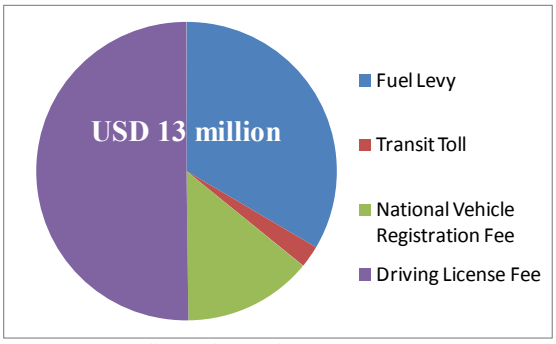
4.2.1 Road Fund Revenue and Revenue Sources

In each of the five EAC partner states, a road fund has been established and in principle all budgets for both periodic and routine maintenance in each country are paid out or planned to be paid out of the road fund. However, as a norm, major work such as reconstruction and rehabilitation is outside of the responsibility of the road fund. In addition, the road fund of Uganda was just established but has not been structured to collect all road user charges defined in the Act.

Comparing the revenue sources of the road funds of the Partner States except for Uganda (the situation of which will be clarified in the Draft Final Report), all consist of mostly road user charges although some still include state subsidies and assistance from development partners as a small portion. Also, all the revenue sources include a fuel levy and transit tolls. Although overloading fees/fines are theoretically included in the budgetary sources of the road fund in all the countries, it is not functional in Burundi and Rwanda due to a lack of appropriate equipment and a lack of a developed legal structure to enforce this category of fees/fines.

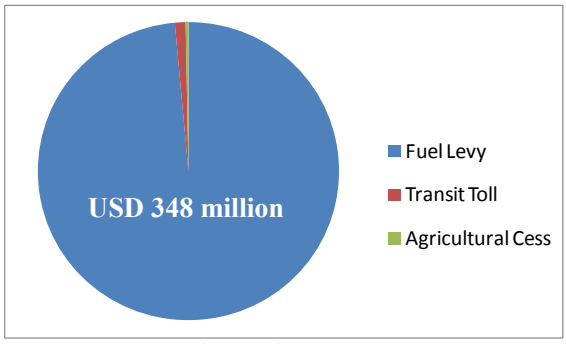
There are also differences in scale of annual budget, shares of each category of revenue source, and characteristics of specific revenue sources in the road funds of these four countries. In Burundi, the road fund consists of a fuel levy, transit toll, national vehicle registration fee, and driving license fee. The transit toll for foreign registered vehicles follows COMESA regulations (as does that in Kenya). The share of fuel levy is only 33%. In Kenya, the road maintenance fund consists of fuel levy, transit toll, and an agricultural cess, but the share of the fuel levy is 98.5%. The transit toll is a foreign registered vehicle fee, the price of which is set following COMESA regulations. The agricultural cess is a new type of road fund revenue currently levied on coffee farms. Under this system, the cess collected from a specific coffee farm is used for access road maintenance in the specific district where the coffee farm is located. The forecast annual revenue for FY 2010/2011 is KES 26.6 billion (USD 248 million equivalent). In Rwanda, the road maintenance fund mainly comes from the fuel levy, transit toll, national vehicle annual registration fee, and subsidies. Although there is a category of "overloading and other penalties" as expected revenue sources, the road maintenance fund has never received this from the Revenue Authority. In Tanzania, the budget of the Tanzania Roads Fund Board comes from a fuel levy, transit toll, and overloading fees. Again, the share of the fuel levy is quite high, at 96.5% of the total.

The comparison of the road funds of the four partner states is shown in Figures 4-2 to 4-5.



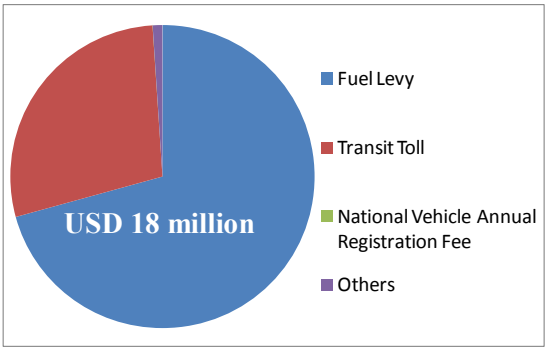
Source: Burundi Roads Fund

Figure 4-2: Burundi Roads Fund: Annual Revenue of 2010



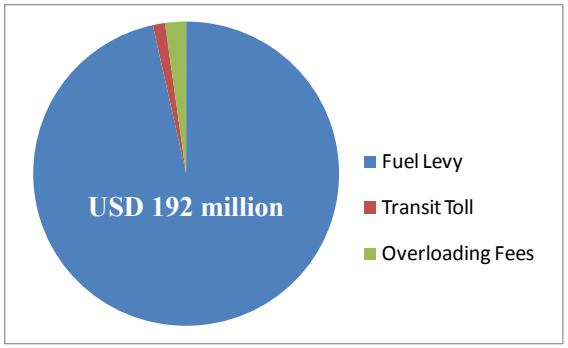
Source: Kenya Roads Board

Figure 4-3: Kenya Roads Board: Forecast of Annual Revenue (FY 2010/11)



Source: Rwanda Road Maintenance Fund

Figure 4-4:
Rwanda Road Maintenance Fund:
Annual Budget for FY 2009/10



Source: Tanzania Roads Fund Board

Figure 4-5:
Tanzania Roads Fund Board:
Annual Revenue of FY 2007/08

4.2.2 Current System to Collect Overload Charges

The level of legal enforcement, equipment installment, and organizational structure to enable efficient overloading control vary in the five Partner States. While Kenya, Tanzania, and Uganda have been developing more organized systems for overload control, those in Rwanda and Burundi are in early developmental stages.

In Kenya, overload fines are collected by the court. KeNHA is the organization that checks the gross and axle weight of vehicles using weighbridges. Police also work in cooperation with KeNHA and take drivers of overloaded vehicles to court. The fines collected by the court are transferred not to the road fund but to the general revenue fund. The Revenue Authority indicated that overload fines are a fee that "disappears". Therefore, they consider that the fine should not be included in the road maintenance budgets for the agency responsible for road maintenance.

In Tanzania, the overload fee is collected by TANROADS and transferred to the road maintenance budget. The weighbridge operation system used by the road agency in cooperation with the police is similar to that in Kenya, but TANROADS itself can collect the fee directly from drivers.

Rwanda law provides for fines or "overloading penalties", but in reality these have never been collected. There are only some weighbridges at the declaration points owned by the Revenue Authority but no weighbridge is controlled by the road agency. Although overloading fines or penalties are to be transferred to the road maintenance budget, the road fund has never received these monies.

The situation of Burundi is very similar to that of Rwanda. Although there are fines defined for each range of axle and gross weight overloading, there is no weighbridge to measure the overloading. Rather, there are only some weighbridges owned by Revenue Authority that check only gross weight at customs declaration points. Even the regulations define such fines, they have never been collected.

Uganda is currently under the process of developing a weighbridge operation system as well as the relevant regulations. They have been introducing Weigh-in-Motion equipment, and are

planning to introduce a computerized system, and an organized data capture system. Fines are to be collected by UNRA directly in the near future.

Table 4-14 compares overload charges in the five countries.

Table 4-14: Comparison of System for Collecting Overloading Charges

Description	Burundi	Kenya	Rwanda	Tanzania	Uganda
Name of fees/fines	Fines for axle overloading/ gross weight overloading	Overload fines	Overloading penalties	Overloading fees	Axle load fines
Collected (yes or no?)	No	Yes	No	Yes	Yes
Supposed to be collected by whom?	Police	Court (modifies amounts reported by police)	Revenue Authority	TANROADS (Road Agency)	Court (decides amounts)
Supposed to be checked by whom?	Revenue Authority	KeNHA (Road Agency)/ Police	Revenue Authority/ Police	TANROADS (Road Agency)/ Police	UNRA (Road Agency)/ Police
Budget allocation	Road maintenance fund	General budget	Road maintenance fund	Road Maintenance Fund	General budget (planned to become road maintenance fund)
Range of charges depending on level of overloading?	No (not clear in the current regulation)	Yes	No (not clear in the current regulation)	Yes	No

Source: JICA Study Team

Also, there is a difference in the concept of overload charges, which is considered as a "fee" in Tanzania but regarded as a "fine" in the other countries. The level of fees/fines also varies among the Partner States. However, the term "fee" or "fine" does not relate to the amount actually charged for overloading as shown in Table 4-15.

Table 4-15: Comparison of the Maximum Level of Fees/Fines

Country	USD	National Currency
Kenya	5,000	400,000
Tanzania	35,000	–
Burundi	2	2,000
Rwanda	300	180,000
Uganda	250	600,000

Source: JICA Study Team

4.3 Funding Needs

4.3.1 Methodologies and Assumptions

The funding needs for road maintenance can be estimated by the following formula;

Yp = F (IRIp, IRIf, V, M) * L, where

Y: Necessary funding amount for expected period (p),
IRIp: present pavement condition in international roughness index (IRI),
IRIf: desired target IRI to be maintained,
V: traffic volume,
M: unit cost of maintenance activities, and
L: length of road section.

The function F estimates the cost for maintenance activities per road length, which is attributable to (i) the present condition of the pavement (IRIp), (ii) the designated future maintenance level of the pavement (IRIf), (iii) unit costs of maintenance activities, and (iv) traffic volume. Following a strategic analysis approach, the JICA Study Team applied the HDM-4 model, which incorporates these factors, to calculate the cost of necessary maintenance activities to realize the designated future maintenance to keep up with traffic volume. The necessary amount of funding (Y) for the maintenance is a multiple of the unit cost and length of the road section. Since road pavement deterioration progresses over several years, a project period (p) was specified and the funding needs in the expected period (Yp) were estimated. Under this analysis, the project period was assumed to be a period of 20 years, from 2010 to 2029.

(1) Network Configuration

In accordance with the study objectives, the "target" network was been determined to cover the international corridors in the EAC Partner States, i.e., the Northern Corridor, the Central Corridor, and the other international links in the region. Figure 4-6 illustrates the target network, which can be categorized into two types of pavement: (i) asphalt mix concrete and (ii) double bituminous surface treatment. Further, the target network was classified into nine categories by traffic volume[7] and roughness index,[8] which are commonly used in national network budgeting analysis utilizing the HDM-4 model.

[7] Three levels: high (more than 15,000), medium (5,000–15,000), and low (less than 5,000).
[8] Three levels: good (less than 4), fair (4–7), and poor (over 7).

Source: JICA Study Team

Figure 4-6: Target Network for Funding Needs Analysis by Country

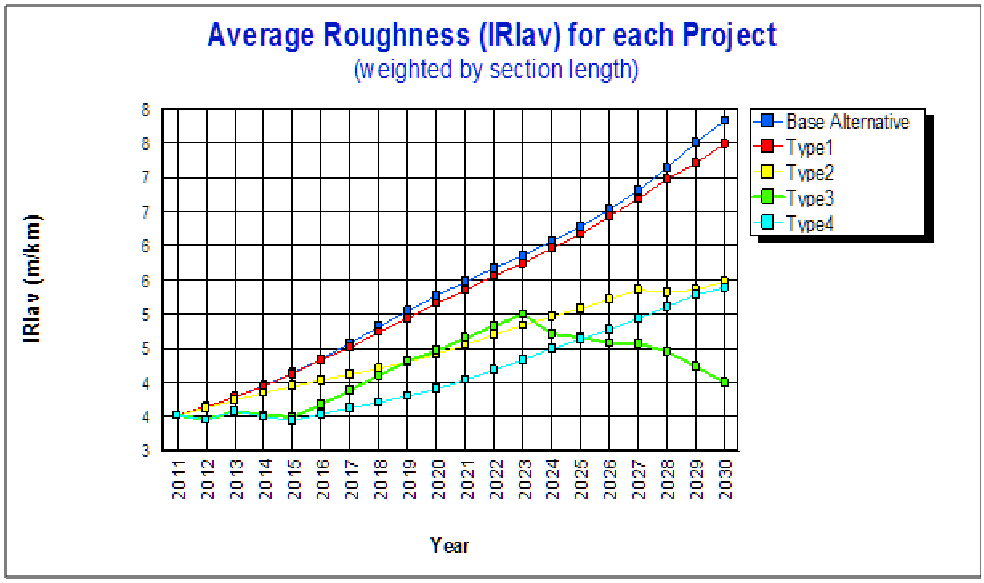
The designated level of maintenance has been assumed as IRIf = 4.0. While none of the Partner States has specified a particular level of maintenance, it could be considered that the IRIf 4.0 is a minimum level for international transport.

(2) Maintenance Configuration and Optimization

Maintenance activities can be specified referring to the HDM-4 standards. In the HDM-4 model, major maintenance activities are daily maintenance (Type 1), (patching and crack seal), resealing (Type 2), overlay (Type 3), and reconstruction (Type 4). These activities are applied according to the degree of deterioration, progress of which is dictated by traffic. The costs of each maintenance type are shown above.

	Maintenance Cost (USD millon)
Type 1	11.596
Type 2	42.355
Type 3	45.820
Type 4	49.618

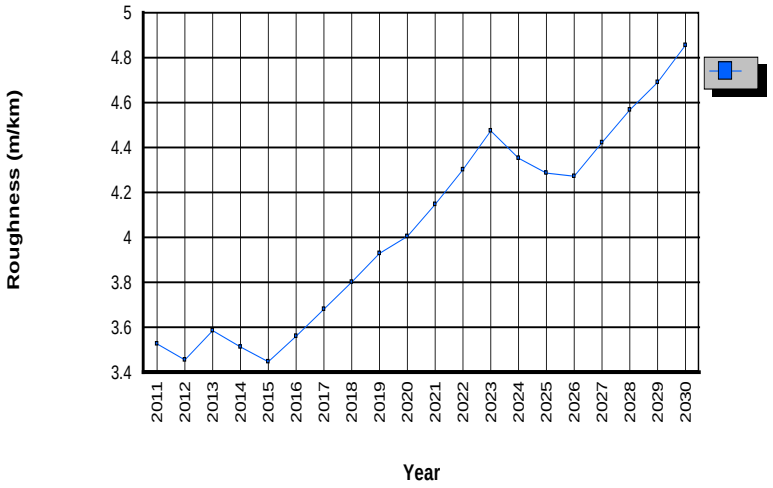
Figure 4-7 illustrates maintenance application by the four activities. The chart shows that Type 3 maintenance will yield the lowest IRI in 2030, but Type 4 maintenance can maintain a better IRI than the others, although it is the most expensive option.



Source: JICA Study Team

Figure 4-7: Example of Four Maintenance Activity Applications (Rwanda Case)

The HDM-4 model was applied to optimize the combination of activities by section to keep the targeted maintenance level (IRI = 4.0) over the 20-year period under the assumption of no budget constraint. Figure 4-8 shows the change in roughness during the period; the total maintenance cost comes to USD 100.676 million (undiscounted).



Source: JICA Study Team

Figure 4-8: Optimized Maintenance Scenario (Combination of the Four Activities, Rwanda)

The cost of maintenance per unit length was estimated by means of present market prices in each country. Referring to Section 3.1.2, however, market prices were not completely collected except for Rwanda. Therefore, it was assumed that (i) prices in Rwanda can be applied to the landlocked countries (Rwanda, Uganda, and Burundi), and (ii) prices equal to 70% of these prices can be applied to the coastal countries (Kenya and Tanzania). Appendix E.1 presents the detailed data used in the analysis.

(3) Traffic Characteristics

Four aspects must be clarified concerning the traffic data inputs for HDM-4: (i) traffic volume, (ii) composition, (iii) specification of vehicle standards, and (iv) traffic growth rate. The latest traffic data were collected and estimated for 2010 by applying a fixed growth rate (assumed to be 3.0% per annum). A total of 7–8 vehicle categories were specified as shown in Table 4-16. Traffic composition was specified by referring to previous traffic composition surveys along the major corridors, and this was applied to sections without composition data. Vehicle specification was designated for each vehicle category by referring to the present market. Particularly, the observed axle load distribution data obtained at Uganda weighbridges were utilized to specify equivalent single axle load (ESAL) and gross vehicle mass. The future traffic growth rate was assumed at 3.0% per annum. Appendix E.1 presents detailed input specifications.

Table 4-16: Category of Vehicles by Country

	Burundi	Kenya	Rwanda	Tanzania	Uganda
Cars	√	√	√	√	√
Pickup	√	√	√	√	√
Minibus	√	√	√	√	√
Bus	√	√	√	√	√
2-Axle Truck	√	√	√	√	√
3-Axle Truck	√		√	√	√
Trailer	√	√	√	√	√
Trailer-Truck	√	√	√	√	√

Source: JICA Study Team

Table 4-17 summarizes major assumptions for estimation of future funding needs.

Table 4-17: General Assumptions in Estimation of Funding Needs

Network	All sections classified into nine categories, by three levels of traffic volume, and three levels of pavement conditions
Project periods	20 years (2011–2030)
Maintenance strategy	Four types of maintenance/improvement are applied with optimized combination to realize IRI = 4.0 and to minimize the total maintenance cost during the project period.
Traffic volume	Adjusted as traffic volume in 2010. The traffic increases by 3% annually during the project period, a conservative (i.e., low) assumption.
Vehicle	Classified into eight categories, particularly four categories for trucks/trailers. Composition was specified by the observed traffic data.

Source: JICA Study Team

4.3.2 Estimation by Country

Table 4-18 summarizes the results by country.

Table 4-18: Summary of Funding Needs

	(A) Forecasted Funding Needs for 2011–30 (USD million, discounted)	(B) Network Length for this Analysis (km) (share in national road length)	(C) Existing Total Road Length (km)	(D) Present Annual Budget* (Table 3-10) (USD million)
Burundi	9.93	115 (3%)	4,473	17.7
Kenya	559.95	1,915 (8%)	25,345	34.0
Rwanda	51.93	539 (11%)	4,698	17.2
Tanzania	392.41	2,506 (8%)	33,012	104.6
Uganda	492.33	834 (4%)	21,195	73.6

	(E) =A/20 Annual Funding Needs (USD million)	(F) = E / B Annual funding per length (USD million/km)	(G) = F * C Estimated National Fund Needs (USD million)
Burundi	0.496	0.00432	19.31
Kenya	28.0	0.01462	370.55
Rwanda	2.60	0.00482	22.63
Tanzania	19.6	0.00783	258.47
Uganda	24.6	0.02952	625.60

*) the budget covers both development and maintenance for the entire network of the country, while on the other hand, the funding needs in the column (E) covers only selected international corridors in the country as shown in Figure 4-6

Source: JICA Study Team

Kenya, Tanzania, and Uganda show larger funding needs than the other two countries. Kenya's funding need per unit road length is higher than that of Tanzania, due to its low pavement quality at present. For Uganda, traffic volumes along major corridors were higher than those for other countries in the region, and therefore its maintenance requirements were estimated to be larger. The details of the estimation are presented in the following subsections.

(1) Burundi

The "target" network length is 115 km, shortest among the countries, which is categorized in Table 4-19. Over 90% of network can be categorized as good pavement.

Table 4-19: Categorization of Target Road Length, Burundi

(km)	High Traffic	Medium Traffic	Low Traffic
ADT=	1,836	636	311
IRI <4 Good	22.3	44	40.1
4<IRI<7 Fair	6.2	–	2.3
IRI>7 Poor	–	–	–

Source: JICA Study Team

The total cost for maintenance over the 20-year period keep IRI equal to 4.0 was estimated at USD 9.93 million, reflecting current toad condition.

(2) Kenya

The designated network, 1,915 km, can be categorized as shown in Table 4-20. The share of poor condition pavement is 73%, which would require additional costs initially for improvement to IRI 4.0.

Table 4-20: Categorization of Target Road Length, Kenya

(km)	High Traffic	Medium Traffic	Low Traffic
ADT=	35,657	5,799	1,000
IRI <4 Good	32	276	65
4<IRI<7 Fair	12	39	92
IRI>7 Poor	80	271	1,048

Source: JICA Study Team

The total cost for maintenance over the 20-year period to keep IRI 4.0 was estimated as USD 559 million, which is the largest among the countries.

(3) Rwanda

The target network is 539 km long, which is connected to the Central Corridor. The present IRI ranged from 3.0 to 8.0 in 2009, and the average IRI was 3.55 (weighted by length), which is relatively better than that in the other countries. Average traffic volume (ADT) is about 3,500, ranging from 100 t o 4,300. For Rwanda, the network was not so complicated to require categorization of link characteristics. The total cost for maintenance over the 20-year period to keep IRI 4.0 was estimated as USD 2.6 million.

(4) Tanzania

The designated network, 2,506 km, can be categorized as shown in Table 4-21. A total of 73% of the pavement was in poor condition, which would require additional cost to improve the section to IRI 4.0 level initially.

Table 4-21: Categorization of Target Road Length, Tanzania

(km)	High Traffic	Medium Traffic	Low Traffic
ADT=	26,396	9,509	1,203
IRI < 4 Good	24	115/33	986/922
4 < IRI < 7 Fair	–	82	35/309
IRI> 7 Poor	–	–	

Source: JICA Study Team

The total cost for maintenance over the 20-year period to keep IRI 4.0 was estimated as USD 392.41 million, which was the second highest among the countries.

(5) Uganda

The designated 834 km network of Uganda can be categorized as shown in Table 4-22. The length of pavement in good condition represents 57% of the total, reflecting relatively good maintenance practices. However, the estimated necessary funding amount for Uganda was the largest among the five countries, which may be attributed to traffic volumes. The ADT for the lower traffic category was 2,245, twice that of Tanzania and Kenya, which will damage the pavement proportionally more.

Table 4-22: Categorization of Target Road Length, Uganda

(km)	High Traffic	Medium Traffic	Low Traffic
ADT=	–	13,908	2,245
IRI < 4 Good	–	46.2	427.3
4 < IRI < 7 Fair	–	37.6	267.6
IRI> 7 Poor	–	0.6	54.8

Source: JICA Study Team

4.3.3 Effect of Differences in Power for Axle Loads in Highway Damage Estimation

Numerous tests and studies in the past in many parts of the world have well established that the damage caused by an axle of certain axle load is not proportionate to the load but exponential, i.e., the degree of damage is proportionate to some power of the load. The most commonly used value of the power is around 4.0 but the value of the power actually used in highway design can vary somewhat depending on the geographic factors. An exponent of 4.0 was applied in all of the analysis in this study concerning highway maintenance mostly by means of the HDM-4 model.

However, following a suggestion by the Tanzanian delegation at the 2nd Stakeholders Meeting, an attempt was made to examine the use of different exponents. In the model six vehicle types were differentiated and their respective axle loads as measured at weighbridge stations were applied to come up with equivalent standard axles (ESAs) vehicle by vehicle. The powers of 4.0 or 4.5 were used to calculate ESA. Then the average ESAs by vehicle type were obtained. Highway damage was estimated with the HDM-4 model by means of cumulative ESAs year-by-year for 20 years.

In order to demonstrate the difference between using the exponents 4.0 and 4.5, the ESA calculations were made for a road section in Tanzania with a known axle load distribution pattern. Table 4-23 presents the results.

Table 4-23: Difference in ESAL by Power 4.0 and Power 4.5

Vehicle Type	No. of Vehicles	Average ESAL		
		Power 4.0	Power 4.5	Difference
2-Axle	195	2.57	2.76	0.18
3-Axle	75	2.49	2.49	0
4-Axle	19	2.14	2.04	−0.11
5-Axle	6	5.12	5.41	0.29
6-Axle	145	4.56	4.49	−0.06
7-Axle	15	5.06	5.00	−0.06

Source: JICA Study Team

As indicated in the table, the difference in results from using the exponents 4.0 and 4.5 is small. In some cases the use of the power 4.5 even resulted in a smaller average ESA. This seemingly contradictory result is due to the fact that the vast majority of axles are within the range of low axle loads and only a relatively small portion are on the high side. When a higher power value is applied, the sum of the ESAs of axles with low loads becomes less although that of high loads becomes more. Because of the large number of axles with low loads the net effect can be less.

No difference emerged when the average ESAs by vehicle type for the above two cases are separately applied to the HDM-4 model to calculate maintenance costs. As in the real world, the HDM-4 model determines maintenance activities depending on a range of cumulative number of ESAs year by year. It does not specify a maintenance activity for every value of cumulative ESAs. For such a small difference the HDM-4 model chooses exactly the same maintenance activities in the same schedule. Thus, estimated maintenance costs for the two cases turned out to be identical. Figure 4-9 illustrates the foregoing.

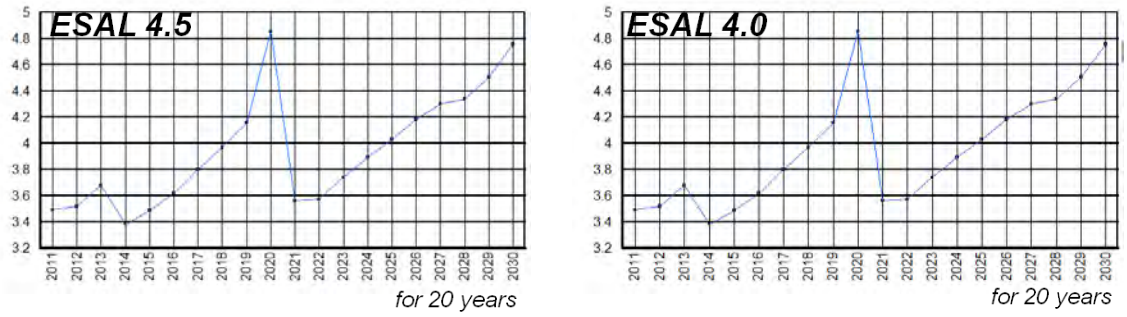


Figure 4-9: Maintenance Cost Schedules for the Power 4.0 Case and the Power 4.5 Case

It may be concluded that for the typical situation in the EAC the use of the power 4.0 or 4.5 does not make any difference.

4.4 Responsibility for Overloading

An attempt was made to estimate the differences in road deterioration with or without overloading. A typical road network in Kenya was assumed, and the HDM-4 model was applied to estimate the deterioration and differences of total maintenance cost in a project period. For the case of "with overloading", a typical overloading situation in EAC countries was characterized by utilizing the several axle load measurement data sets in the region. For the case of "without overloading", calculations were made assuming that overloaded vehicles would be

replaced by fully loaded vehicles with gross vehicle mass (GVM) at the limit, resulting in less per vehicle payload and an additional number of vehicles.

4.4.1 Assumptions for Overloaded Traffic

(1) Present Conditions of Overloading and Traffic Characteristics for the "With Overloading" Case

The JICA Study Team collected axle load measurement data sets at several weighbridges in the region, and analyzed overloading characteristics by country:

(i) The records of weighbridge measurement captured all freight traffic passing through the station.
(ii) Uganda provided a large amount of measurement records with 11,000 freight vehicles, recorded from June to August 2010 i n two weighbridges,[9] and 57% of vehicles overloaded vis-à-vis GVM and/or axle load limits.
(iii) Tanzania provided measurement results for 454 vehicles, recorded on 12 July 2010[10] at a weighbridge along the Central Corridor in suburban of Dar es Salaam, showing 29% of vehicles overloaded vis-à-vis GVM and/or axle load limits.[11]
(iv) Burundi provided results for 361 vehicles, recorded in 2010 at six weighbridges, showing 28 % of vehicles are overloaded against GVM and/or axle load limits.
(vii) Kenya provided results for 42,798 vehicles, showing 61% of the vehicles overloaded against GVM and/or axle load limits.

Appendix G presents a detailed analysis of the present overloading status.

After analyzing the axle load data indicated above, the JICA Study Team differentiated two types of overloading characteristics:

(i) Overloading Type T: referring to the Tanzania results, this reflects a low rate of overloading in high traffic volume (over 15,000 ADT, with a freight traffic share of 9%); and
(ii) Overloading Type UB: referring to conditions in Kenya, Uganda, and Burundi, this type reflects high overloading violations in smaller traffic volume (i.e., less than 2000 ADT and a freight traffic share of 38%).

The JICA Study Team thus established a dataset for overloading of Types T and UB as shown in Table 4-24.

[9] Mbaraba (5,023 vehicles in total) and Masaka (6,548 vehicles); ADT for both locations is 700–800.
[10] Monitored on Monday.
[11] ADT at the location is 7,500 and the weighbridge has a reputation for its good monitoring operation performance.

Table 4-24: Overloading Characteristics in the "With Overloading" Case

# of Axles	Type T			Type UB		
	ESAL per vehicle	GVM per vehicle (kg)	Composition in freight traffic (%)	ESAL per vehicle	GVM per Vehicle (kg)	Composition in freight traffic (%)
2	2.57	16,470	42.7%	4.28	15,887	19.6%
3	2.49	22,456	16.5%	5.88	24,245	28.5%
4	2.14	26,881	4.2%	3.13	27,495	2.4%
5	5.12	38,500	1.3%	5.73	36,532	4.7%
6	4.56	44,033	31.9%	5.76	42,707	40.6%
7	5.06	49,690	3.3%	13.85	56,167	4.3%

Source: JICA Study Team and Uganda Road Authority

Comparing the two types, it was found that the ESAL for each vehicle type for Type UB was much higher than for Type T, particularly for 3-axle and 7-axle vehicles, even though the GVMs were not much different. For example, taking the figures for a 2-axle vehicle as an example, Type T (2.57) shows a lower ESAL than does Type UB (4.28) although the GVM in Type T (16,470 kg) is higher than for Type UB (15,887 kg), which suggests that trucks in Type UB have a more concentrated loading on the rear axle, and the resultant higher ESAL damages the pavement more.

To run the HDM-4 model for the "overloading case", vehicles were classified into four classes: (i) 2-axle trucks, (ii) 3-axle trucks, (iii) heavy trucks (4 and 5 axles), and (iv) trailers (6–7 axles).

(2) Traffic Characteristics for the "Without Overloading" Case

For the "without overloading" case, the following was assumed:

1) Overloaded traffic is separated from non-separated traffic

Non-overloaded traffic and overloaded traffic are separated. A dataset for the non-overloaded traffic for HDM-4 was prepared.

2) Fully-loaded vehicle types were specified

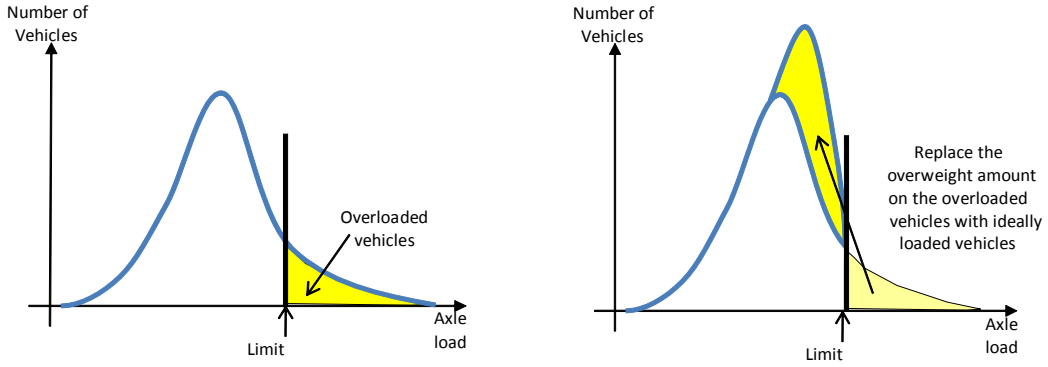
An ideal vehicle satisfying both axle load and GVM limit regulations was specified for each type of vehicle configuration, as shown in Table 4-25, and the ESALs associated with each type were calculated.

Table 4-25: Axle Load and GVM Specifications of Ideal Vehicles

Ideal Full Load Model											
Vehicle	No.1	No.2	No.3	No.4	No.5	No.6	No.7	GVW	Tare/W	Max/L	ESAL
2 Axle	8000	8000						16000	4000	12000	1.85
3 Axle	8000	8000	8000					24000	8000	16000	2.77
4 Axle	8000	8000	8000	8000				32000	10000	22000	3.70
5 Axle	8000	8000	8000	8000	8000			40000	12000	28000	4.62
6 Axle	8000	8000	8000	8000	8000	8000		48000	16000	32000	5.55
7 Axle	8000	8000	8000	8000	8000	8000	8000	56000	20000	36000	6.47

3) Overloaded vehicles were replaced by "ideal" vehicles

The number of ideal vehicles necessary to carry the overloaded amount of the present overloaded vehicles was estimated by (i) identifying the overloaded amount for each axle of each vehicle by comparing it with the regulatory limit per axle, (ii) accumulating the overloaded amount for all vehicles, and (iii) specifying the number of ideal vehicles equivalent to carry the total accumulated overloaded amount by dividing the figure by the maximum payload as shown in Table 4-25. Figure 4-10 presents this procedure graphically.



Note: For computational simplicity, the area in yellow in the right-hand graph is represented by "ideally" loaded vehicles, i.e., vehicles with axle loads at the limit.

Figure 4-10: Replacement of Overloaded Amount by Ideal Vehicles

4) Apply the two types of vehicles into the HDM-4 model

GVM and ESAL characteristics for the non-overloaded vehicles and the ideal vehicles were specified (Appendix D.3 shows details). The necessary amount for the maintenance cost for each scenario was estimated by assessing both non-overloaded and ideal vehicles with the HDM-4 model.

4.4.2 Maintenance Cost Estimation

Table 4-26 presents the assumptions for the maintenance cost estimation process.

Table 4-26: Assumptions in With/Without Overloading Analysis

Network	Referring to a part of the existing Kenya network, the assumed 124 km network with good, fair, and poor pavement condition in the initial case. Appendix D.3 presents details.
Project Period	20 years (2011–2030)
Maintenance Strategy	Four types of maintenance/improvement are applied in optimized combinations to realize the condition that IRI = 4.0 and to minimize total maintenance cost during the project period.
Traffic Volume	Assumed 10,000 for ADT (all vehicles) and annual growth of 3% during the project period. Traffic composition by vehicle type was specified for each vehicle of Overloading Type T and Overloading Type UB. Appendix D.3 presents details.
Vehicle	For eight categories, ESAL and GVM were specified for each vehicle of Type T and Type UB. Appendix D.3 presents details.

Table 4-27 presents the results of the HDM-4 calculation.

Table 4-27: Maintenance Expenditure With/Without Overloading

USD millions, undiscounted

	For Traffic Type T (low violation rate)	For Traffic Type UB (high violation rate)
a) Maintenance Expenditure **with Overloading (present)**	111.16	124.04
b) Maintenance Expenditure **without Overloading (ideal)**	91.56	111.16
c) With/without Difference (a/b)	1.21	1.12

Source: JICA Study Team

This analysis shows that (i) overloading will increase maintenance expenditure by 12% to 21%, and (ii) high rates of overloading violations will increase maintenance expenditures. Appendix D.3 presents the details of the analysis results.

4.5 Charges for Overloading

4.5.1 Proposed Principles for Overloading Charges

There have been a number of discussions in recent years on a harmonized legal framework for vehicle overload control and overloading (and other road user) charges for the East and Southern Africa (ESA) region. Based on these discussions and the existing situation in the region, the following two principles regarding the decriminalization of overloading and the level of overloading charges were suggested for the EAC Partner States (as well as for SADC and COMESA member countries).

(1) Decriminalization of Overloading

Principle 1:
Overloading is to be decriminalized and overloading charges are to be collected administratively.

Of the five EAC Partner States, only Tanzania does not consider overloading a crime. Under such a policy, charges for overloading are handled as fines through judicial procedures. On the other hand, Tanzania has decriminalized overloading at least to some extent. Tanzania handles overloading fees administratively and they are paid instantly at weighbridge stations although some criminal provisions remain in the current Tanzanian regulations.

Under this existing situation, the EAC, COMESA, and SADC agreed to decriminalization of overloading at a tripartite workshop held in Nairobi in July 2008. In addition, at an EAC technical committee on axle load limits implementation in August 2007, the EAC Secretariat recommended that overloading should be decriminalized, i.e., removed from the court system and handled administratively. The technical meeting report also mentioned that "judicial fines are in many cases not a deterrent and due to the many layers of bureaucracy involved, [and] could encourage corruption".

The JICA Study Team also recommends decriminalization of overloading considering the following four reasons based on the current situation in the region:

- in order to secure revenues from overloading charges for the road maintenance budget under the policy of beneficiary liability for road maintenance cost, which has been discussed for a long time in the East and Southern Africa Region, decriminalization of overloading is essential (otherwise, the charges are collected by courts and revenues from the charges are included in the general budget of the country - see Figure 4-11);
- to avoid the long delays suffered by prosecuting offenders judicially and the related uncertain outcomes of such a process in terms of the adequacy of the fine imposed in relation to the economic damage caused by overloading; and
- to secure an immediate, administratively effected sanction that reflects the additional damage to the pavement as a result of the overloading; and
- to avoid encouraging corruption caused by complicated criminal procedures for overloading, as mentioned in the August 2007 EAC technical committee meeting report.

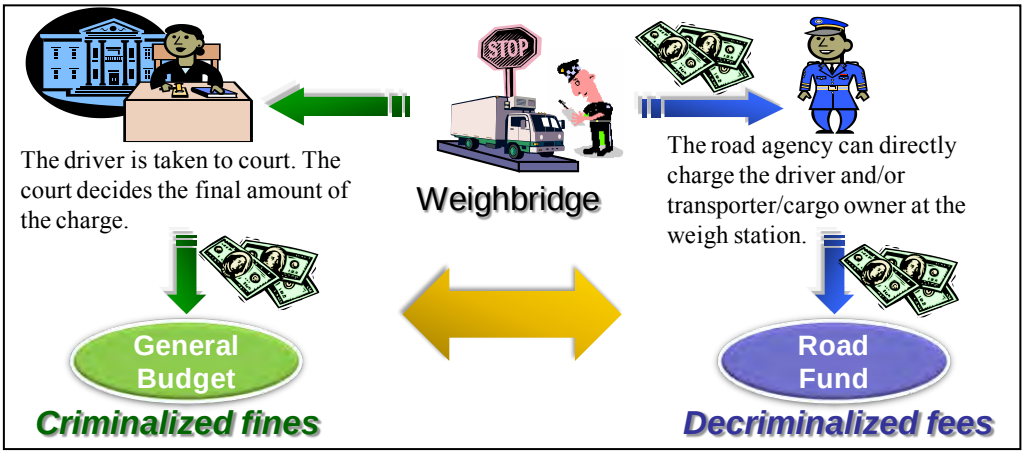


Figure 4-11: The Difference between Criminalized Fines and Decriminalized Fees

(2) Level of Overloading Charges

Principle 2:
Overloading charges are to 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.

The series of studies under the 2006/2007 Work Program of the Regional Economic Communities Transport Coordinating Committee of the Sub-Saharan Africa Transport Policy Program (SSATP)[12] recognized that road transport was an important component in the economy and every aspect of the economy was affected by this mode of transport. The studies

[12] COMESA, SADC, and the Southern Africa Office of the United Nations Economic Commission for Africa (UNECA) working under the Regional Economic Communities Transport Coordinating Committee established under the Sub-Saharan African Transport Policy Program (SSATP) identified vehicle overload control as one of the priority areas to be addressed in their 2006/2007 Work Program. In this regard, a project was commissioned to prepare reports on various aspects of overload control in the East and Southern Africa (ESA) region. The key outputs of the project were the following three studies: (i) Synthesis of Overload Control Practice and Main Lessons Learned; (ii) Case Studies on E merging Good Practice; and (iii) Guidelines on Aspects of Overload Control. Based on the recommendations made by these three study reports, the EAC, COMESA, and SADC discussed the direction of harmonized overload control standards at the Regional Workshop on Harmonization of Key Elements and Implementation of Best Practice in Overload Control in Nairobi in July 2008.

also highlighted that a criminal response to overloading does not provide any financial link to actual road damage, and there is no price for overloading since the fines are non-economic and do not match the cost of the damage to the road. Considering the findings of the SSATP reports, the EAC Secretariat recommended Partner States to start charging economic fees that are commensurate with the damage caused by overloading at the technical committee on axle load limits implementation in the East African Community in 2007. In addition, EAC, COMESA, and SADC agreed that overload fees should be set based on the recovery of road damage costs at the tripartite workshop in Nairobi in 2008. Further, a Proposed System of Harmonized Road Transit Charges for the SADC Region produced by a Southern African Transport ***and*** Communications Commission (SATCC)/Southern African Customs Union (SACU) Joint Task Team suggests that road users, including foreign road users, should contribute the full costs of maintaining roads and progressively contribute the full costs of providing roads. Based on that principle, the study proposed transit charges calculated based on long-run marginal costs with the following cost elements: (i) routine maintenance costs, (ii) periodic maintenance costs, (iii) rehabilitation costs, and (iv) general maintenance costs. The study also suggested that as more data becomes available, reconstruction/upgrading cost elements would be considered for cost recovery as well. Moreover, the SADC Protocol on T ransport, Communications and Meteorology requires member states to develop and implement cohesive and definitive road funding policies with a view to ensuring that revenues obtained from road user charges shall be regarded as dedicated for the provision, maintenance, and operation of roads.[13] On the other hand, within the existing acts or protocols of the EAC, there is no exact definition of road user charges and the road fund revenues of the EAC Partner States are currently used only for maintenance costs including routine maintenance costs and periodic maintenance costs but excluding rehabilitation costs. Considering the movement toward harmonization of transport agreements among the EAC, SADC, and COMESA and also the shortage of funds of road authorities of the Partner States, the JICA Study Team suggests a definition of the road user charges including road rehabilitation cost should be considered by the EAC Partner States.

Based on recent trends in the region and the current situation as described above, the JICA Study Team recommends that the level of overloading charges be set based on the folloing two principles:

- Overloading charges should be set based on the principle of recovering road damage cost.
- The road damage cost should be defined based on long-run marginal costs including not only routine and periodic maintenance costs but also rehabilitation and reconstruction costs to cover the road damage.

4.5.2 Estimation of the Level of Overloading Charges

(1) Estimation Process

Based on the principles proposed in Section 4.5.1, the level of overloading charges was estimated to be proportional to the travel distance and equivalent standard axle loads (ESALs) caused by the overloading. ESAL is the most commonly accepted indicator to equate damage from wheel loads of various magnitudes and repetitions to damage from an equivalent number of "standard" loads. The relation among level of road damage, ESAL, and axle weight is shown in Figure 4-12.

[13] Source: Article 4.5(e), Funding Sources, SADC Protocol on Transport, Communications and Meteorology.

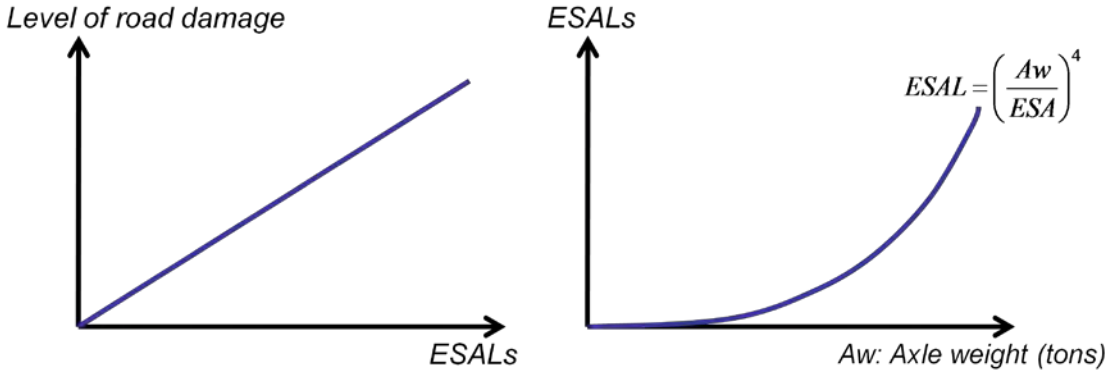


Figure 4-12: Relation among Level of Road Damage, ESAL, and Axle Weight

Estimation was conducted using the total road maintenance cost of the "target network" in each Partner State (see the calculation results in Section 4.3) and road maintenance cost of the with and without overloading cases of a 124 km model road section (see the calculation results in Section 4.4). The road maintenance costs calculated by using HDM-4 in Sections 4.3 and 4.4 are long-run marginal costs for 20 years from 2010 including routine maintenance, periodic maintenance, and rehabilitation and reconstruction costs, which correspond to the Principle 2 above. In the cases involving the estimation using the results of Sections 4.3 and 4.4, the level of the overloading charges was calculated as maintenance cost per ESAL per km. Following the assumptions of the HDM-4 analysis, the traffic growth rate was assumed to be 3% in both cases.

For the estimation using the results of Section 4.3, the maintenance cost per ESAL per km was calculated by country applying the following formula, and calculation results and input data of the HDM-4 analysis. The input data of the HDM-4 analysis used for this calculation included traffic volume, traffic composition, and traffic characteristics of the "target network" of each country.

$$M_{ESAL \cdot km} = \frac{M}{\left[\sum_{k=1}^{n_{Sec}} \sum_{j=1}^{n_{VEH \cdot Cat}} (ESAL_{VEH \cdot Ave}(j) \cdot ADT_{VEH}(j)(k) \cdot d(k))\right] \cdot 365 \cdot \sum_{y=0}^{20} 1.03^y}$$

Where,
$M_{ESAL \cdot km}$: Maintenance cost per ESAL per km;
M : Maintenance expenditure on major international corridor network;
$ESAL_{VEH \cdot Ave}(j)$: Average ESAL of a vehicle of vehicle category *"j";*
$ADT_{VEH}(j)(k)$: Average daily traffic volume of vehicle category *"j"* on road section *"k";*
$d(k)$: distance of road section *"k";*
$n_{VEH \cdot Cat}$: Number of vehicle categories;
n_{Sec} : Number of road sections; and
y : Year from 2010.

Regarding the estimation using the results of Section 3.3, maintenance cost per ESAL per km was calculated for "Type T" and "Type UB" individually, by applying the following formula, and the calculation results and input data from the HDM-4 analysis. The HDM-4 analysis input

data used for this calculation included traffic volume, traffic composition, and traffic characteristics of the 124 km model road section.

$$M_{ESAL \cdot km} = \frac{M_{with} - M_{without}}{\left[\sum_{i=1}^{n_{OL \cdot AX}} (ESAL_{OL \cdot AX}(i) - ESAL_{L \cdot AX}) \right] \cdot 124km \cdot 365 \cdot \sum_{y=0}^{20} 1.03^{y}}$$

Where,

$M_{ESAL \cdot km}$: Maintenance cost per ESAL per km;

M_{with} : Maintenance expenditure with overloading;

$M_{without}$: Maintenance expenditure without overloading;

$ESAL_{OL \cdot AX}(i)$: ESAL of an overloaded axle *"i";*

$ESAL_{L \cdot AX}$: ESAL of axle limit;

$n_{OL \cdot AX}$: Number of overloaded axles per day on the 124 km target section; and

y : Year from 2010

(2) Summary of the Estimation Results

Following the process described above, the road maintenance cost per ESAL per km was estimated for the case of the model network in each country, and that of the with and without analysis. In the case of the with and without analysis, the road maintenance cost per ESAL per km was estimated under simplified conditions of a 124 km road section, ADT of 10,000, and the same traffic composition as the target section. Estimation for the model network was conducted under more specific conditions of the entire target network, which consists of the entire major international corridor network in the region, and by applying different (actual) traffic volume and traffic composition by different section of the network.

It was found that the difference between the with and without cases as calculated by the HDM-4 model was too volatile in respect of minor differences in input data such as the distribution of road conditions in an unevenly maintained road network. On the other hand, the total maintenance cost figures of the target network of the Partner States were found to be stable. It was therefore decided to utilize the total cost rather than the difference in cost as the basis for charge amount.

Table 4-28 presents the estimation results by using the maintenance costs of the target network. Appendix F presents the input data and detailed calculation results.

Table 4-28: Calculation Results of Maintenance Cost per ESAL per Unit Distance

	Target network length (km)	Maintenance Cost (USD)/day*km (2010)	Average ESAL/day	Maintenance Cost (USD/ESAL*100 km
Kenya	1,915	29.81	6,478	0.46
Tanzania	2,506	15.97	3,611	0.44
Burundi	115	8.81	1,171	0.75
Rwanda	539	9.82	1,027	0.96
Uganda	834	32.07	5,004	0.64
Average	-	19.30	3,458	0.65

Source: JICA Study Team

*Note: The "Maintenance Costs/ESAL*km" of Kenya, Tanzania, and Uganda are lower than those of the other two countries because of their lower relative construction cost (70% of the level in Burundi and Rwanda).*

(3) The Recommended Level of Vehicle Overloading Charges

Applying the average maintenance cost per ESAL per distance of the five Partner States, the level of overloading charges is proposed as follows.:

Proposed Level: USD 0.65 per ESAL per 100 km

In order to calculate the level of charge by different axle weight, the following formula is to be adapted based on the definition of ESAL:

When Aw > Al

$$C = \left\{ \left(\frac{Aw}{ESA} \right)^4 - \left(\frac{Al}{ESA} \right)^4 \right\} \cdot \frac{d}{100} \cdot US\$0.65$$

Where,
C: Level of charge;
Aw: Axle weight;
Al: Axle limit;
d: Travel distance; and
ESA: Equivalent Standard Axle, which is set as 8,158 kg.

The use of the average figure of USD 0.65 per ESAL per 100 km and the calculation formula written above gives the level of overloading charges by overloaded axle weight shown in Table 4-29. Each country may modify the figures in proportion to the ratio of actual maintenance costs in the country and the average maintenance costs of the five countries. The amount of the total overloading charge for a vehicle can be the sum of the overloading charge of all axles of that vehicle.

Table 4-29: Calculation Results of Maintenance Cost per ESAL per Distance

Overloading weight (kg)	Avg. weight (kg)	ESAL Over the Limit			Charge (USD/100km)		
		Axle limit: 6,000 kg	Axle limit: 8,000 kg	Axle limit: 10,000 kg	Axle limit: 6,000 kg	Axle limit: 8,000 kg	Axle limit: 10,000 kg
0 –500	250	0.052	0.121	0.234	0.03	0.08	0.15
500–1,000	750	0.176	0.399	0.757	0.11	0.26	0.49
1,000–1,500	1,250	0.331	0.728	1.359	0.22	0.47	0.88
1,500–2,000	1,750	0.522	1.115	2.046	0.34	0.73	1.33
2,000–2,500	2,250	0.753	1.567	2.826	0.49	1.02	1.84
2,500–3,000	2,750	1.031	2.090	3.709	0.67	1.36	2.41
3,000–3,500	3,250	1.360	2.692	4.701	0.88	1.75	3.06
3,500–4,000	3,750	1.748	3.379	5.812	1.14	2.20	3.78
4,000–4,500	4,250	2.199	4.159	7.052	1.43	2.70	4.58
4,500–5,000	4,750	2.722	5.042	8.429	1.77	3.28	5.48

Source: JICA Study Team

Chapter 5 Axle Load and Gross Vehicle Mass Limits

5.1 Existing Maximum Load Limits in EAC/COMESA/SADC Countries and the Rest of the World

5.1.1 Load Limits Agreed at the Tripartite EAC/COMESA/SADC Meeting, 2008

The EAC Partner States held a series of intensive meetings to harmonize vehicle overload control regulations in the Community.[1] For further harmonization with the neighboring (and overlapping) regional economic communities of the Common Market for Eastern and Southern Africa (COMESA) and the Southern African Development Community (SADC), dialogues and meetings have been held.

Notably, in July 2008, a *Regional Workshop on Harmonization of Key Elements and Implementation of Best Practice in Overload Control* was held in Nairobi with a view to harmonizing overload control among the member states of EAC, COMESA, and SADC. The three RECs – including the EAC Partner States – agreed to adopt the SADC Memorandum of Understanding (MoU) and Model Legislative Provisions (MLP) and to review and amend each state's own national vehicle overload control laws and regulations to ensure compliance with this MoU and MLP. Accordingly, a preparatory process was called with the participating states to develop a memorandum based on the SADC Protocol.

Accordingly, it may be argued that the EAC Partner States have agreed to adopt SADC standards on axle load limits and gross vehicle mass (GVM) limits. However, the reality is that four of the EAC Partner States have adopted the former COMESA standards,[2] except for Tanzania, which has adopted the SADC standards, as can be seen in Table 5-1 showing representative axle load control limits and GVM limits in EAC, COMESA, and SADC countries. In particular, the figures in yellow in the table in the columns for the tandem axle unit, the tridem axle unit (six wheels), and vehicle combination show different values by country that need to be harmonized in the future.

Table 5-1: Typical Limits on Axle Load and Gross Vehicle Mass

Unit: tons

COMESA (former)	SADC	Name of Countries	Single Axle			Tandem Axle Unit		Tridem Axle Unit		Vehicle Combi-nation
			Steering	Non Steering	Non Steering	Non Steering	Non Steering	4 wheel/ 2 axles & 2wheel/ axle	Non Steering 4 wheel/ axle	
			2 Tires	2 Tires	4 Tires	4 Tires	8 Tires	10 Tires	12 Tires	
○		Kenya	**8**	**8**	**10**	12	16	NS	**24**	48
○		Uganda	**8**	**8**	**10**	12	16	**18**	**24**	**56**
	○	Tanzania	**8**	**8**	**10**	12	**18**	**21**	**24**	**56**
○		Burundi	NS	NS	**10**	NS	16	**24**	**24**	53
○		Rwanda	NS	NS	**10**	NS	16	NS	**24**	53
○		Comoros								
○	○	D.R. Congo								
○		Djibouti								
○		Egypt								
○		Eritrea								
○		Ethiopia								
	○	Lesotho	7.7	**8**	9	15.4	**18**		**24**	**56**
○		Libya								

[1] See, e.g., East African Community, *Meeting of the Technical Committee on Axle Load Limits Implementation in the East African Community, Report of the Meeting*, 30 August 2007.
[2] Based on a communication received from COMESA on 26 April 2011, it was confirmed that COMESA adopted the same standards as SADC at the COMESA Infrastructure Ministers' Third Meeting held in Djibouti on October 2009.

COMESA (former)	SADC	Name of Countries	Single Axle			Tandem Axle Unit		Tridem Axle Unit		Vehicle Combi-nation
			Steering	Non Steering	Non Steering	Non Steering	Non Steering	4 wheel/ 2 axles & 2wheel/ axle	Non Steering 4 wheel/ axle	
			2 Tires	2 Tires	4 Tires	4 Tires	8 Tires	10 Tires	12 Tires	
○	○	Madagascar								
○	○	Malawi	**8**	**8**	**10**	**16**	**18**		**24**	**56**
○	○	Mauritius								
○	○	Seychelles								
○		Sudan								
○	○	Swaziland	7.7	**8**	9	**16**	**18**		**24**	**56**
○	○	Zambia	**8**	**8**	**10**	12	**18**		**24**	**56**
○	○	Zimbabwe	**8**	**8**	**10**	**16**	**18**		**24**	**56**
	○	Angola	6		**10**		**16**		**24**	38
	○	Botswana	**8**	**8**	9	**16**	**18**		**24**	**56**
	○	Mozambique	**8**	**8**	9	**16**	**18**		**24**	48
	○	Namibia	7.7	**8**	9	**16**	**18**		**24**	**56**
	○	South Africa	7.7	**8**	9	**16**	**18**		**24**	**56**
19	15									
		SADC	**8**	**8**	**10**	**16**	**18**	NS	**24**	**56**
		COMESA (former)	**8**	NS	**10**	NS	16	NS	**24**	

Notes: (i) NS = not specified; and (ii) the standards shown for COMESA are its former standards - COMESA adopted the same standards as SADC at the COMESA Infrastructure Ministers' Third Meeting held in Djibouti on October 2009

Source: Federation of East and Southern African Road Transport Associations (FESARTA), *Vehicle Combination and Axle/Axle Unit Load Limits,* 4 December 2009; COMESA/SADC East African Community, *Meeting of the Technical Committee on Axle Load Limits Implementation in the East African Community, Report of the Meeting*, 30 August 2007, p. 12. "Inspiration" for the structure of the table was provided by IDC and Associates, *Inception Report of the Project for Development of the National Axle Load Control Policy*, prepared for the Ministry of Works and Transport, Republic of Uganda, November 2010, p. 26.

5.1.2 Country-Specific Regulations on Axle Load Limits in Countries Other Than Those Listed Above

(1) Japan

The "Vehicle Security Regulation" of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) has set regulations or limits on axle loads and gross vehicle mass from the viewpoints of securing traffic safety, road protection, and protection from transport hazards. Table 5-2 presents representative limit values.

Table 5-2: Axle Load and Gross Vehicle Mass Limits in Japan

Unit: tons

Country/ Community	Single Axle			Tandem Axle Unit		Tridem Axle Unit		Vehicle Combi-nation
	Steering	Non Steering	Non Steering	Non Steering	Non Steering	4 wheels/ 2 axles & 2wheels/ axle	Non Steering 4 wheels/ axle	
	2 Tires	2 Tires	4 Tires	4 Tires	8 Tires	10 Tires	12 Tires	
Japan	**NS**	**NS**	**10**	**NS**	**18**	**NS**	**NS**	**36 (44)**
SADC	8	8	10	16	18	NS	24	56
COMESA (former)	NS	NS	10	NS	16	NS	24	NS

Notes: (i) n/s: Not Specified; (ii) ( ): special case; and (iii) the standards shown for COMESA are its former standards - COMESA adopted the same standards as SADC at the COMESA Infrastructure Ministers' Third Meeting held in Djibouti on October 2009

Source: JICA Study Team

The Japanese "Vehicle Security Regulation" further dictates axle load limits and GVM limits in detail as shown in Tables 5-3 to 5-6 in the following subsections.

(a) Axle Load Limit over Adjoining Axles

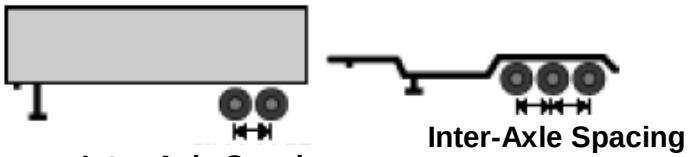


Table 5-3: Maximum Axle Load limits by Distance of Inter-Axle Spacing

Distance of Inter-Axle Spacing	Axle Load (Maximum)
D < 1.8 m	18 tons
1.3 m <D <1.8 m (<9.5 tons / Axle load)	19 tons
1.8 m < D	20 tons

Source: Japanese Vehicle Security Regulation

(b) Gross Vehicle Mass of Tractor/Full Trailer

Table 5-4: Maximum Gross Vehicle Mass Limits by Maximum Wheelbase

Maximum Wheelbase	Gross Vehicle Mass
D < 5.5 m	20 tons
5.5 m < D <7.0 m	22 tons
5.5 m < D <7.0 m (total length of vehicle < 9.0 m)	20 tons
7.0 m < D	25 tons
7.0 m < D(total length of vehicle L < 9 m)	20 tons
7.0 m< D (total length of vehicle 9 m <L <11 m)	22 tons

Source: Japanese Vehicle Security Regulation

(c) Maximum Allowable Gross Vehicle Mass for Semi-Trailers

Between Kingpin and the Rearmost Axle

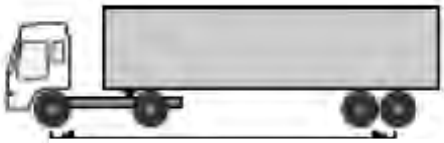
Table 5-5: Maximum Allowable Gross Vehicle Mass by Distance between Kingpin and the Rearmost Axle

Distance between Kingpin and the Rearmost Axle	Maximum Allowed Gross Vehicle Mass
D < 5.0 m	20 tons
5.0 m < D <7.0 m	22 tons
7.0 m < D <8.0 m	24 tons
8.0 m< D <9.5 m	26 tons
9.5 m < D	28 tons
Special case	44 tons

Source: Japanese Vehicle Security Regulation

(d) Maximum Allowable Mass for a Train of Tractor-Trailer, Towing Vehicle, Vans, Containers, and Tanks

Maximum Wheelbase



Maximum Wheelbase

Table 5-6: Maximum Allowable Vehicle Mass by Wheelbase Distance

Road	Maximum Wheelbase	Gross Vehicle Mass
Expressway	8.0 m < D <9.0 m	25 tons
	9.0 m < D < 10.0 m	26 tons
	10.0 m < D < 11.0 m	27 tons
	11.0 m < D < 12.0 m	29 tons
	12.0 m < D < 13.0 m	30 tons
	13.0 m < D < 14.0 m	32 tons
	14.0 m < D < 15.0 m	33 tons
	15.0 m < D < 15.5 m	35 tons
	15.5 m < D	36 tons
Ordinary road	8.0 m < D < 9.0 m	24 tons
	9.0 m < D < 10.0 m	25.5 tons
	10.0 m < D	27 tons
	Special case	44 tons

Source: Japanese Vehicle Security Regulation

(2) Australia, Europe, and the United States

Australia, European countries, and the United States have their own gross vehicle mass standards. Table 5-7 presents representative control limits.

Table 5-7: Maximum Gross Vehicle Weight by Country

Country/Region	Maximum Gross Vehicle Weight
United Kingdom	44 tons; both tractors and semi-trailers must have three or more axles each
European Union and European Economic Area (EEA) member states	40 tons, or 44 tons if carrying an ISO container
Sweden and Finland (exemption from the EEA)	60 tons [two types are to be used: (i) a 26-ton truck pulling a dolly and semi-trailer, or (ii) an articulated tractor unit pulling a B-double]
Australia	62.5 tons (B-doubles are very common)
United States	Rules governing the maximum size and weight of vehicles differ from one state to another.
	The Department of Transportation (DOT) has established a limit of 80,000 pounds (36 tons) for gross vehicle weight. These limits can be exceeded as each state has the right to issue temporary oversize and/or overweight permits.
	"longer combination vehicles" (LCVs)
	Triples: Three 28.5-foot (8.7 m) trailers; maximum weight up to 129,000 pounds (58.5 tons).
	Turnpike Doubles: Two 48-foot (14.6 m) trailers; maximum weight up to 147,000 pounds (66.7 tons)
	Rocky Mountain Doubles: One 40-foot (12.2 m) to 53-foot (16.2 m) foot trailer (although usually no more than 48 feet) and one 28.5-foot (8.7 m) trailer; maximum weight up to 129,000 pounds (58.5 tons)

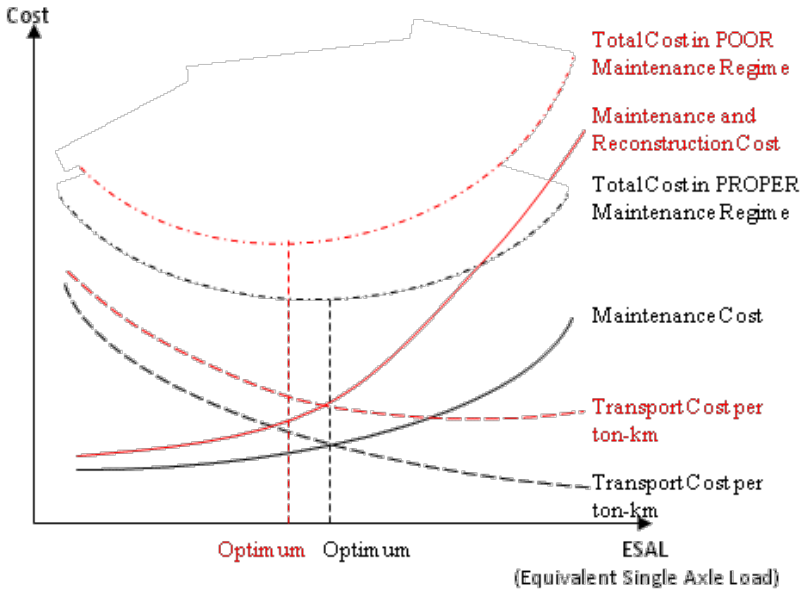
Source: http://en.wikipedia.org/wiki/Semi-trailer_truck

5.2 Verification of Axle Load Limits

5.2.1 Background

Past studies have shown that the economically optimum axle load limit that gives the least total cost combining road maintenance cost and vehicle operating cost is around 13 tons.[3] Indeed, there are some developed countries that set the axle load limit at 12-13 tons. On the other hand, many countries in Eastern and Southern Africa set the axle load limit at 10 tons. When roads are designed and constructed to high standards and road maintenance is always properly done eliminating the need for major reconstruction, the economically optimum single axle load limit may well be around 13 tons. However, when maintenance is inadequate, the optimum axle load limit may be lower as illustrated in Figure 5-1.

[3] See, e.g., Institute of Transport Economics and Carl Bro International A/S, *Axle Load Study for Southern Africa, Final Report*, for the Southern Africa Transport and Communications Commission, 1993.



Source: JICA Study Team

Figure 5-1: Total Cost and Optimum Axle Load Limit

The JICA Study Team considers that it is difficult to realize a proper maintenance regime in Africa, even in the EAC region, due to a shortage of maintenance budget, capacity limitations in carrying out proper maintenance techniques, an unsatisfactory quality of pavement materials, and overloading.

The HDM-4 model is capable of estimating vehicle operating cost and road maintenance cost over time under various conditions. The JICA Study Team applied the model to estimate the optimum axle load limit in the EAC region, with the following steps:

(i) specify variations in the axle load limit;
(ii) modify the traffic data to correspond with each of the variations;
(iii) specify two maintenance scenarios (IRI = 4.0 for proper maintenance policy and IRI = 7.0 for a lesser maintenance policy);
(iv) apply the traffic data in HDM-4 to estimate the transport cost per ton-km, and maintenance/reconstruction cost;
(v) plot the total cost with the several variations in load limit; and
(vi) find the optimum axle load limit and corresponding axle load limit.

Table 5-8 summarizes assumptions for this analysis.

Table 5-8: Assumptions for Estimation of Optimum Axle Load Limit

Network	A sample 124 km length network referring to the Kenya network (including good, fair, and poor pavement condition initially. (Appendix E.3 presents details.)
Project Period	20 years (2011–2030)
Maintenance Strategy	Two types of maintenance policies were applied: (i) Proper maintenance: IRI =4.0 as a target; and (ii) Poor maintenance: IRI=7.0 as a target. Four types of maintenance/improvement strategies were applied with the optimized combination the same as that in the analysis described in Section 4.2.
Traffic Volume	Assumed 1,000, 10,000, and 15,000 as ADT (all vehicles), with the annual growth rate set at 3% during the project period. Assumed 9% of ADT was freight traffic.
Traffic	Specified the ESAL factor and GVM for the four vehicle categories according to the designated axle load limit (6, 8, 10, 12, and 14 tons). The vehicle operation cost estimation process assumed vehicle configurations typically found in the EAC region.

Source: JICA Study Team

Specification of representative equivalent single axle load (ESAL) factors and GVM required several assumptions. Representative ESAL is necessary for calculating maintenance needs and GVM is necessary for calculating vehicle operating costs. Combining the existing typical axle load distribution and ESAL factor by load (applying the fourth power principle for the actual load and equivalent standard axle relationship), the JICA Study Team estimated that the average equivalent standard axle of the axle load distribution was 78–89% of the equivalent standard axle of the axle load limit. Similarly, the JICA Study Team found that the average of GVM was 88%–96% of the GVM limit (see details in Table 5-9). Therefore, on specifying average ESAL and the average GVM of the representative vehicles, this analysis adopted figures of 84.2% for axle load limit and 92.2% for the GVM limit.

Table 5-9: Specification of GVM and ESAL Factors (in 8-ton limit)

	GVM			ESAL Factor		
	a) Ideal	**b) Observed**	**b/a**	**a) Ideal**	**b) Observed**	**b/a**
2 Axles	18,000	16470.9	0.915	3.18	2.57	0.808
3 Axles	24,000	22456.0	0.936	2.77	2.49	0.899
4 Axles	28,000	26881.6	0.960	2.43	2.14	0.881
5 Axles	42,000	38500.0	0.917	5.96	5.12	0.860
6 Axles	48,000	44033.8	0.917	5.55	4.56	0.821
7 Axles	56,000	49690.0	0.887	6.47	5.06	0.781
	Average		0.922	Average		0.842

Note: "Ideal" means a situation in which all vehicles are at these values. "Observed" means values derived from actual axle load distribution patterns.

5.2.2 Results

Operation cost and maintenance cost estimated with the HDM-4 model are summarized in this subsection for the IRI 4 and IRI 7 cases and different traffic volumes.

Operation cost includes fuel, tire, lubricant, driver wage, and waiting time cost of freight traffic only. The unit rate per vehicle-km of operation cost corresponds to the average IRI estimated by the HDM-4 model. The annual average operation cost per ton-km decreases as the axle load

limit increases because the loading efficiency increases. There is not much difference in operation cost between the IRI4 and IRI7 cases because the sensitivity in unit vehicle operating cost against IRI is small.[4]

As for maintenance cost, the cumulative cost of maintenance work for 20 years was initially estimated with the HDM-4. Secondly, freight ton-km for 20 years was projected for four categories of freight vehicles, and then the annual maintenance cost per ton-km was calculated.

Tables 5-10 and 5-11 and Figures 5-2 and 5-3 show the results of analysis for ADT (all vehicles) of 10,000 and 15,000, respectively.

Table 5-10: Estimated Cost by Axle Load Limit
(All Vehicle ADT=10,000, Heavy Vehicle ADT=900)

	IRI= 4 Case USD/ton-km-annual average			IRI= 7 Case USD /ton-km-annual average		
Axle Load Limit	Maintenance Cost	Operation Cost	Total Cost	Maintenance and Reconstruction Cost	Operation Cost	Total Cost
6	1.65	3.53	5.18	3.54	3.67	7.20
8	1.98	2.98	4.97	3.54	3.13	6.66
10	2.43	2.73	5.15	3.80	2.86	6.66
12	2.78	2.58	5.37	3.81	2.72	6.53
14	2.82	2.50	5.32	5.39	2.60	7.99

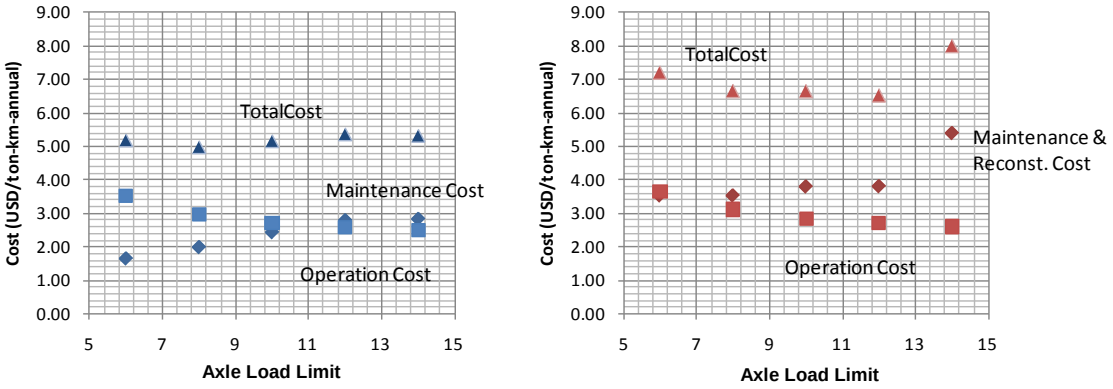


Figure 5-2: Estimated Cost by Axle Load Limit,
All Vehicle ADT=10,000 (Left: IRI=4, Right IRI=7)

This ADT 10,000 case is applicable to major international corridors in the EAC region, and heavy vehicle composition is set at 9% of ADT. The combined cost of maintenance and vehicle operation is at its lowest when the axle load limit is between 12 tons and 14 tons for the IRI=4 case and between 6 tons and 8 tons for the IRI=7 case.

[4] It was estimated that the vehicle operating cost (VOC) per km for 6-axle freight vehicles was USD 1.78 for IRI 3.3 and USD 2.06 for IRI 8.0.

Table 5-11: Estimated Cost by Axle Load Limit (All Vehicle ADT=15,000, Heavy Vehicle ADT=1,350)

	IRI=4 Case USD/ton-km-annual			IRI=7 Case USD/ton-km-annual		
Axle Load Limit	Maintenance Cost	Operation Cost	Total Cost	Maintenance and Reconstruction Cost	Operation Cost	Total Cost
6	1.49	3.94	5.43	2.59	4.07	6.67
8	1.75	3.18	4.93	2.64	3.37	6.01
10	1.73	2.87	4.60	2.85	3.02	5.87
12	2.13	2.69	4.82	3.59	2.77	6.37
14	2.04	2.59	4.62	4.13	2.68	6.80

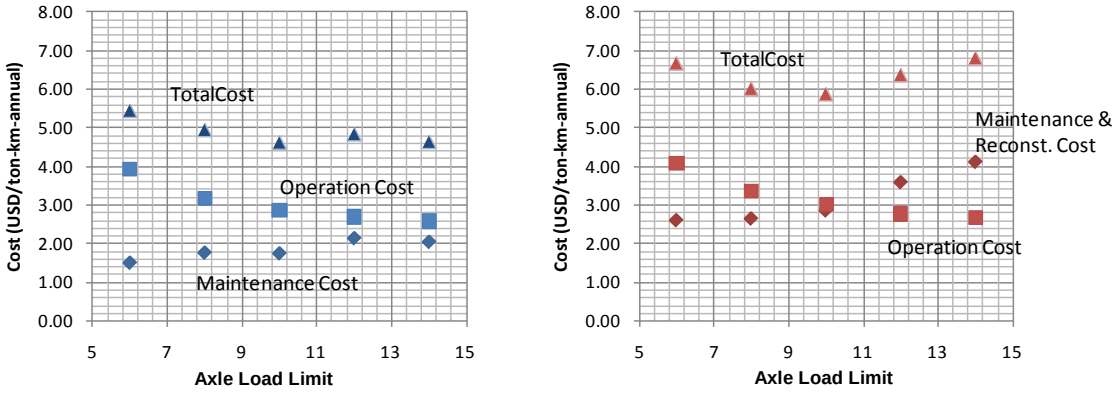


Figure 5-3: Estimated Cost by Axle Load Limit, Al Vehicle ADT=15,000 (Left: IRI=4, Right IRI=7)

This ADT 15,000 case can be applicable to presently heavily trafficked sections of the international corridors such as in suburban areas of major cities, or to the traffic situation of major corridors in the future. For the IRI 4 case, the operation cost exceeds the maintenance cost for all axle load ranges. For the IRI 7 case, they balance at around 10 tons, which suggests that the axle load limit should be kept at around 10 tons in the future if the amount available for maintenance in the EAC region is kept within the bounds specified.

5.2.3 Summary

This analysis suggests the following:

(i) A comparison of the results of the two cases (the proper maintenance case and the poor maintenance case) shows that proper maintenance can accommodate heavier axle load than poor maintenance with a lower total cost.

(ii) The results for cases of all-vehicle ADT 10,000 and 15,000 suggest that the total cost of vehicle operation and highway maintenance shows a rather flat curve against various axle load limits, while a limit around 10 tons yields the minimum total cost.

5.3 Verification of Maximum Permissible Gross Vehicle Mass (GVM) Limits as Agreed by the 2008 Tripartite Meeting

5.3.1 Verification by Safety Factor to be Employed in Bridge Structure Design

GVM limit values play a critical role in bridge design. Limit values are determined so that the bridge structure does not undergo structural failure when a vehicle crosses the bridge. In bridge design, as shown in Section 3.4.2, bridge structure is determined by loading the bridge with a live load at the GVM limit.

This study has undertaken a verification of GVM limits against prevailing bridge structural design by following four steps:

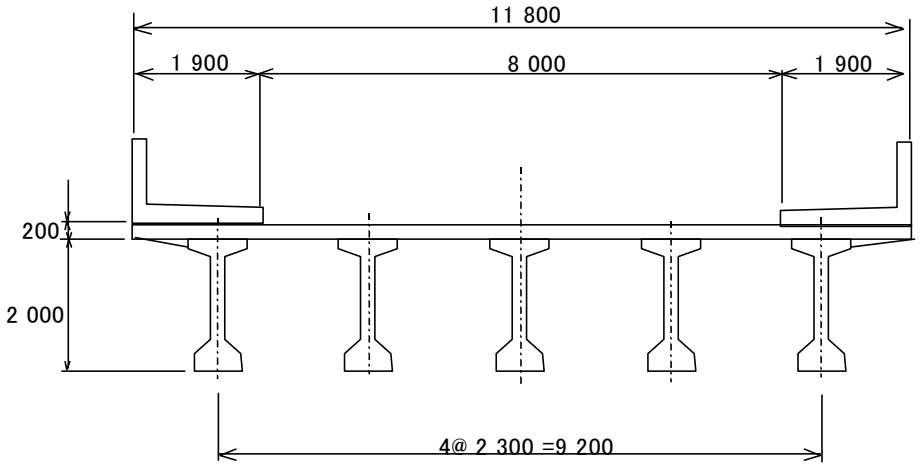
(1) Step 1: Examination of Bridge Type

At present, the GVM limits currently adopted and applied are 48 tons in Kenya and 56 tons in Tanzania (a SADC member country) and Uganda.

Verification was undertaken by comparing the difference in stress caused by the passing of vehicles with GVMs of 48 tons and 56 tons.

Specifications of the bridge subjected to the analysis are as follows (see Figures 5-4 and 5-5):

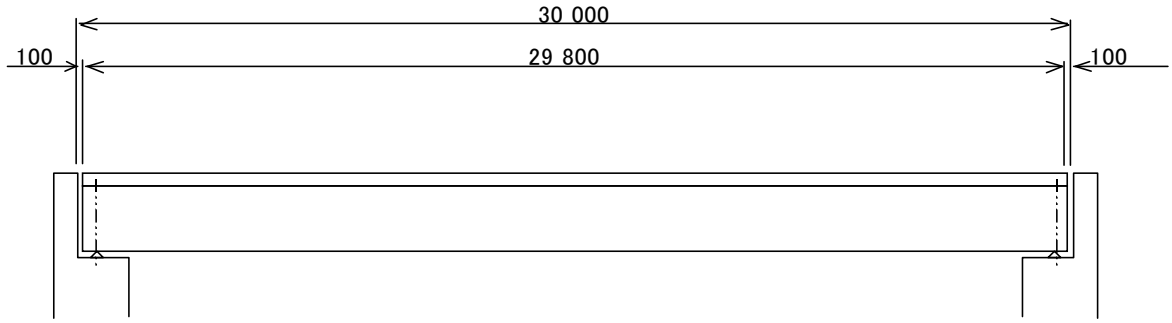
(i) Roadway dimension: Class B of Kenya Road Standards;
(ii) Bridge span: 30 m so that a vehicle of 22 m total length can be placed within a span; and a
(iii) Bridge type: Post-tension pre-stressed concrete structure.



Source: JICA Study Team

Figure 5-4: Cross Section

For a bridge span longer than 30 m, the difference in maximum stress between the cases of a GVM of 48 tons and a GVM of 56 tons is smaller than the case of a 30 m span because of the longer distance between the loading point and the supporting point relative to the live load.



Source: JICA Study Team

Figure 5-5: Side View

(2) Step 2: Design Conditions

As for bridge design standards, the British Standards (BS) were adopted, which are applied in Kenya, Tanzania, and Uganda.

The were the main design conditions:

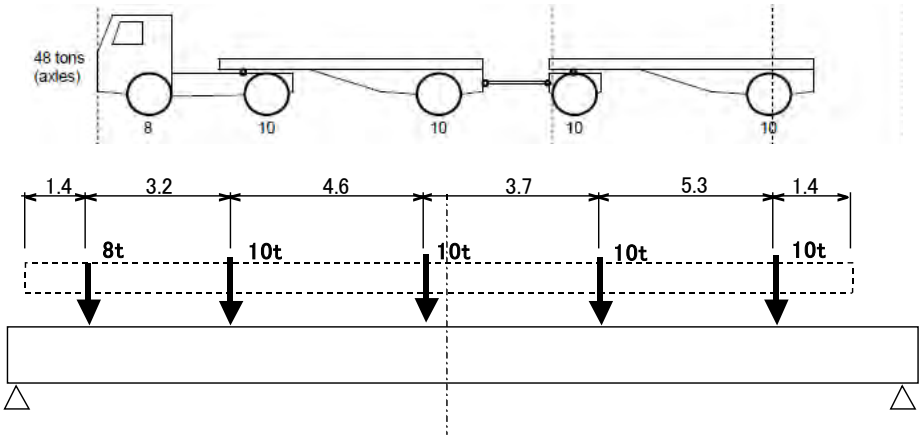
(i) Design Standards: British Standards BS 5400 (Part 4. Code of Practice for Design of Concrete Bridges);
(ii) Structural Material Design Conditions: Serviceability Limit State (S.L.S.) or Ultimate Limit State (U.L.S.);
(iii) Live Load: HA load (UDL load distribution 30 kN/m^2/lane);
(iv) Strength of Concrete: Slab 30 N/mm^2, Beam 40 N/$mm^{2;}$
(v) Steel Bar Type: Reinforce Bar SD345; and
(vii) PCWire Type: PC SWPR7B 12S12.7*4 numbers for each beams

(3) Step 3: Conditions of Structural Calculations

(i) Loading Conditions

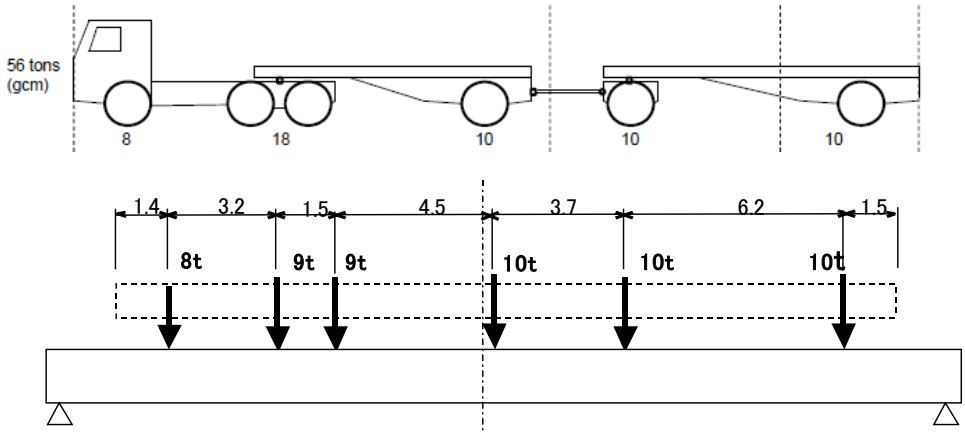
Two cases were tested: Case A for a live load of 48 tons and Case B for 56 tons.

A vehicle combination and its axle spacing was selected so that maximum bending moment is caused in the main beam when placed on the bridge. For Case A, a five-axle semi-trailer with a GVM of 48 tons was selected (see Figure 5-6). Its total length (TL) was 19.6 m and the extreme axle spacing (L) was 16.58 m. For Case B a six-axle semi-trailer with GVM of 56 tons was selected (see Figure 5-7). Its total length (TL) was 22.0 m and the extreme axle spacing (L) is 19.1 m.



Source: JICA Study Team

Figure 5-6: Case A - Live Load by GVM of 48 Tons



Source: JICA Study Team

Figure 5-7: Case B - Live Load by GVM of 56 Tons

(ii) Analysis Method

In general, the detailed design of a bridge calls for the examination of bending, sheer, and twisting under the conditions of S.L.S. or U.D.S. In this analysis, as the following conditions are apparent, the analysis focused on the degree of safety against structural failure at U.D.S.:

(a) For ordinary bridges with a span around 30 m, the critical factor is the bending moment. Thus, such a bridge can be judged safe when the main beam withstands the maximum bending moment.

(b) When a bridge is designed under live load conditions of BS HB loading: 300 kN per axle times four axles, or 1,200 kN (=120 tons), the live load level as specified by BS is much higher than the live loads of Case A and Case B. Therefore, it may be expected that the difference between Cases A and B would be small and the safety margin would be sufficiently high. However, if the Case A and Case B results differ greatly or the safety factor is close to 1, a detailed analysis is necessary.

As for the design of slab, it is necessary to determine detailed load distribution and consequent stress distribution. Load distribution among beams and beam-ends must also examined. In

addition, cross-section loading must also be determined. However, in this study such a detailed examination was not necessary for the purpose.

(iii) Evaluation of Calculation Results

Results of the structural calculations for Cases A and B were compared and evaluated:

(a) Values of maximum bending moment under live load were calculated and compared.
(b) Values of maximum permissible bending moment were calculated by combining the material strengths in terms of maximum permissible stresses and structural dimensions. They are called resistance moment. Maximum bending moments were compared with the resistance moments for Cases A and Case B. This gives a safety factor.
(c) All loadings including dead load were considered and safety factors against the failure of main beams were calculated and compared.

Appendix F presents details of the data used for the calculations.

(4) Step 4: Calculation Results

(i) Maximum Bending Moment Under Live Load

Under the live load conditions shown in Figure 5-6 (Case A) and Figure 5-7 (Case B), maximum bending moments were calculated as shown in Table 5-12.

Table 5-12: Maximum Bending Moment under Live Load

Unit: kN·m

Items	Case A	Case B	Case B/Case A
Live Load	48 tons	56 tons	**+16.7%**
Maximum Bending Moment by GVM Limit	2,424	2,681	**+10.6%**

Source: JICA Study Team

(ii) Maximum Bending Moment and Resistance Moment Considering Live and Dead Load

In addition to live load, dead loads such as deck slab, beam, and pavement were included in the total loading. Maximum bending moment was calculated for Cases A and B and compared with the resistance moments as shown in Table 5-13.

Table 5-13: Maximum Bending Moment and Ultimate Resistance Moment under Total Load

Unit: kN·m

Items	Case A	Case B	Case B/Case A
Live Load Case	48 tons	56 tons	**+16.7%**
Maximum Bending Moment by Total Load	9,676	10,043	**+3.8%**
Resistance Moment of the Section	16,453	16,453	**0%**

Source: JICA Study Team

(iii) Safety Factor

The safety factor is defined as the ratio of the resistance moment and the maximum bending moment for a given structure, i.e., the ratio of maximum bending moment that corresponds to the maximum permissible stress of the weakest part of a structure and maximum bending moment under actual loading. Thus, calculated safety factors are as shown in Table 5-14.

Table 5-14: Safety Factor

Items	Case A	Case B	Case B/Case A
Live Load	48 tons	56 tons	**+16.7%**
Safety Factor	1.70	1.64	**−3.5%**

Source: JICA Study Team

From the foregoing analysis the following conclusions can be drawn:

(i) Live load increases by 16.7% when the maximum vehicle mass limit is increased from 48 tons (Case A) to 56 tons (Case B).
(ii) The difference between Case A and Case B concerning maximum bending moment is 10.6% and less than the difference in actual mass.
(iii) When dead loads are added, the difference is only 3.8%.
(iv) Increasing the GVM limit from 48 tons (Case A) to 56 tons (Case B) results in a change in safety factor from 1.70 to 1.64, a mere 3.5% decrease. Both factors are sufficiently high in any case.
(v) The above comparison was made for a bridge with a span of 30 m. For bridges with spans longer than 30 m, the difference is even smaller.
(vi) It is concluded that for bridges designed and constructed under British Standards as in Kenya and Tanzania, increasing the GVM limit from 48 tons to 56 tons would not result in a significant effect on structural safety.

5.3.2 Recommended GVM Limits Suited to Regional Characteristics

(1) Establishing GVM Limits Suited to the Region's Unique Features

Vehicle load limits may be determined by the road and transport demands of the region and its constituent countries under the constraints of binding environmental features. Table 5-15 compares road network features, terrain, and topography, road maintenance status, physical distribution/haul length, and road/bridge design standards of Japan, the European Union, and the United States. Japan has lower limits since it maintains its roads fairly well with a shorter average haul length, and it has a relatively large number of bridges. On the other hand, the European Union has load limits commensurate with well-maintained roads with relatively shorter-haul lengths for cross-border transport and a dominance of ISO-container transport. Further, the load limits of the federal government of the United States were set in consideration of long-haul interstate transport, but state governments often set higher GVM limits, which allow for relatively efficient transport operations. For example, a typical 6-axle combination with 48 tons GVM carries up to 32 tons of payload, whereas another typical 7-axle combination with 56 tons GVM carries up to 36 tons of payload. This additional 4 tons of payload gives a 12.5% increase in payload capacity and lower overall transport cost per ton of payload in the order of 10%.

Table 5-15: Load Limits and Regional Characteristics

	Characteristic	Japan	European Union	United States
1	Road Network Features	Sufficient road network established throughout the island country.	Sufficient road network established linking EU countries.	Sufficient road network established throughout the vast country.
2	Terrain and Topography	Many bridges serve the country's mountainous terrain, which covers 85% of the country.	Mostly flat and hilly, although there is some mountainous terrain.	Not many bridges due mostly to flat and hilly terrain.
3	Road Maintenance Status	Sufficient maintenance is done.	Sufficient maintenance is done.	Sufficient maintenance is done.
4	Physical Distribution/Haul Length	Transport distance is comparatively short.	Longer international haul transport.	Longer haul transport serving the vast country.
5	Road/Bridge Design Standards	Japanese standards (follow the AASHTO standards of the United States)	European standards (e.g., British, French, German)	AASHTO standards
6	Load Limits	Axle Load: 10 tons GVW: 36 (44) tons	Axle Load: 10 ton GVW: 40 (44) tons	Axle Load: 9 tons GVW: 36 (58.5) tons

Source: JICA Study Team

(2) Recommended GVM Limits Suitable for the EAC's Unique Features

Table 5-16 presents the EAC region's status in terms of road network provision, topography and terrain, status of road operation and maintenance, physical distribution/haul length, and road design standards. The formulated control limits need to consider these conditions.

Table 5-16: Load Limits and Regional Characteristics

	Characteristic	EAC Features
1	Road Network Features	A sufficient road network serving the region has not yet been established.
2	Terrain and Topography	Not that many bridges due to flat and hilly terrain in the region.
3	Road Maintenance Status	Sufficient maintenance is not done.
4	Physical Distribution/ Haul Length	Long-haul transport serving the landlocked countries.
5	Road/Bridge Design Standards	Follow the standards of former colonial powers.
6	Load Limits	An appropriate control limit (the central theme)

Source: JICA Study Team

The EAC needs to establish its own design standards suitable for its distinct environmental conditions, which are unlike those of Japan, Europe, and the United States. With reference to the discussion in Section 5.2, the Regional Workshop on Harmonization of Key Elements and Implementation of Best Practice in Overload Control (Nairobi, July 2008), and the foregoing discussion in Section 5.3, the SADC Regulations seem to have reasonable justification and should be considered as a basis for harmonization in the EAC.

That said, additional measures to assure vehicle and traffic safety, particularly for bridges, are needed for Kenya, Burundi, and Rwanda, which maintains gross vehicle mass limits of 48 tons, 53 tons, and 53 tons, respectively, if these load limits are to be increased to 56 tons. It is recommended that a separate study be conducted to address the bridges along the international corridors and to verify design loads, to assess maximum load bearing capacity and the physical conditions of the bridges. For those bridges identified as being of insufficient capacity to sustain a 56-ton load, an individualized approach to increase bridge capacity is recommended.

More concretely, the following countermeasures are envisaged:

(i) "soft" measures: vehicle traffic control and detour guidance; and
(ii) "hard" measures: strengthening of bridge structures to be able to sustain 56-ton loads, replacement of existing bridges with existing design of an insufficient capacity.

5.4 Introduction of a Bridge Formula

In the preceding section it was demonstrated that actual effects on bridges from a vehicle with GVM of 48 t ons and another with GVM of 56 t ons are virtually the same under normal circumstances. The section shows that for a given bridge a 5-axle vehicle with an extreme axle spacing of 16.8 m and a GVM of 48 tons would cause a maximum stress in the bridge only 3.8% less than the case in with a 6-axle vehicle with an extreme axle spacing of 19.1 m and a GVM of 56 tons. Since the stress is proportionate to the load when all other conditions are equal, a load of 49.8 tons (=48 x 1.038) on the 5-axle vehicle would produce the same maximum stress as a 6-axle, 56-ton vehicle since the spacing of the axles is shorter (16.8 m versus 19.1 m). In other words, a vehicle with shorter axle spacing causes higher stress on a bridge than a vehicle with longer axle spacing even though both have exactly the same GVM. It is therefore desirable to limit the GVM in relation to axle spacing. The less the axle spacing, the less the GVM limit should be in order to keep the maximum stress under a certain level.

There are many types of bridges and many types of vehicles. The combinations of bridge and loaded vehicle that cause the same amount of maximum permissible stress on the bridge can be numerous. However, in reality (i) the bridge design standard applied in an area that determines the maximum allowable stress is often unique, (ii) the vehicles actually used to carry certain loads are also limited since they are also limited by axle load limits, and (iii) the actual combination of vehicle and axle spacing falls in a narrow band. A statistically meaningful line can be drawn over them.

In theory, all such combinations that cause the same maximum stress on the bridge can be put in a calculation considering not only the extreme axle spacing but all axle spacing to determine the maximum permissible combination and a bridge formula can be defined as the line (or plane) enveloping all such combinations. However, it is neither practical nor feasible to do so. Even if an enveloping line or a plane is obtained, such a complicated expression can never be used in practice as a guide to limiting GVM and axle spacing.

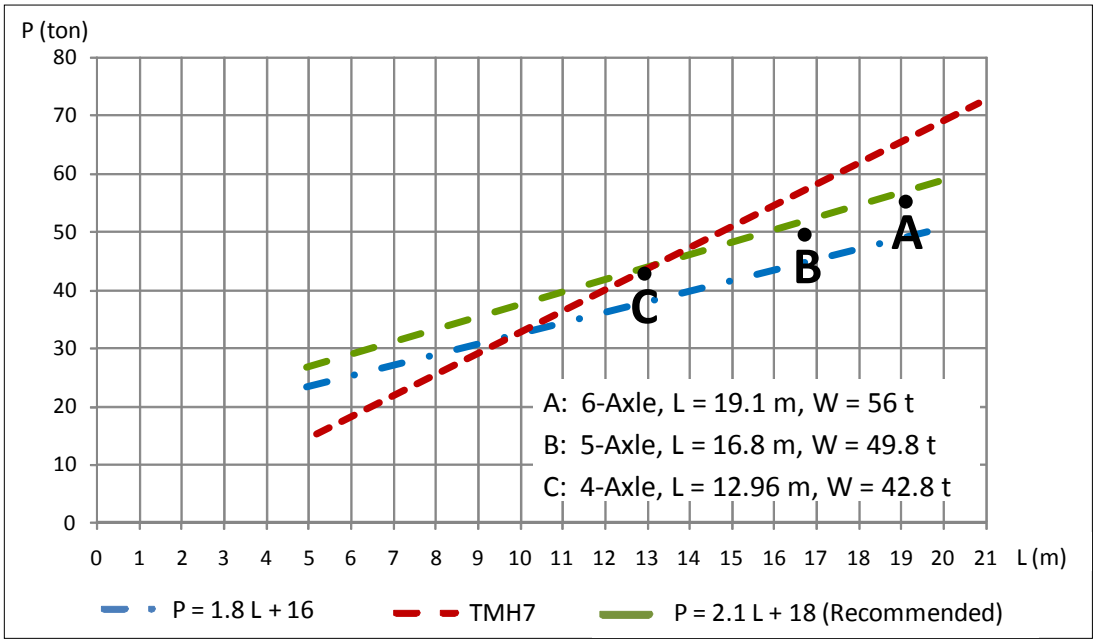
Many countries have tried to formulate a simple and practical formula for the purpose. Appendix I describes the historical course of events that led SADC to adopt their current bridge formula.

From the calculations described above, a vehicle with a GVM of 49.8 tons and an extreme axle spacing of 16.8 m produces the same stress on the bridge as a vehicle with a GVM of 56 tons and an extreme spacing of 19.1 m. The study examined a third case of loading the same bridge with a 4-axle vehicle with GVM of 38 tons and extreme spacing of 12.96 m. Following similar

calculations, the load that causes the same amount of maximum stress as the case of a 56-ton, 19.1 m, 6-axle vehicle was determined to be 42.8 tons.

Three combinations of GVM and extreme axle spacing were obtained that cause the same maximum stress: 56 tons and 19.1 m, 49.8 tons and 16.8 m, and 42.8 tons and 12.96 m. These combinations were plotted in the graph in Figure 5-8 below as points A, B, and C. Three bridge formulas were developed elsewhere are also plotted. The one adopted by SADC is shown by the green dotted line. The above three points are quite close to this line, which is expressed as P = 2.1L + 18, where

P is the GVM limit in tons, and
L is the extreme axle spacing in meters.



Note: The formula is not applicable for a low range of axle spacing.

Figure 5-8: Bridge Formula

It is highly desirable to limit GVM in relation to spatial axle load distribution since concentrated, i.e., narrowly spaced, axle loads result in greater damage to bridges than do widely spaced axle loads. It is impossible to calculate bridge stress for every combination of spatial axle load distribution and subject bridges. A practical and easy-to-use formula is required. The proposed bridge formula is not an accurate expression of all cases but it is on the safer side and is far better than not using one at all.

Chapter 6 Accommodation of Vehicle Technology Development

6.1 Vehicle Configurations/Combination Types

Road transporters in the less-developed countries in Africa have chosen vehicle combinations that have largely been dictated by road conditions. These conditions include not only how potholed, muddy, or sandy the roads are, but also the gradients. Under the most severe conditions, small two-axle, four-wheel drive trucks (4 × 4), with a payload of around five tons, have been the only vehicles able to haul the goods. Trailers were invariably not used. As the road conditions improved, even before tarred surfaces, transporters would use larger trucks with payloads of 10–15 tons and also to pull trailers. Total payloads were in the range of 20–25 tons.

Under conditions such as these, the government authorities were not concerned with regulating load limits, nor with managing them. Weighbridges were just not practical on such routes and only recently have portable weigh scales been introduced. The decisions previously had been solely the responsibility of the consignor, consignee, and transporter. This situation still prevails in the most rural parts of East Africa.

As traffic levels increased and the road authorities became more concerned with the cost of maintaining their roads, the governments introduced load limits and started managing them, first with portable weigh scales and then with single-axle weighbridges. To enable weighbridge personnel to easily identify the vehicle configurations/combinations, drawings were made of those most commonly found on the major routes and these drawings were used to enforce the load limits. In Tanzania and Uganda, where the gross combination mass (GCM) had been increased to 56 tons, the governments merely added an axle to the existing drawings of the largest truck and trailer combinations. As the articulated vehicle (horse and semi-trailer) could not accommodate an extra axle, it was not identified as being able to gross more than 48 tons.[1]

In general, drawings of vehicle combinations have been based on those commonly used in East Africa and have not taken into consideration vehicle combinations used in other parts of Africa and the rest of the world. The countries of East Africa are no longer insulated from the rest of the continent, but are part of the wider African community. Specifically, intraregional trade between countries within and outside of East Africa is being encouraged. With this in mind, government policy makers should be aware of all types of vehicle combinations used in the wider region and accommodate them within their national laws and regulations. The transporter should be free to use whatever vehicle combination is best suited to his/her operation, provided that it does not exceed dimensional, load, or maneuverability limits.

[1] Kenya was as an exception, where, under pressure from the road transport industry, a fourth axle was added to the tridem axle unit on the semi-trailer. This was not a good decision for road wear and, when this was realized, Kenya subsequently banned the “quadrem” axle unit.

Recommendation:
Policy-makers should legislate and regulate according to a simplified set of regulations (as agreed at the Regional Workshop on Harmonization of Key Elements and Implementation of Best Practice in Overload Control, Nairobi, July 2008) and then provide drawings of vehicles and vehicle combinations as guidelines for weighbridge operators. The proposed set of drawings is shown in Appendix J.

6.2 Super-Single or Wide-Based Tires

Super-single or wide-based tires are tires with a width greater than the conventional tires used on heavy commercial vehicles. The width of the conventional tire as used for the highest GCM vehicle combinations has increased over the years. The conventional tire of 20 years ago was an 1100 × 20, which was an 11-inch (280 mm) wide cross-ply tire, fitted to a 20-inch diameter wheel rim. In single tire configuration, the axle could carry about 6.5 tons at a pressure of 750kPa (kilopascal) or 7.5 bars.

When radial-ply tires became the sought-after tire in the 1990s, the equivalent tire that could carry at least the same load was the 12R22.5. This was a 12-inch (305 mm) wide radial-ply tire on a 22.5-inch diameter wheel rim. In single tire configuration, the axle could carry in the region of 7.0 tons at a pressure of 800kPa or 8.0 bars.

As the load limit regulations increased over the years to 8 tons for the single tire on a front axle, transporters needed to source a tire that could carry this load. The successful tire size is 315/80R22.5 (Photograph 6-1), which is a 315 mm wide tire, with an 80% aspect ratio (the 80% aspect ratio is required, or else the tire would be too tall for normal operations). The single-tired axle load limit for this tire is around 8.0 tons at a pressure of 800kPa or 8.0 bars. It is suitable for the 8-ton axle. Transporters would also use them in place of dual tire fitment for the tridem axle unit because the single tire saved mass over the dual fitment and there was less likelihood of wheel studs coming loose. This could only be used where country regulations permitted. However, only Tanzania permitted 8 tons on an axle with single tire fitment in a tridem axle unit, with the proviso that the semi-trailer was fitted with an air suspension.

When super-single tires came on to the market from Europe and the United States 15 years ago, it was the 385/65R22.5 tire that first saw general use. Where transporters had been using 315/80R22.5 tires as a single fitment in the tridem axle unit, they generally converted to 385/65R22.5 for greater safety and longer tire life.

Photograph 6-1: 56-ton Semi-trailer and "Pup" Combination, with 385/65R22.5 Tires on the Trailers

More recently, the 425/65R22.5 has become available in Europe. Now, the 445/65R22.5 is being considered as a replacement for the dual 315 fitment on drive axles in Europe.

Since 2007, transporters in South Africa have been fitting 385/65R22.5 tires to the steering axles of their heavy vehicle combinations. The tire has a greater safety margin than the commonly-used 315/80R22.5 and is said to have a longer life. It is also a matching tire when the same super-single tires are used on the trailers. This fitment is also well-received by the road authorities, since it has a greater contact area than the 315 and therefore results in less stress in the pavement.

The regulations in the different countries generally limit the load on a single-tired axle to 8 tons. There is no consideration for the width of the tire. There is also little consideration for the wheel rim diameter and trucks using 16-inch wheel rims have been seen to pass over weighbridges in Tanzania with 18 tons on a tandem axle unit. This is a safety concern, since the tires are not designed to carry such a load and can burst in the loaded condition.

Transporters recommend that a super-single tire should be given a higher load limit than a conventional tire. The 2008 workshop in Nairobi debated the load limits for super-single tires, but was unable to come up with recommendations. It was agreed that a desktop study should be carried out by the South African Council of Scientific and Industrial Research (CSIR) to determine recommended load limits for different super-single tire widths. The study, which was completed in November 2010, took into consideration the latest research in the world and also used a South African empirical method for determining axle loads and road wear.

The CSIR desktop study conservatively recommended that the road wear limit for single axles fitted with wide-base tires of 425 mm and wider can be increased to 9 t and for tandem axle units to 18 t. It also stated that for axles fitted with wide-base tires of 385 mm, the recommended limit is 8.5 t for single axles and 17 t for tandem axle units.

A further complicating matter is the introduction of air suspensions into vehicles in the region. Various studies have been conducted on how beneficial air suspensions are to road wear and it can be safely stated that they are more road-friendly than steel suspensions. Exactly by how much is still the subject of more research, but the principle can be used to guide the harmonization of load limits.

Figures 6-1 and 6-2 present two sets of drawings showing the various combinations of conventional tires, super-single tires, and axles fitted with air suspensions. As shown in the second set of drawings, there is little room to move when apportioning limits to a particular set of axles and/or axle units.

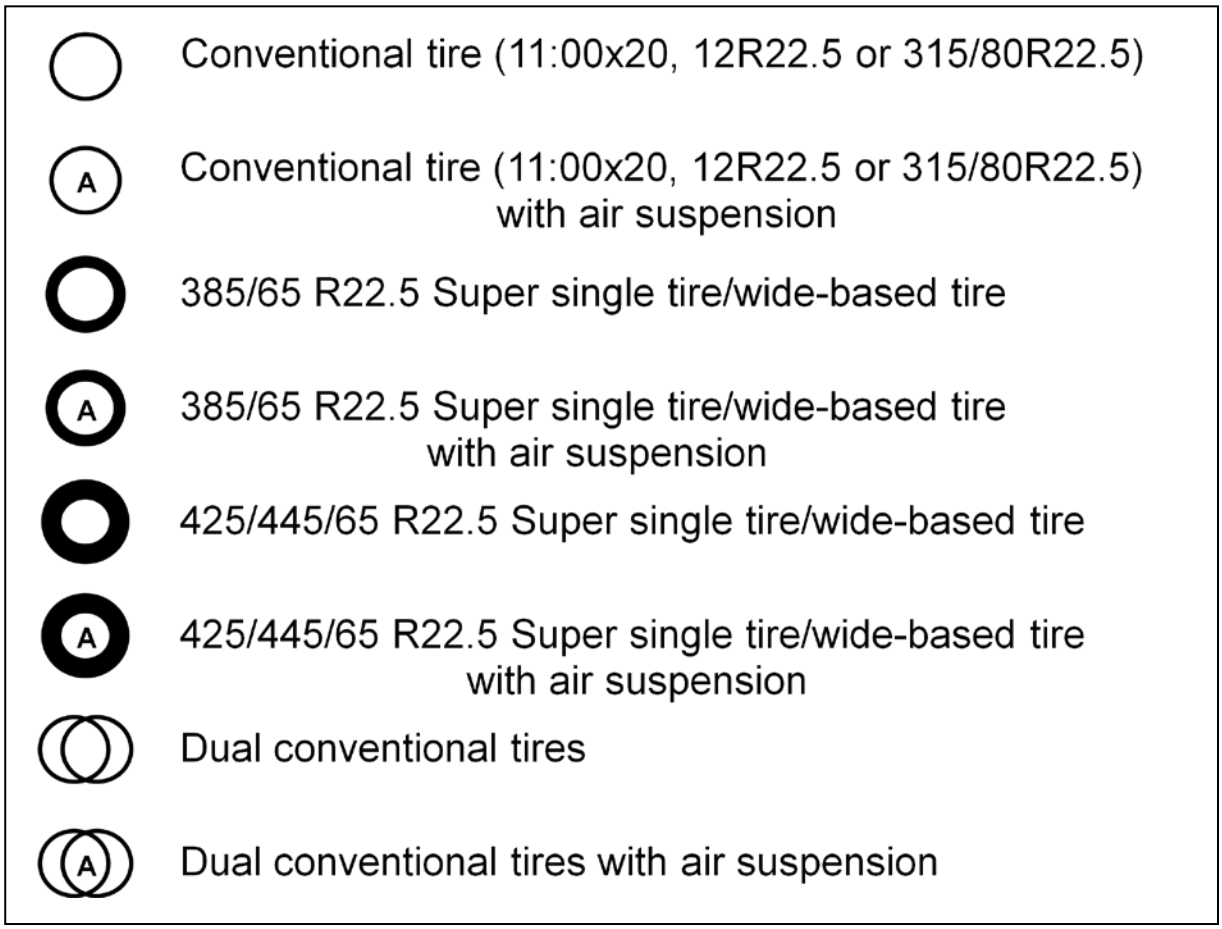


Figure 6-1: Drawings Showing Various Combinations of Conventional Tires, Super-Single Tires, and Axles Fitted with Air Suspensions

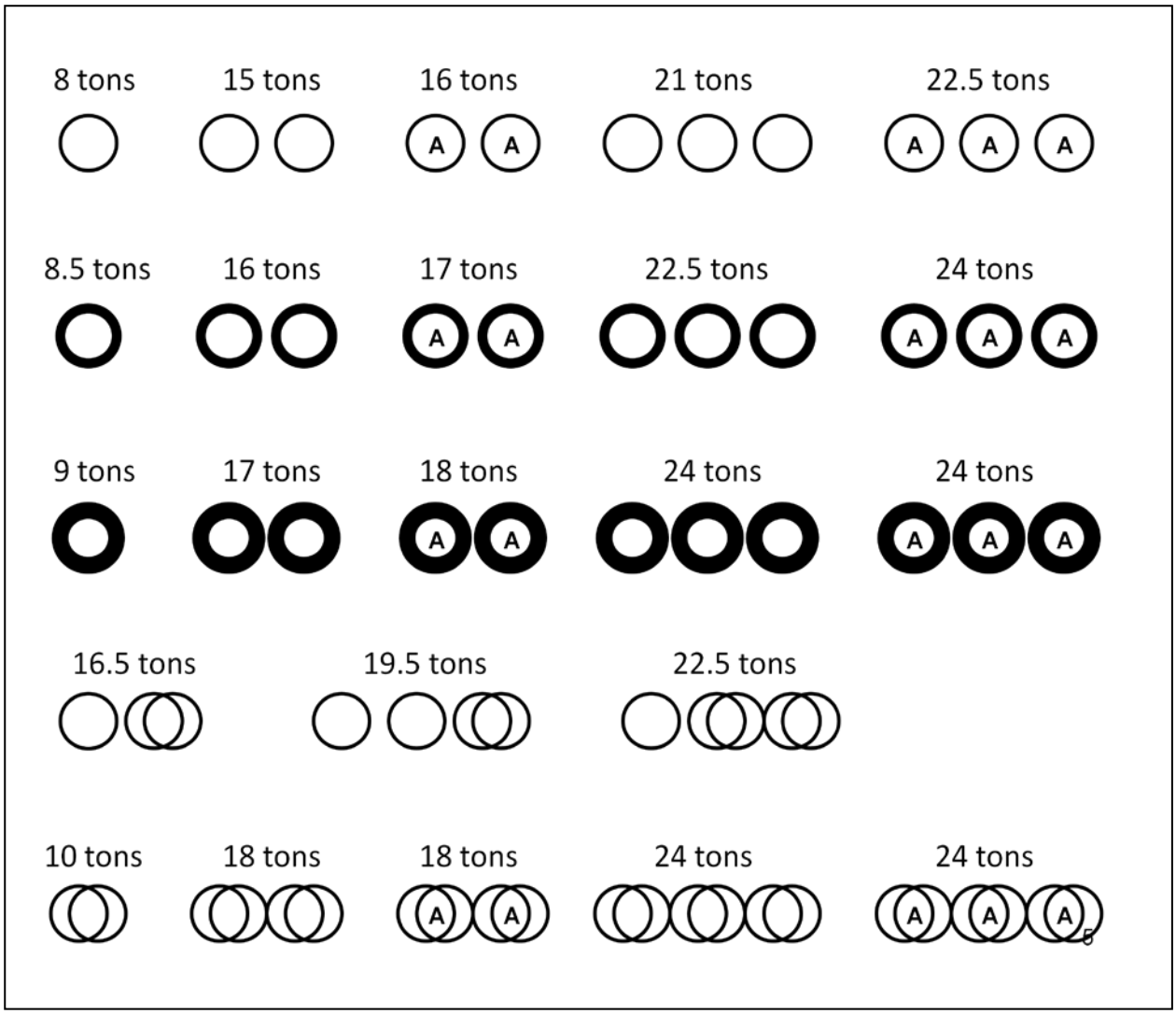


Figure 6-2: Drawings Showing Various Combinations of Conventional Tires, Super-Single Tires, and Axles Fitted with Air Suspensions

Further consideration could be given to the stress in pavements due to a fully loaded single axle fitted with conventional single tires.

Recommendations:

- A mass limit of 8 tons for a single axle fitted with two conventional tires
- A mass limit of 8.5 tons for a single axle fitted with two 385/65R22.5 tires
- A mass limit of 9 tons for single axle fitted with two 425/65R22.5 or 445/65R22.5 tires
- A mass limit of 10 tons for a single axle fitted with four conventional tires
- Axle units with various tire types and sizes to have mass limits as shown in the drawings in Figure 6-2
- Only tires of the same type and size permitted on an axle and in an axle unit
- If tires of different sizes or types are fitted in an axle unit, the mass limit of the axle unit shall be as if all the tires in the axle unit are of the size and type of the tires with

the least mass limit
- For axle units using air suspension, the mass limits are as shown in the drawings
- Where air suspension is used, the increased axle unit mass limit may only be enjoyed if the air suspension, including the shock absorbers, are in good working condition
- Where an axle unit uses a mixture of air and steel suspension, the mass limit of the axle unit shall be as if the axle unit is using only steel suspension
- For a single axle fitted with single tires to enjoy the 8-ton limit, it should be fitted with tires with width of at least that of the 315/80R22.5 tire

6.3 Liftable Axles

6.3.1 Definition

A liftable axle is an axle that, through the reduction of air pressure in its suspension "load" air bags and an increase in pressure in the suspension "lift" air bags, can be lifted off the road pavement. A liftable axle is always fitted as part of a tandem or tridem axle unit and can be lifted off the road pavement through the operation of a switch by the driver.

6.3.2 Truck or Truck Tractor Application

In the case of a truck or truck tractor (horse), the liftable axle is fitted with single or dual tires and is located in front of (pusher axle) or behind a single drive rear axle (tag axle).
The intention of both the manufacturers and government authorities is that the axle is to be lifted only when the vehicle is not loaded. This is a "failsafe" condition.

In many modern vehicles, the axle cannot be lifted if the vehicle is loaded, unless under exceptional circumstances. The circumstances occur when the vehicle goes over an obstacle such as a ramp or a speed bump, or in slippery conditions. In such a situation, loading on the fixed drive axle is reduced to such an extent that traction is lost. The vehicle then becomes immobilized and can become a hazard to other road users.
In such exceptional circumstances, the operation of a "dead man's" switch can be used to lift the axle. This is a switch that is spring loaded and has to be held "in" by the driver while the axle is in the lifted position. As soon as the driver takes his/her hand off the switch, the axle returns to the pavement and takes up normal loading. If a failsafe system is not fitted to the vehicle and the liftable axle is lifted while the vehicle is in the loaded operating condition, the fixed axle can easily be loaded to twice the legal limit and cause serious damage to the road pavement.

6.3.3 Trailer or Semi-Trailer Application

The exceptional circumstances noted above do not occur with liftable axles on trailers or semi-trailers. In the case of a trailer or semi-trailer, the liftable axle can be fitted either as the second axle in a tandem axle unit, or as the second and/or third axle in a tridem axle unit.

The manufacturer designs the suspension system such that if all the tires in the axle unit are of the same load carrying capacity, the lift axle/s will carry the same mass as the fixed axle. The tare mass of the trailer exerted on a tridem axle unit can be around 6 tons and this can be carried adequately by the remaining single axle. Operating the empty trailer in such a manner reduces overall tire wear and road wear, particularly with reference to scuffing.

6.3.4 Examples of Liftable Axles

Photographs 6-2 to 6-5 provide examples of liftable axles.

Photograph 6-2: Semi-trailer with Two Liftable Axles

Photograph 6-3: Two Liftable Axles on a Semi-trailer

Photograph 6-4: Semi-trailer with One Liftable Axle

Photograph 6-5: Truck Tractor with Liftable "Tag" Axle

6.3.5 Other Remarks on Liftable Axles

Consideration must be given for the rear overhang and wheelbase of a vehicle when fitting lift axles. If the liftable axle is positioned behind the last fixed axle of a vehicle, the rear overhang of the vehicle will be increased substantially when the liftable axle is lifted. This situation would have to be checked against the overhang limit of a country. Similarly, if the liftable axle is fitted in front of the axle unit in a semi-trailer and is lifted, the wheelbase of the semi-trailer can be greater than what regulations allow.

In Europe, in particular, considerable use is made of liftable axles and they benefit both the transporter and the road authority. About 5-10 liters of fuel per 100 km can be saved through the use of lift axles.

Unfortunately, in East Africa (and in other regions), unscrupulous transporters sometimes lift the axles when the vehicle is loaded and this causes excessive road wear and also increases wear on the loaded tires. The transporter is prepared to accept the increased wear on loaded tires since wear is saved on the lifted tires.

To prevent this from happening, Kenya has banned lift axles. This protects its roads from these unscrupulous road transporters, but also disadvantages those transporters who are professional, self-regulate, and manage liftable axles in the correct manner.

6.3.6 Recommendations

Recommendations on liftable axles follow.

Recommendations:

- Only liftable axles that are authorized by the manufacturer of the vehicle and fitted by an accredited service provider can be used. The vehicle should be plated accordingly.
- In the case of a truck or truck tractor, the liftable axle should automatically be in the "down" position on the road pavement, if the adjacent fixed axle is loaded to or above the with the legal maximum axle mass. The liftable axle could only be lifted through the operation of a "dead-man's" switch, under exceptional circumstances.
- In the case of a trailer or semi-trailer, the liftable axle should be automatically in the "down" position if the adjacent fixed axle/axle unit is loaded to or above the legal mass limit. The driver can keep the liftable axle in the "down" position, but may not be able to override the system and keep it in the lifted position.
- Such an operating mechanism should be certified by the manufacturer of the liftable axle and a suitable plate showing this should be affixed to the vehicle, close to the liftable axle and clearly visible to a traffic officer.
- The mass limits applicable to liftable axles could be the same as for fixed axles, although they should also be limited to the manufacturer's specifications, whichever is the lesser of the two.
- Both wheel hubs of the liftable axle should be painted in a bright contrasting colour (e.g., red or orange) to the color of the other wheel hubs on the vehicle.

6.4 Front Tandem Axle Unit of Drawbar Trailers

Figure 6-2 presents drawings of a drawbar trailer with front steerable single axle and a drawbar trailer with a front steerable tandem axle unit.

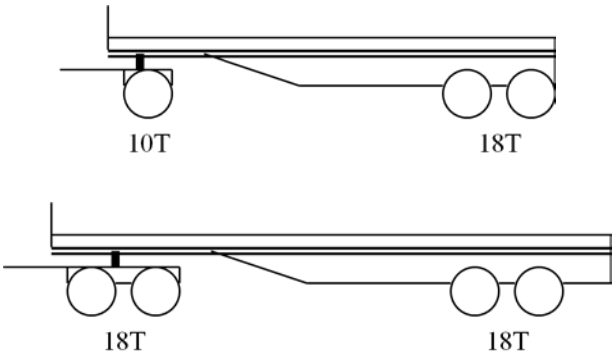


Figure 6-3: Drawings of a Drawbar Trailer with Front Steerable Single Axle and a Drawbar Trailer with a Front Steerable Tandem Axle Unit

Photographs 6-6 and 6-7 show 56-ton vehicle combinations that include drawbar trailers with front steerable tandem axle units.

Photograph 6-6: 7-axle Petroleum Tanker at Kibaha Weighbridge, Tanzania

Photograph 6-7: 7-axle Cement Tanker near Johannesburg, South Africa

Kenya does not allow drawbar trailers with front steerable tandem axle units, while Tanzania and Uganda do. Rwanda and Burundi do not have regulations that clearly state whether these axle configurations are legal.

Until COMESA agreed on the 56-ton vehicle combination mass limit, 48-ton truck and trailer vehicle combinations traditionally used drawbar trailers with a single front steerable axle. This trailer is shown in the first drawing in Figure 6-2.

When COMESA adopted the 56-ton load limit and Tanzania increased its legal limit to 56 tons, the logical method of upgrading the truck and trailer vehicle combinations to cope with 56 tons was for transporters to add an axle to the front steerable dolly of the drawbar trailer. This option was chosen as the way forward and many such vehicle combinations are seen on the roads in Tanzania and Southern Africa. Interlinks, the other option to achieve 56 tons in Tanzania, had not been included in the regulations and were therefore not legal as normal vehicle combinations.

The JICA Study Team could find no justifiable reason why the front steerable tandem axle unit compromised safety and suggests that the concern may result from poor design or roadworthiness of the vehicle.

Recommendation:
There should be no restriction on the use of the front steerable tandem axle unit on drawbar trailers.

6.5 Interlink or B-doubles Configuration

An Interlink or B-doubles configuration is a vehicle combination comprising a truck tractor and two semi-trailers. It has a "fifth wheel" on the truck tractor and another on the rear of the first semi-trailer. The GCM of an interlink can vary from a 4-axle, 22-m, 38-ton volume carrier (mattresses, foam), to a 7-axle, 56-ton long-distance freight carrier. Eight-axle interlinks are seen in Southern Africa, but unless they are fitted with super-single tires on the semi-trailers their payloads are restricted due to the 56-ton GCM limit and the added tare mass of the eighth axle.

While the interlink is widely used in Southern Africa, it is not normally shown in the drawings of vehicles in the regulations in East Africa and, for this reason, is seen as being illegal.

Photographs 6-8 to 6-13 present examples of interlinks.

Photograph 6-8: Flat Deck Interlink Carrying Waste Paper

Photograph 6-9: Pantechnicon Interlink

Photograph 6-10: Bulk Cement Interlink with Super-single Tires

Photograph 6-11: Curtain-Sider Interlink

Photograph 6-12: Flat Deck Interlink with 1 × 6 m and 1 × 12 m High-cube Containers

Photograph 6-13: Flat Deck Interlink with 1 × 6 m and 1 × 12 m Containers

Partner States have expressed concern that interlinks are "bigger" and/or "heavier" than other vehicle combinations. As clarified in the opening paragraph of this section, the interlink refers to a vehicle configuration and has nothing to do with its size or mass. Regulations limit it to 22 m long and it can vary in GCM from around 38 tons to the maximum limit of 56 tons.

Photograph 6-14 presents a photograph of an interlink used for furniture removals. Its GCM has a limit of only 46 tons and it is around 20 m long.

Photograph 6-14: An Interlink Used for Furniture Removals

In its maximum limit configuration, the interlink in Photograph 14 is almost identical in appearance and causes virtually the same road wear as the maximum limit truck and trailer. The load equivalence factors of the two combinations are virtually the same.

Photographs 6-15 present the comparison.[2]

[2] Unfortunately, the photograph of the truck and trailer was cut off at the rear, due to the insufficient lens angle of the camera. The rear of the trailer has been added.

Photograph 6-15: Comparison of the Truck and Trailer and Interlink Combinations

The "turning corridor" of an interlink is not as favorable as that of the equivalent length truck and trailer. Therefore, interlinks are not as maneuverable in a congested city situation. Transporters are fully aware of this and are cautious as to where they send interlinks. The CSIR desktop study produced turning corridors of different vehicle configurations. Those for the 22-m truck and trailer, and interlink, are shown in Figure 6-4.

It can be seen that the interlink "cuts in" by an extra 1.2 m on a 90-degree turn. The JICA Study Team considers that the difference is insufficient to legislate or regulate against interlinks, since the difference of 1.2 m is relatively small when considering the large amount of space that both vehicle combinations require.

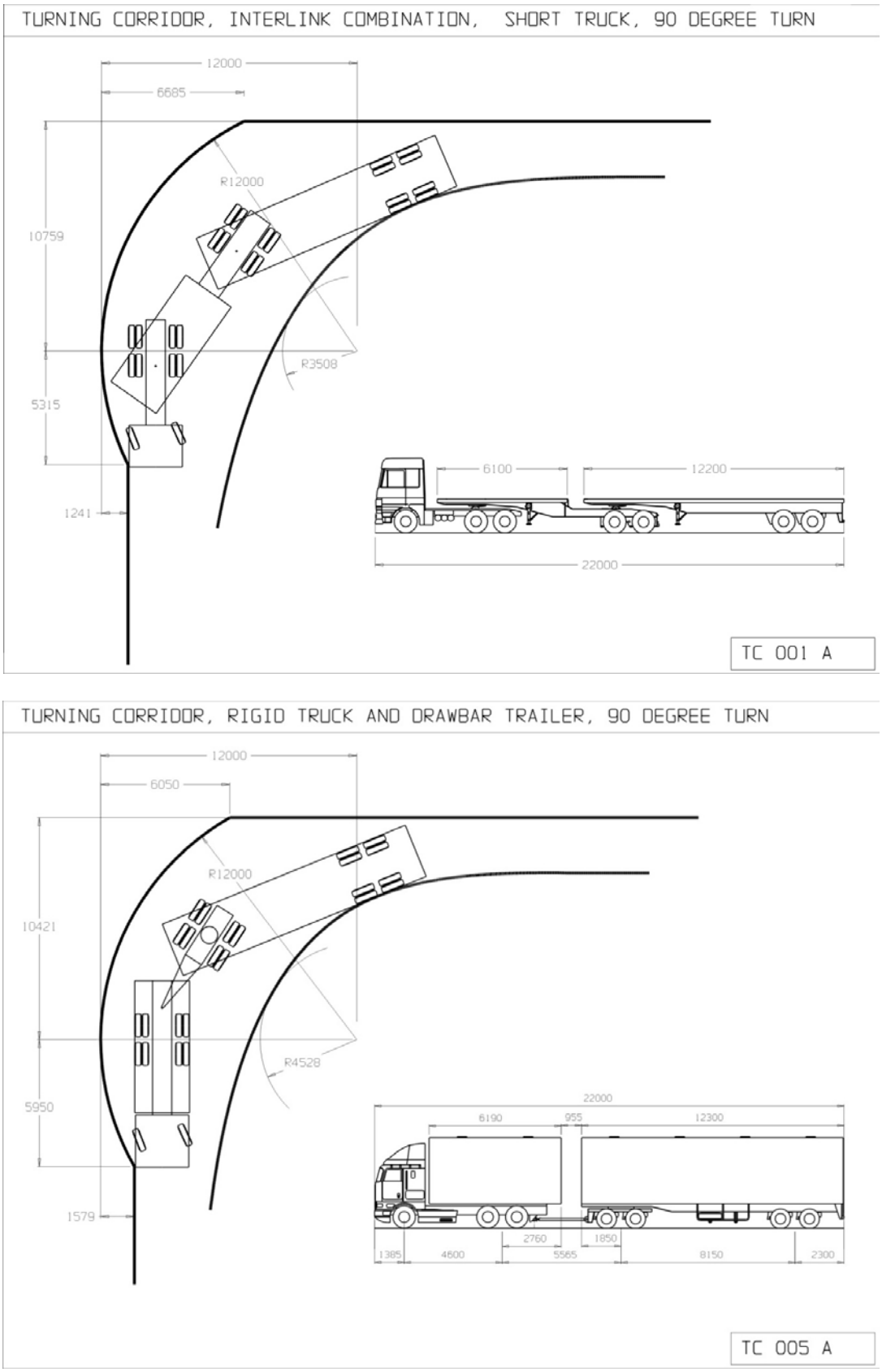


Figure 6-4: Turning Corridors for 22-m Truck and Trailer, and Interlink (as determined by the Council for Scientific and Industrial Research)

Each of the two vehicle combinations has their own advantages to the transport operator:

(i) Due to their two rotating connections being farther apart, they are more stable on the road than the truck and trailer and therefore improve road safety. This statement is confirmed by drivers. It is also shown in a document describing research done in Australia (see Appendix L).

(ii) The semi-trailers of an interlink can be unhooked, pre-loaded, and parked ready to be hooked to the next available truck tractor. Truck tractors can be chosen to move different sets of semi-trailers and therefore fleet utilization can be improved. The truck in a truck and trailer combination cannot be utilized in such a manner.

(iii) The truck and trailer combination is better suited to rural operating conditions. For example, a driver can offload the trailer at a main road consignee's location, off-hook it, and then take only the truck to offload at a location on a poor condition and barely passable road.

Recommendations:
There should be no restrictions specifically against interlinks for general use on major corridors. If there are to be any restrictions on particular routes due to size or mass, the restrictions should either be against the overall length of 22 m, or the mass limit of 56 tons.

6.6 Self-Regulation

In many countries and particularly in East Africa, the road transporters and law enforcement authorities do not enjoy a good working relationship with each other. Since the authorities believe that the transporters are habitual overloaders and are out to abuse the road traffic regulations, the authorities apply punitive measures to address the perceived problem. The transporters for their part believe that only a few within their industry are bad, but all are being treated unfairly. Effectively, there is a stalemate.

To break the stalemate and to create a harmonious relationship between the authorities and transporters, self-regulation can be introduced. Self-regulation has been introduced in South Africa in the form of the Road Transport Management System (RTMS) and the following has been extracted from its 2006 Strategy Document, as set out in Box 6-1.

Box 6-1: Extract from the South African Road Transport Management System Strategy Document (2006): An Example of Self-Regulation

RTMS is an industry-led self-regulation scheme that encourages consignees, consignors and transport operators engaged in the road logistics value chain to implement a vehicle management system that preserves road infrastructure, improves road safety and increases the productivity of the logistics value chain.

All players in the road logistics value chain are aware of the problems concerning road logistics that affect their industries. The road infrastructure is deteriorating rapidly due to, inter alia, overloading and there are an unacceptable number of accidents attributed to heavy trucks. Both road safety and road infrastructure are public concerns subject to strict regulation by governments, particularly when abused. Overregulation, road deterioration and high accident rates pose a significant threat to the long term sustainability and global competitiveness of the road logistics value chain. This has prompted users of road haulage (consignors and consignees) and providers of road haulage (transport operators) to jointly develop strategies aimed at protecting the road network, improving road safety and transport productivity for the benefit of the country's citizens and the industry itself.

The industry also recognizes that poor compliance to transport regulations creates an unfair competitive environment. It was therefore felt that a self-regulation scheme is required to create standard rules for the industry, and that these rules should become the "business norm" - supporting the principles of g ood corporate governance. It is for this reason that industry is leading this initiative, to ensure its quick adoption by all businesses participating in the road logistics value chain.

Furthermore, industry recognizes its critical role in the economy's growth. Efficient movement of goods between a country's centers of production and its centers of export boosts competitiveness in international markets. RTMS is one of the key innovative and pro-active initiatives that will make this possible.

RTMS's mission is to provide a national management system (standards, auditors, manuals) and implementation support (information portals, recognition, technology transfer) for heavy vehicle road transport to consignees, consignors and transport operators, focusing on: (i) load optimization, (ii) driver wellness, (iii) vehicle maintenance, and (iv) productivity.

To obtain acceptance of the self-regulation system by governmental authorities, the system has to be professionally managed and failsafe (i.e., the governmental authorities must be satisfied that, if they are to give preferential treatment to accredited/certified transporters, the authorities must know that the transporters will operate according to the requirements of the country's regulations. To achieve this condition, the national standards body in South Africa, with the guidance of the RTMS National Steering Committee, has drawn up Recommended Practices, to govern the system. These Recommended Practices are to be upgraded to National Standards. In addition, auditors accredited by the South African auditing association are contracted to audit any company wishing to be part of the system. The applicant pays for this service. The National Steering Committee ensures that the system is managed in a professional manner and that companies accredited to the system operate according to the recommended practices.

The RTMS has shown that benefits accrue to both the government authorities and those accredited to the system. The country benefits from improved road safety and overloading has been reduced from 15% to less than 5%. The companies accredited to the system run better and improve their "bottom lines".

Recommendations:

Hold sensitization workshops in each Partner State. Development partners active in the region, such as the United States Agency for International Development and TradeMark East Africa, may fund the workshops.

Input to the workshops to be provided by representatives from the RTMS auditors, the RTMS National Steering Committee, and the Federation of East and Southern African Transport Associations (FESARTA).

Workshop delegates to include representatives of government and the private sector.

Following the workshops, set up an East African Regional Steering Committee, similar to that of the RTMS National Steering Committee.

Chapter 7 Weighbridges and their Operations and Management

7.1 Introduction

7.1.1 Background

The efficient and effective control of overloading in the EAC Partner States requires the adoption of a harmonized approach to a variety of factors related to the operation and management of weighbridges. These factors include:

- Type and characteristics of weighbridges operated;
- Location of weighbridges on the regional road network;
- Management of weighbridges;
- Weighbridge operations and procedures;
- Personnel involved in overload control operations; and
- Weighbridge verification and calibration.

7.1.2 Purpose and Scope

The purpose of this chapter is to recommend a harmonized approach to the operation and management of weighbridges in the EAC region based on regional (SADC/COMESA) and international best practice. The overall goal is to achieve efficient and effective control of overloading in the EAC region as a basis for reducing the accelerated deterioration of road networks and, as a consequence, reducing total transport costs.

7.1.3 Approach and Methodology

In order to adequately address the scope of work implied in addressing the various factors related to weighbridge operations and management listed above, the following tasks were undertaken:

Task 1: A Review of the existing situation in EAC Partner States;

Task 2: A review of relevant background information as a framework for assessing the existing situation

Task 3: An analysis of the issues arising from the review of the existing situation, including recommendations for improving weighbridge operations and management in the EAC region.

7.2 Review of the Existing Situation

7.2.1 General

In order to adequately address the factors listed in Section 7.1.1, the following tasks were undertaken:

- Visits were made to all EAC Partner States during which interviews pertaining to various aspects of overload control operations were held with a cross-section of stakeholders. Field visits were also made to a selection of typical weighbridges in each Partner State with a view to seeing at first hand the type of weighbridge facilities, manner of carrying out weighbridge operations and personnel involved

- Documents and reports were collected on all matters pertaining to overload control as listed in Section 7.1.1. Related documents were also sourced from the region and internationally on the subject matter.
- A survey questionnaire was prepared in which the relevant stakeholders were requested to reconfirm the information obtained during the country visits.

7.2.2 Findings

(1) Documentation

Informative documentation was obtained from the three EAC Partner States where overload control is carried out (Kenya, Tanzania, and Uganda). Other relevant documentation was also obtained from the SADC/COMESA region as well as from abroad (e.g., UK, Australia, Japan). [1]

(2) Weighbridges – Existing Situation

Table 7-1: Type, Number, Location, and Hours of Operation

	Number of Weighbridges Operated for Controlling Axle Load and GCM Limits								
	Fixed					Location of Fixed Weighbridges			
						At border post		Inland	
Country	Single axle Scale (3.2 m × 1 m)	Axle Unit Scale (3.2 m × 4 m)	Multi-Deck Scale (3.2 m × 22 m)	Portable	WIM	No	Op hrs	No	Op hrs
Burundi	0	0	0	0	0	0	0	0	0
Kenya	13	0	0 (1)*	2	0 (2)*	3	24	10	24
Rwanda	0	0	0	0	0	0	0	0	0
Tanzania	3	14	0	14	0	2	16	15	24
Uganda	3	0	0	4	3	1	24	2	24

Notes: Figures in brackets indicate weighbridges to be installed in near future

Table 7-2: Institutional Arrangements for Overload Control Operations

	Responsibility for Overload Control Operations	
Country	Weighing of Vehicles	Enforcement of Regulations
Burundi	N/A	N/A
Kenya	Roads agency (KeNHA)	Police
Rwanda	N/A	N/A
Tanzania	Roads agency (TANROADS)	Traffic Inspectorate
Uganda	Roads agency (UNRA)	Police

[1] The main documents reviewed are: Austroads (2006), *Weigh-in-Motion Technology, AP-R168;* Commonwealth of Australia, National Measurement Institute (2008), *Weighbridge Operators Manual,* NSW 2070, Australia; East African Community (2006), *The East African Community Standardisation, Quality Assurance, Metrology Testing Act, 2006;* Institute of Measurement and Control (2000), *A Guide to the Specification and Procurement of Industrial Weighing Systems,* Publication Reference Number: WGC1099; Institute of Measurement and Control (2003), *A Code of Practice for the Calibration of Industrial Process Weighing Systems,* Publication Reference Number: WGC0496; Institute of Measurement and Control (2010), *A Guide to Dynamic Weighing for Industry,* London WC1E 6AF; Pinard et al (2010), *Overload Control Practices in Eastern and Southern Africa: Main Lessons Learned. SSATP Working Paper No. 91,* The World Bank, Washington, DC.*;* Republic of Botswana (2007), Weights and Measures, Chapter 43:06. Government Printer, Gaborone; Republic of Kenya (2009), *Technical Report on Axle Load Control,* Inter-Ministerial Technical Committee on Axle Load Control, Nairobi, Kenya; SADC (1999), *Enabling legal reform: Control of Vehicle Loading*, SADC Secretariat, Gaborone; South African National Department of Transport (2004), *Guidelines for Law Enforcement in Respect of the Overloading of Goods Vehicles,* Pretoria; Standards Bureau of South Africa (2003), *Verification of non-automatic electronic self-indicating road vehicle mass measuring equipment for use by road traffic authorities, SANS 10343:2003;* Vehicle Inspectorate and LACOTS, UK (2002), *Enforcement Weighing of Vehicles: Consolidated Code of Practice.*

Table 7-3: Personnel Involved in Overload Control Operations

	Personnel Aspects			Training Aspects			Annual Budget Amount (USD)
Country	No. of Supervisors	No. of Staff	Job Description?	Training Program	Training Manual	Frequency of Training	
Burundi	–	–	–	–	–	–	–
Kenya	13	135	No	Yes	Yes	6 months	1,200,000
Rwanda	–	–	–	–	–	–	–
Tanzania	30	+/− 500	Yes	Yes	Yes	12 months	2,000,000
Uganda	3	31	Yes	Yes	No	Intermittent	145,000

Table 7-4: Verification, Calibration, and Weighing Tolerances

	Weighbridge Verification, and Calibration Issues						
	Legal	Verification		Calibration		Tolerance	
Country	Instrument	Agency	Frequency	Agency	Frequency	Axles	GCM
Burundi	–	–	–	–	–	–	–
Kenya	W & M Act	W & M	12 months	Private sector	3 months	5%	–
Rwanda	–	–	–	–	–	–	–
Tanzania	W & M Act	W & M	12 months?	TANROADS	3 months	0%	0%
Uganda	W & M Act	None	–	Bureau of Standards	4 months	–	–

7.3 Background Information for Assessing Existing Situation

7.3.1 General

This section presents background information, including best practice approaches, on various aspects of weighbridge operations and management as listed in Section 7.1.1. This provides a good basis for assessing the adequacy of the existing situation by allowing a comparison to be made between these best practice approaches and those currently prevailing in EAC Partner States.

7.3.2 Types and Characteristics of Weighbridges

In principle, any of the following types of vehicle-weighing systems are officially recognized by the International Legal Metrology Organisation (ILMO) for vehicle weighing purposes:

Table 7-5: ILMO Approved Types of Weighing Systems

Type of Weighing System	Vehicle Element Weighed
Static– fixed	Total weight (GCM)
Static or dynamic: low speed – fixed	Single, tandem or tridem axle
Static or dynamic: low speed – mobile	Single, tandem or tridem axle

ILMO approved weighing material guarantees accurate measurement results and reliability throughout time. Such certification ensures robustness and solidity standards, e.g., the weighing platform must be able to bear the breaking of a 50 ton axle at 30 km/h without being damaged in any way. This requires that the materials used in the construction of the weighbridge have undergone a series of tests which comply with ILMO standards.

Although various types of ILMO-approved weighing systems may be used for vehicle weighing purposes, they exhibit varying characteristics and a careful choice must be made in relation to the main purpose of weighing the vehicle. These characteristics are summarized in Table 7-6.

Table 7-6: Weighbridge Characteristics

Type of weighbridge / Method of weighing		Fixed Weighbridges	Mobile Weighbridges
		• Easy to operate • Minimum personnel • Cargo off-loading • High installation costs • Limited placement	• Wide coverage • Difficult site selection • High operating costs • Equipment easily damaged • Police cooperation • Traffic disruption
Static	• More precision • Accepted for legal enforcement • Slower (esp. single axle scales)	• Easiest to operate • Highest level of precision • Can weigh and register axle units	• Lowest investment • Optimal for enforcement
Dynamic (WIM)	• Rapid monitoring • Lower precision • Generally not acceptable for enforcement	• Fast for monitoring • Requires large installation • Requires careful direction of vehicles	• Minimum disruption of commercial traffic • Lowest accuracy • Excellent for statistical monitoring

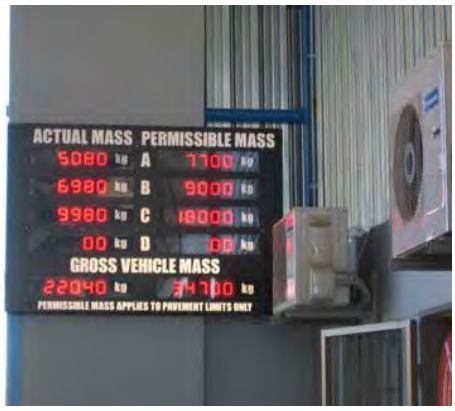
(1) Fixed/Static Weighing Systems

Multi-deck: Where the traffic volumes warrant it (typically > 500 vpd) a multi-deck weighbridge (also known as split-deck weighbridge) consisting of four individual decks with lengths typically of 3 m, 6 m, 7 m, and 6 m, respectively, giving an overall length of 22 m, with a width of 3.2 m should be provided. Each deck must be capable of weighing a maximum mass of 40,000 kg, giving a total weighing capacity of 160,000 kg. A standard requirement at all weighbridges should be a roof over the scale. This will improve the working conditions and will make it possible to do weighing in all weather conditions. Photograph 7-1 shows a typical 3.2 m x 22 m multi-deck weighbridge.

Photograph 7-1: Typical 3.2 m × 22 m Multi-deck Weighbridge

When configured correctly, multi-deck weighbridges can individually display the weights of all axle groups of both the truck and trailers. Digital weight indicators are assigned to each separate axle group weight to be displayed as illustrated in Photograph 7-2. A summing indicator is used to display the total vehicle mass on the multi-deck weighbridge and then relay all deck weights to a PC if required. External remote displays can also be connected to display the axle group weights back to the truck driver (Photograph 7-3).

Photograph 7-2: Vehicle Control Centre



Photograph 7-3: Digital Display of Actual and Permissible Axle Group and GCM Masses

Some of the benefits of multi-deck scales are as follows:

- Static weighing which results in very accurate measurement (<1% error) of individual axles and axle unit configurations as well as GCM;
- Level tolerances on the approach slabs are not normally a problem as the whole vehicle is weighed at once;
- It is relatively very quick to weigh a vehicle;
- Short verification tests can easily be done without test weights (measure any axle or axle unit on each of the weighbridge decks and the results should be consistent); and
- It is more difficult to "manipulate" the weighing process, as the whole vehicle is weighed in one go (with an axle unit scale it is easy to weigh only part of an axle unit or to weigh one unit twice and skip an overloaded unit).

Axle unit scales: Where commercial traffic volumes (typically < 500 vpd) do not warrant the use of a more expensive multi-deck weighbridge, an axle unit scale can offer a cost-effective choice of weighing system. These scales are typically 3.2 m × 4 m and comprise a single deck (see Photograph 7-4) which can be connected to a digital weight indicator and are capable of weighing a maximum mass of about 40,000 kg. A digital summing indicator can then be used to display the combined weight of the individual axles and axle groups to give the GCM.

Photograph 7-4: Typical 3.2 m × 4 m Axle Unit Scale

Axle unit scales have largely replaced the single axle scales found in many SACD/COMESA countries where the latter are gradually being phased out for various reasons (see next section). Some of the benefits of the axle unit scale are as follows:

- They can weigh any axle unit of a truck (i.e., single, tandem, or tridem unit), not as quickly as a multi-deck scale, but much more quickly than a single axle scale;
- Level tolerances on the approach slabs no longer have to be as accurate as for the single axle scale but still need to meet minimum requirements;
- Verification testing is relatively simple (limited staking of test weights); and
- It is far quicker to weigh multi-axle vehicles than using a single axle scale but not as quick as using a multi-deck scale.

Single axle scales: These may be described as the "first generation" scales that were used commonly in many countries in eastern and southern Africa. They typically comprise a single, 3.2 m × 1 m deck placed centrally within a 40m concrete slab with a recess to accommodate the scale (see Photograph 7-5). The scale can be connected to a computer linked to a digital reader and printer for producing weighbridge slips indicating the various weights of the axles and axle groups.

Photograph 7-5: 3.2 m × 1 m Single Axle Scale

Although relatively cheaper to install than multi-deck or axle init scales, single axle scales have a number of drawbacks including:

- The sites have to be constructed to very precise level requirements which are not easily met (see section below on accuracy of weighing systems);
- Weighing of multi axles is cumbersome and time consuming, especially for articulated or truck-trailer vehicles when up to seven or eight separate axles must be weighed;
- Verification of the scales is difficult due to the difficulty of fitting the test weights onto the small deck.

The risk of weight transfer during the weighing will be the determining factor in levels of accuracy, irrespective of the inherent accuracy of the weighbridge.

Due to the pressure from the courts with regard to the accuracy of single axle scales/sites, a number of countries in southern Africa have dispensed with their use in favor of either axle unit or multi-deck scales, depending on the volumes of commercial traffic to be weighed.

(2) Portable Scales

Static and dynamic

Portable (mobile) scales – either statically or dynamically operated – are normally used for screening purposes. These portable scales can be set-up next to any road where there is a suitable surface and an area to pull off and weigh trucks. These scales cannot be used for law enforcement purposes, but are sufficiently accurate to identify vehicles that are probably overloaded with a high degree of confidence. Due to the fairly high accuracy of the portable scales, screening can take place at considerable distances from the weighbridge, as the chance of diverting vehicles that are legally loaded to the weighbridge is slim. These portable weighing devices are considerably cheaper than static scales, are relatively light, can be set up very rapidly and measure individual wheels, axles, axle units and vehicle/combination mass.

Examples of a static device (Photograph 7-6) and a dynamic device, a Vehicle Load Monitor weigh-in-motion scale (Photograph 7-7), are shown below.

Photograph 7-6: Portable Static Weighing Device

Photograph 7-7: Portable Dynamic WIM Device

Fixed/dynamic

Weigh-in-motion (WIM): A WIM system is a device that measures the dynamic axle mass of a moving vehicle to estimate the corresponding static axle mass. These systems are designed to capture and record axle weights and gross vehicle weights as vehicles drive over a measurement site at normal traffic speeds. Overhead variable message signs are used to redirect legally loaded vehicles back onto the highway while vehicles suspected of being overloaded are directed to an adjacent lane for accurate weighing on a static scale. Thus, the total number of vehicles to be weighed should be considerably less and a smaller facility may then be adequate.

WIM systems fall into two broad groups as follows:

- High speed (HSWIM) – vehicle travel > 15 km/h
- Low speed (LSWIM) – vehicle speed ≤ 15 km/h

WIMS have traditionally been used for screening rather than enforcement purposes at or near static weighbridges. However, the emergence of a new generation of single-axle weighing fixed WIMS allows vehicles to be weighed at slow speed (typically < 5 km/h) and with sufficient weighing accuracy (< 1%) for enforcement purposes. Although such systems have not yet been used widely in the eastern and southern Africa region, they are worthy of consideration and offer an alternative to static devices if a rigorous evaluation confirms their long-term suitability for this type of weighing.

Types of WIMS: The most widely accepted and utilized WIM devices are:

- *Piezoelectric sensor:* The sensor is embedded in the pavement and produces a charge that is equivalent to the deformation induced by the tire loads on the pavement's surface. It is common to install two inductive loops and two piezoelectric sensors in each monitored lane. A properly installed and calibrated Piezoelectric WIM system can provide gross vehicle weights that are within 15% of the actual vehicle weight for 95% of the measured trucks.
- *Bending Plate*. The bending scale consists of two steel platforms that are typically 0.6 × 2 m, adjacently placed to cover a 3.65 m lane. The plates are instrumented with strain gages, which measures tire load induced plate strains. The measured strains are then analyzed to determine the tire load. A properly installed and calibrated bending plate WIM system can provide gross vehicle weights that are within 10% of the actual vehicle weight for 95% of the measured trucks. Photograph 7-8 shows a typical bending plate high speed WIM device.
- *Single Load Cell*. This device consists of two 3 × 3 m platforms placed adjacently to cover the 3.65 m monitored lane. A single hydraulic load cell is installed at the centre of each platform to measure the tire load induced forces that are then transformed into tire loads. A properly installed and calibrated single load cell WIM system can provide gross vehicle weights that are within 6% of the actual vehicle weight for 95% of the measured trucks.

Photograph 7-8: Typical High Speed WIM Device (Bending Plate)

(3) Satellite (Virtual) Weighing Stations

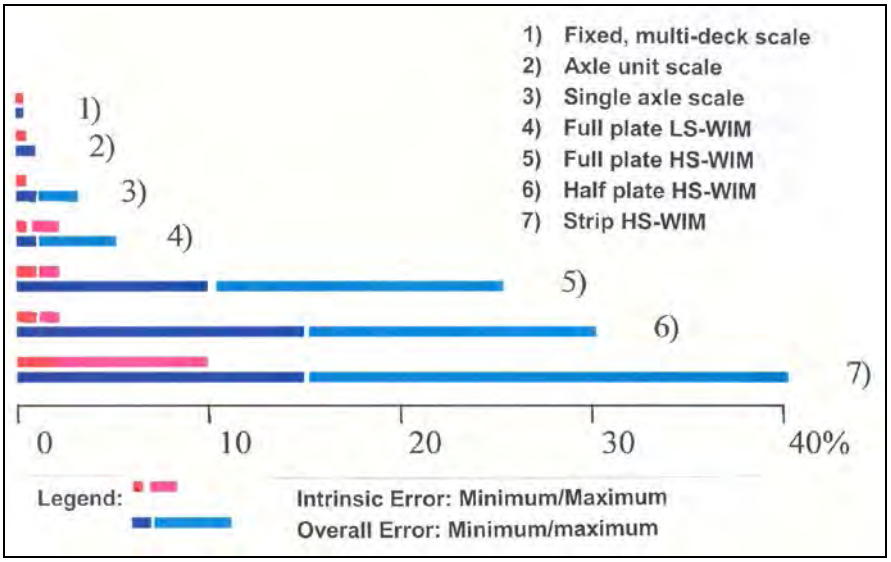
Satellite weighing stations (sometimes referred to as "virtual weigh stations") provide a means of economically and unobtrusively monitoring commercial vehicle traffic at locations where there are a number of alternative, by-pass routes to cover. These stations deploy WIM systems that automatically weigh vehicles as they travel at normal speeds along a road, classifies them based on weight and axle spacings, determines when vehicles are in violation of regulations, and produces a display of these records on a computer with a network connection. Overloaded heavy vehicles cannot be prosecuted or detained at such satellite stations and would have to be sent or escorted to a static weighbridge where they can be weighed accurately for enforcement purposes.

(4) Accuracy of Weighing Systems

The accuracy of weighing systems is primarily influenced by the following factors:

- *The error of the scale*: This is the *difference* between the *indication* and the *load* placed on the platform of the weighing device. It is affected by such factors as temperature, eccentric load, tilted condition, repeatability, creep, and span stability.
- External factors: These are the influences which make a wheel or axle load lower or higher that it would be under perfect conditions. The perfect condition is: absolutely level site, all suspensions of the vehicle in an average, frictionless position, no braking, no vehicle oscillation. These external factors have nothing to do with the scale accuracy.

The accuracy of the weighing system will depend on the type of system used and the weighing method adopted. Figure 7-1 gives a good indication of the accuracy of various types of weighing systems.



Source: HAENNI (2009), *Technical Aspects of Weighing Road Vehicles.* Proc. BSEC Conference, Geneva, 18 June 2009.

Figure 7-1: Accuracy of Various Weighing Systems

As indicated in Figure 7-1, the most accurate method of weighing is by the use of a multi-deck, static scale which is not affected by external factors which are produced by unfavorable characteristics of the vehicle and weighing site. In contrast, the least accurate method of static weighing is by the use of a single axle scale which weighs one axle at a time and for which the difference in height between the approach slab and the weighing platform is a critical factor. Based on a survey carried out to assess the effect of level tolerance on mass accuracy of weighbridges[2], the proposed specifications, including tolerance limits, are as follows and are illustrated in Figure 7-2:

1) Approach slab: a minimum length of 20 m on either side of the scale
2) Tolerance on coping: Zero to −1 mm
3) Tolerance on deck: Zero to −2 mm
4) Tolerance on approach slab up to 3 m on either side of deck: Zero to +2 mm
5) Tolerance of approach slab from 3 m to 20 m on either side of deck: 30 mm (e.g., +/− 15 mm; 0 to +30 mm; 0 to −30 mm).

[2] Council for Scientific and Industrial Research (CSIR) (1994), *Assessing the Effect of Level of Tolerance on Mass Accuracy of Weighbridges.* Pretoria, South Africa.

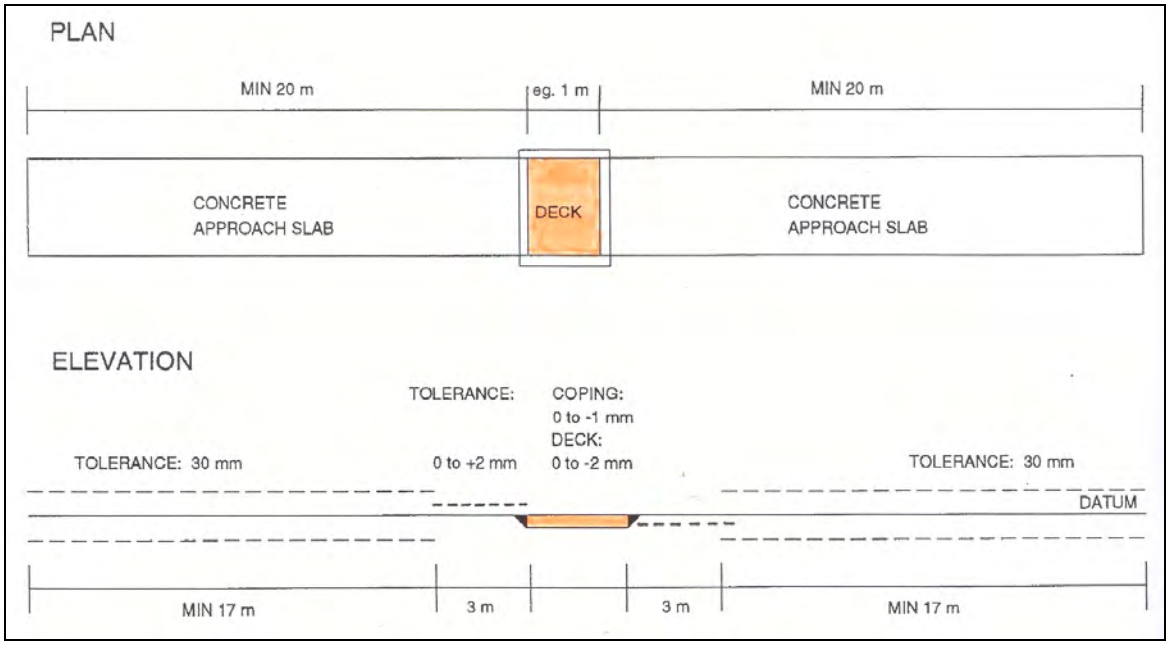


Figure 7-2: Recommended Tolerances for a Single Axle Unit Scale

(5) Weighing Tolerances

Due to scale errors and other external factors contributing to the accuracy of weighing systems, no such systems can be totally accurate all of the time. For this reason, some allowance in the weighing measurement is normally made in the form of a *weighing tolerance.* The magnitude of such an allowance is based on the assumed scale error (scale type dependent) plus that estimated for external factors.

In order to ascertain a reasonable basis for setting a weighing tolerance, a national weighbridge survey was carried out in South Africa in 2002, [3] in which 57 weighbridges were used (single axle scales, axle unit scales and muiti-deck scales) to weigh a multi-axled vehicle that had been previously weight-assized. The survey found that:

- *Combination mass:* All readings fell within the range −0.88% to +0.76% of the average combination mass;
- *Axle unit:* All readings fell within the range −2.14% to +2.78% of the average combination mass;
- *Steering axle:* All readings fell within the range −5.12% to +4.96% of the average steering axle mass.

Based on the above findings, it was recommended that the tolerance on GCM should be set at +/−2% and that on axles at +/−5%. However, it was agreed at a tripartite (SADC/ COMESA/EAC) Regional Workshop on Harmonisation of Key Elements of Best Practice in Overload Control (InfraAfrica (Pty) Ltd, 2008) that, as an interim measure, a mass tolerance of 5% on axles, axle units and GCM would be adopted.

[3] Council for Scientific and Industrial Research (CSIR) (2003), *National Weighbridge Survey 2002: National Department of Transport,* Pretoria, January 2003.

7.3.3 Location and Number of Weighbridges on the Regional Road Network

In order to ensure that the available resources for overload control are utilized in a cost-effective manner in EAC Partner States, it is important to adopt an appropriate strategy for deciding on the location and number of weighbridges that should be deployed along the regional road network. At one extreme, a strategy which seeks to eradicate overloading by locating numerous weighbridges along as many routes as possible will be extremely costly and un-cost effective.

In terms of deciding on an optimum number and location of weighbridges, the law of diminishing returns is very important to acknowledge ***(i.e., for every weighbridge added after a certain number, every additional investment has a smaller return until the return on that investment does not warrant any further investment.).*** In this regard, the addition of a new a weighbridge on the regional road network will only be economically viable if the capital, maintenance and operational costs are less than the savings in pavement damage due to overloading. The economic viability analysis should be conducted over the lifetime of the weighbridge network which requires the costs and benefits be converted to Net Present Values (NPVs).

Strategic matters that influence the location of a weighbridge include proximity to a port-of-entry (border post or a port) or generators of heavy vehicle traffic, such as industrial areas and whether the location is such that escape routes are minimized and that the greatest impact on reducing overloading can be achieved (i.e., where heavy vehicle traffic volumes are the highest and/or the extent of overloading is the highest. The influence of the strategic matters on the location of a weighbridge should be evaluated after the economic viability of the location has been established.

A methodology has been developed to determine how the location of weighbridges can be optimized within an overload control (OLC) network.[4] This methodology is based on the determination of an overload control index (OLCI) which converts the different NPVs of overload control benefits and costs to a common factor which can be used to rank the options. For an overload control network to be financially viable the OLCI should be equal to or greater than two. Figure 7-3 illustrates the OLCI calculation graphically.

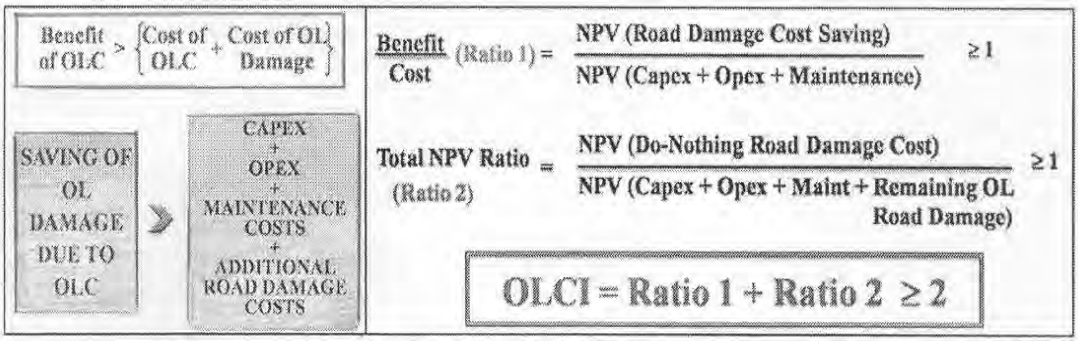


Figure 7-3: Graphical Illustration of the Calculation of the Overload Control Index

[4] Bosman, J and Kapofi, N. (2010), *The Optimisation of Weighbridge Location.* 4th SARF/IRF Regional Conference for Africa, 11–13 October 2010, Somerset West, Cape Town, South Africa.

7.3.4 Management of Weighbridges

There are a number of different specialist disciplines required in the area of weighbridge management, operations and maintenance (MOM) including the following:

- Legal issues;
- Electronic systems;
- Computer systems;
- Mechanical systems;
- Traffic signaling systems;
- Facilities management;
- Staff management;
- Operations management; and
- Maintenance management.

The most common options available for undertaking the above aspects of weighbridge management are:

- **In-house operations:** In this option, the Roads Agency takes full responsibility for the operational management of weighbridge facilities. However, historically, for a variety of reasons, this arrangement has generally not been very effective or efficient in the southern African region. Moreover, many of the weighbridge facility operations are generally not considered to be core functions of a Roads Agency and, in principle, should be contracted out to the private sector either as a commercialized or privatized operation.

- **Private sector operations:** In this option, the private sector may be appointed by the Roads Agency to carry out some or all of the operational management responsibilities listed above – in essence, a public-private partnership (PPP). Various PPP arrangements may be considered, each with their advantages and disadvantages.

The range and characteristics of the various contract types through which the private sector can become involved in the operational management of weighbridge facilities is summarized in Table 7-7.

Table 7-7: Summary of Private Sector Involvement Options in Overload Control

Item	Service Contract	Management Contract	Lease Contract	Concession Contract	Full Privatization
Ownership	Public Sector	Public Sector	Public Sector	Public Sector	Private Sector
Financing Fixed Assets	Public Sector	Public Sector	Public Sector	Private Sector	Private Sector
Financing Working Capital	Public Sector	Public Sector	Private Sector	Private Sector	Private Sector
Duration	Short (1–3 yrs)	Short (5 yrs)	Medium (6–10 yrs)	Long (20–30 yrs)	Indefinite
Risk	Public Sector	Public Sector	Public Sector	Shared	Private Sector
Remuneration of Private Sector	Operation and management (O&M) costs	O&M costs	O&M costs and working capital	O&M costs, working capital and financing of fixed assets	

The option that could be chosen for a particular overload control operation will, among others, depend on the following:

- financing of fixed assets;
- financing of working capital;
- financing of maintenance;
- extent to which risk is shared between the public and private sector; and
- remuneration of the private sector.

7.3.5 Weighbridge Operations and Procedures

For legal enforcement purposes, it is mandatory that the personnel involved in the weighbridge operations are legally authorized to do so. Typically in the eastern and southern African region, such personnel come from the traffic section of the Police or from a Traffic Inspectorate. It is also critical that personnel involved in weighbridge operations are properly trained and are able to carry out the weighing procedures in the prescribed manner, particularly in those countries where overloading is treated as a criminal offence.

Certain of the weighbridge operational procedures depend on the type of weighbridge being used while others are mandatory to all facilities. It would be normal for any weighbridge facility to have a Weighbridge Operators Manual to ensure that all operational procedures are carried out in a proper and consistent manner in accordance with the manufacturer's requirements. Failure to adhere to proper weighbridge operational procedures could result in an overloading violation being thrown out in court.

7.3.6 Personnel Involved in Overload Control Operations

The efficient and effective control of overloading utilizing increasingly sophisticated equipment requires well-trained and experienced staff conversant with a wide range of related disciplines including the following:

- Transport environment;
- Legislation and regulations;
- Weighbridge equipment;
- Weighing operations;
- Software operation;
- Data management;
- Management reporting;
- Staff management;
- Operations management;
- Maintenance management; and
- Safety.

Thus, it should be mandatory for all weighbridge personnel to follow a prescribed training course so that they are able to perform their duties satisfactorily in terms of ensuring that the applicable weighing procedures are followed and overload control regulations are applied correctly. In a regional context, training should be carried out in a coordinated manner in order to endure uniformity across all countries.

7.3.7 Weighbridge Verification and Calibration

The use of any weighing equipment used by the public, such as a weighbridge, is regulated by law. The principal legislation affecting the use of such equipment is normally contained in the

Weights and Measures Acts of most countries. Under that legislation weighing equipment must be individually verified by an authorized Inspector with a stamp of verification and a certificate of verification issued by the inspector.

In essence, the verification process basically involves placing masspieces that are calibrated and traceable to the national standard on the scale(s) and then confirming that the reading given is correct. The frequency of verification is prescribed in the Act.

Photograph 7-9: Weighbridge Verification

Failure to comply in all respects with the legal requirements of the Weights and Measures Act, including the verification procedures, would render weighbridge operations illegal.

Calibration of a weighbridge is the carrying out of a set of prescribed operations which establish, under reported conditions, the relationship between the weighing system output and corresponding known values of the load applied to the weighbridge. The calibration exercise is normally carried out by an accredited body in accordance with a prescribed procedure such as that contained in *A Code of Practice for the Calibration of Industrial Process Weighing Systems, October 2003* published as – BS EN ISO 9000 series of Quality Management and Quality Assurance Standards as issued by the Institute of Measurement and Control in the UK.

The result of the calibration is normally reported in a formal document – the *certificate of calibration* – which includes a variety of data deemed relevant by the calibrating authority. The data obtained as a result of the calibration operation may be used to estimate the weighing system errors or to adjust the system output to an agreed specified value.

The frequency of calibration is governed by the following factors:

- Manufacturer's recommendation;
- Frequency and manner of use;
- Environmental influence; and
- Accuracy sought.

7.4 Issues Arising from Review of Existing Situation and Recommendations

7.4.1 General

Against the background information presented in Section 7.3, this section highlights the issues arising from a review of the existing situation by comparing best practices approaches with

those prevailing in EAC Partner States. On that basis, recommendations are made for improving weighbridge operations and management.

As would be apparent from the information presented in Table 7-2, overload control operations in Burundi and Rwanda have not yet started as a result of which the review of the existing situation focuses on Kenya, Tanzania, and Uganda.

7.4.2 Types and Characteristics of Weighbridges Operated

Main findings: As indicated in Table 7-1, single axle scales are used exclusively in Kenya and Uganda while Tanzania uses mostly axle unit scales. Multi-deck scales are not used in any of the countries although there are plans to introduce them in Kenya. Mobile weighbridges are also used in all countries for random policing and screening purposes. Apart from Uganda, WIMs are not used in the other countries although Kenya is planning to introduce them in the near future. All countries operate their weighbridges for 24 hours except Tanzania which operates those at the border for 16 hours. Weighbridges within Partner States are not electronically linked.

Ironically, while most countries in the SADC region have largely phased out the use of single axle scales for the variety of reasons listed in Section 7.3, these devices are still used extensively in the EAC countries and, indeed, there are plans in some countries to purchase new ones.

Stakeholders report a number of shortcomings with the types of weighbridges used in the EAC countries with the two most frequently stated being:

- Congestion and delays at some weighbridges due to the length of time taken to weigh multi-axled vehicles on a single axle scale at multiple locations along road networks, including border crossings; and

- Different readings produced by different weighbridges for the same vehicle resulting in acrimonious relations between transporters and weighbridge operators.

The above shortcomings are attributed largely to an injudicious choice of the type of weighbridge (single axle scale) used at locations where large volumes of commercial vehicles need to be weighed, coupled with the inherent problems associated with achieving the necessary levels of accuracy of such scales. These shortcomings (delays to transporters) contribute significantly to the very high transport costs that prevail in the region.
Conclusions: A radical change in approach is required as regards the type of weighbridge infrastructure to be used which would benefit from standardization. The objective should be to facilitate the speedy flow of commercial traffic on the corridors and across the borders of all countries in the region while also ensuring that vehicle overloading is minimized in an efficient and cost effective manner.

The above objective can be achieved by moving away from the traditional concept of a standalone weighbridge with adjacent office, weighbridge operator and ticket printer and, instead, shifting the emphasis to encompass and enhance key areas such as improved overall system integration – site wide, nationally and regionally – through the use of modern-day weighbridge technology, including the use of WIMs and data acquisition systems, within a well laid out overload control facility or, better, Traffic Management Centre. Harmonization of such an approach among EAC Partner States is a critical factor.

Recommendations: Based on the approach indicated above, the following recommendations are made:

Recommendation 1: Standardized categories of Traffic Management Centres should be agreed upon for which the following classes are proposed:

Category A: Full Traffic Control Centre (FTCC): As the name implies, a FTCC includes a full range of facilities to efficiently and effectively undertake an overload control process at minimum disruption to relatively large volumes of heavy vehicle traffic. Such a facility would normally operate on both sides of the road and would typically include within its operational system the following:

- A high-speed weigh-in-motion (HSWIM) screening device in the main traffic lane
- A low-speed weigh-in-motion (LSWIM) screening device to confirm vehicles suspected to be overloaded as indicated by the HSWIM
- A static platform scale for accurately weighing axle and axle unit loads and total vehicle or combination mass for prosecution purposes.

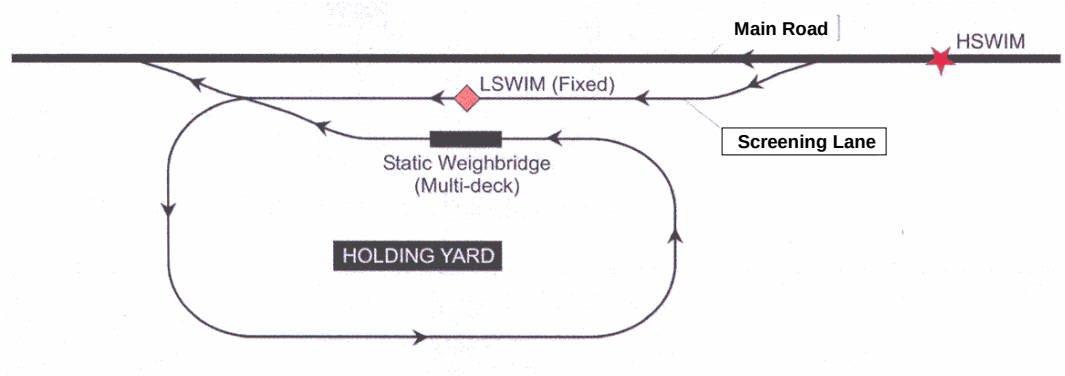


Figure 7-4: Typical Layout of a FTCC Facility (Showing One Side of the Road Only)

The capacity of a FTCC for undertaking various aspects of the overload control process is given in Table 7-8. Such a facility would normally operate 24 hours per day on s trategic routes (corridors) which carry relatively high volumes (> 2,000 vpd) of commercial vehicles.

Table 7-8: Capacity Characteristics of a FTCC Facility

Activity	Typical capacity
Screening capacity (veh/h)	200
Weighing capacity (veh/h)	50
Prosecution capacity (veh/h)	10
Max system ADTT	2,000

Source: Mikros Systems, South Africa

Category B: Type 1 Traffic Control Centre (TCC 1): A TCC 1 is essentially the same as a FTCC except that it operates on only one side of the road and the HSWIM in the main road is located on an internal screening lane. The drawback of this system is that any vehicles travelling in one direction that are identified as overloaded by the HSWIM must cross over the opposing traffic stream to be weighed. Thus, this type of facility is ideally suited for use where access across the road is provided by an interchange or where traffic flows are not so high as to frustrate the passage of vehicles across the road to the weighbridge.

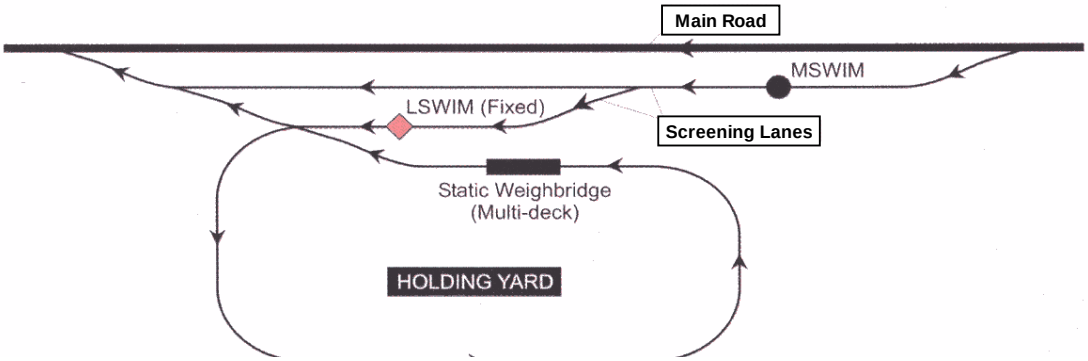


Figure 7-5: Typical Layout of a TCC 1 Facility

The capacity of a TCC 1 is very similar to that of an FTCC (see Table 7-8). This type of facility is less costly to operate than an FTCC as only one team is required to control the station. Such a facility would normally operate 16–24 hours per day on routes which carry medium volumes (500–2000 vpd) of commercial vehicles.

Category C- Type 2 Traffic Control Centre (TCC 2)*:* A type 5 TCC has fewer control facilities than either a FTCC or TCC 1 in that it does not have in-lane traffic screening but requires all heavy vehicles to leave the main carriageway and cross over a LS-WIM. In this layout arrangement (see Figure 7-6) legally loaded vehicles can immediately continue with their journey, but overloaded vehicles must proceed to the static weighbridge for weighing and prosecution.

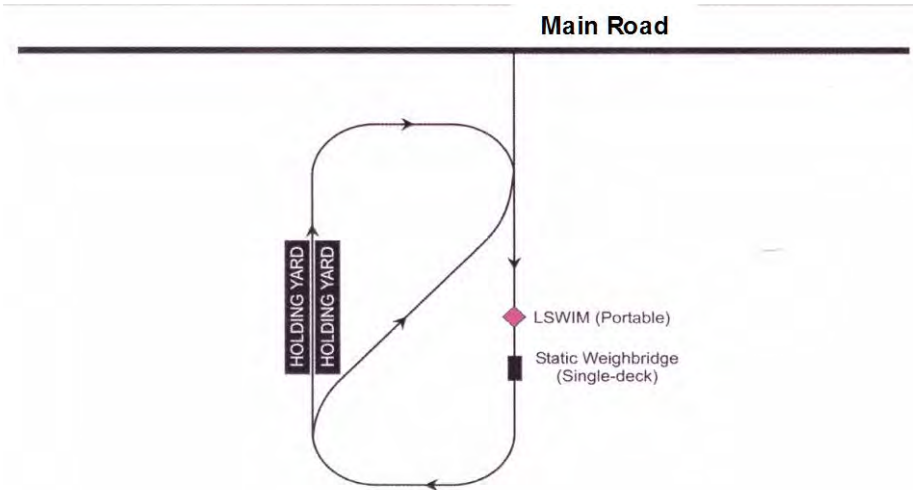


Figure 7-6: Typical Layout of a TCC 2

The capacity of a TCC 5 for undertaking various aspects of the overload control process is given in Table 7-9.

Table 7-9: Capacity Characteristics of a TCC 5 Facility

Activity	Typical capacity
Screening capacity (veh/h)	40
Weighing capacity (veh/h)	15
Prosecution capacity (veh/h)	5
Max system ADTT	400

Source: Mikros Systems, South Africa

As indicated in Table 7-9, a TCC 5 facility has the capacity to prosecute approximately 100 overloaded vehicles in an 18 hour day. Thus, from a technical point of view, it is appropriate for locations where the traffic stream carries up to 1,000 heavy vpd in both directions.

Category D - Lay-by Control Centre (LCC): A LCC facility consists essentially of a road lay-by at which either a static or mobile weighbridge is installed (see Figure 7-7). The facility comprises a suitably constructed level concrete platform adjacent to the road where the weighbridge is installed (or in the case of a mobile vehicle scale – with provision for easy installation of such a scale. The installed weighbridge may be operated in conjunction with a HSWIM as a screening device.

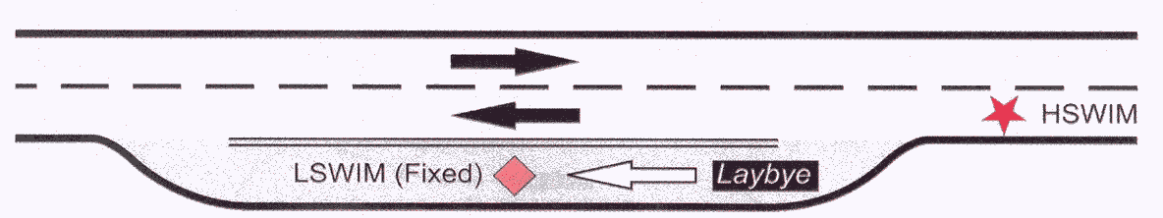


Figure 7-7: Typical Layout of Lay-by with HSWIM Screening Device

Recommendation 2: The choice of weighbridge facility should be decided by carrying out a full life cycle analysis of the status quo versus the proposed option which may be either an upgraded or new facility.

The life-cycle cost analysis would typically include the following:

- Project costs
  - Initial costs
  - Operating costs
  - Maintenance costs

- Project benefits
  - Fees collected for overloading
  - Saving in road damage

Recommendation 3: *Single axle scales should be gradually phased out in favor of either axle unit or multi-deck scales within a TCC facility as illustrated in Figures 7-4, 7-5, and 7-6.*

Recommendation 4: *The more extensive use of WIMS, in conjunction with static weighbridges, to reduce the number of commercial vehicles that need to be weighed.*

Recommendation 5: *An audit of existing weighbridge infrastructure that has been identified as forming part of the regional weighbridge system should be carried out. This should include an evaluation of the existing facilities in terms of weighbridge type (single axle, axle unit, multi-deck), computerization, staff and driver facilities, parking-off areas, etc. in order to determine the required upgrading and estimated cost implications.*

Recommendation 6: *A weighing tolerance of 5% on both axles and GCM should be adopted on a regional basis.*

Recommendation 7: *Develop harmonized accreditation standards for weighbridges and develop regional database of accredited weighing stations.*

7.4.3 Location of Weighbridges along the Regional Road Network

Main findings: Weighbridges are located at relatively frequent intervals along EAC corridors. For example, between Rusumo and Dar es Salaam there are nine weighbridges and between Gatuna and Mombasa there are eight weighbridges. On the basis of an average weighing time of 30 minutes for a multi-axled vehicle on a single axle scale and a queue of ten trucks to be weighed results in a delay time of five hours. If this is replicated at nine weighbridges, then the total delay is almost 2 days![5] Clearly such delays are very costly and, indeed, unacceptable in terms of the additional transport costs incurred. Weighbridges are also located at all main border posts, sometimes on both sides of a common border.

Conclusions: The deployment of numerous weighbridges along the EAC corridors at relatively close intervals is responsible for significant delays to commercial traffic and is contributing to additional transport costs.

There is a need for adopting an appropriate strategy for deciding on the location and number of weighbridges along the regional road network.
There should be stronger cooperation with regard to the sharing of weighbridge facilities in the EAC region. Separate operation of weighbridges on both sides of international borders is unnecessary and results in inefficient use of scare resources.

Recommendations: Based on the main findings highlighted above, the following recommendations are made:

Recommendation 1: *The development of a regionally coordinated strategy for the control of overloading by the judicious deployment of weighbridges along EAC corridors in accordance with a regionally agreed network of weighing stations.* This strategy needs to be supported by two other strategies which will be the responsibility of individual Partner States, and which focus on national and urban heavy vehicle routes. Obviously, some of the national routes will coincide with the regional corridors.

Recommendation 2: *The identification on a regional map of the key points from which vehicle overloading can be effectively controlled from a regional perspective.* Border posts are obvious strategic points as, with few exceptions, there are limited route choices for a truck driver to travel from one EAC country to another. However, the deployment of weighbridges on both sides of international borders should be avoided in favor of greater bi-lateral cooperation in the operation of a single weighbridge facility, especially where one-stop border posts are operated.

[5] Ministry of Trade and Industry and Private Sector Federation, Rwanda (2010): *Current Status of NTBs Along the Northern and Central Corridors.*

Recommendation 3: *The determination of an overload control index to help determine the optimum number of weighbridges that should be deployed along the EAC network (ref. Section 7.3.3).* This will avoid the tendency to over-police the road network with too many weighbridges.

Recommendation 4: *In locating weighbridge stations, preference to be given to the establishment of such stations in common control areas at border posts as well as to the joint use of weighing stations and related facilities.*

7.4.4 Management of Weighbridges

Main findings: As indicated in Table 7-2, the Roads Agencies in EAC Partner States are responsible for the weighing of vehicles while the enforcement of regulations is carried out either by the police or traffic inspectorate. However, the efforts of these separate bodies are often uncoordinated leading to loopholes that are exploited by unscrupulous transporters.

Although all the roads agencies are required in their Roads Acts to operate in a commercialized manner and to focus on core strategic activities, these agencies still undertake a certain amount of non-core activities, including the deployment of a large number of staff to undertake overload control activities. For example, Tanzania employs more than 500 staff to operate their thirty-one weighbridges (static and potable) at an annual cost of approximately USD 2 million – a very costly undertaking which might well be more cost-effectively carried out with the involvement of the private sector.

Conclusions: Relatively high costs are incurred by roads agencies in carrying out what are essentially non-core activities in-house. The outsourcing of some aspects of weighbridge operations by roads agencies, without relinquishing their strategic management responsibility, might therefore well be a preferable alternative for which there are a number of options to choose from (ref. Section 7.3.4).

Recommendations:

Recommendation 1*: In principle, the private sector should be involved in some aspect(s) of overload control operations.* Such involvement could range from an ordinary management contract to a full Public-Private Partnership based on the build, operate and transfer (BOT) concept. An assessment of the various options should therefore be carried out to determine the preferred option.

7.4.5 Weighbridge Operations and Procedures

Main findings: A number of shortcomings were identified by stakeholders related to weighbridge operations and procedures in EAC Partner States. These include:

- Weighbridge operation procedures are generally not properly documented and the procedures that are carried out differ from country to country.
- There is no system for maintenance and repair of weighbridges;
- There is no mutual recognition of weighbridge certificates among EAC Partner States;
- Weighbridges are generally not linked to each other and to a central control unit.
- The quality and extent of data that is collected at weighbridges varies enormously among EAC Partner States and what is collected is not shared on a regional basis.

Conclusions: The absence of standardized, documented procedures for carrying out weighbridge operations has led to inconsistency in overload control activities in some EAC

countries. Moreover, lack of mutual recognition of weighbridge certificates and sharing of information has diluted the efficiency and effectiveness of overload control operations.

Recommendations:

Recommendation 1: *Development of a weighbridge operators manual to ensure that all weighbridge operations are carried out in a proper, consistent and standardized manner in all EAC Partner States.*

Recommendation 2: *Development of a regional weighbridge certificate and mutual recognition by all EAC Partner States of such a certificate and related documentation issued by an accredited weighing station.*

Recommendation 3: *The linking of weighbridge certificates with customs clearance processes to provide a further filter in the overload control process.*

Recommendation 4: *All weighbridges on the regional road network to be networked and to be linked electronically to a regional data centre to facilitate sharing of information on overload control.*

Recommendation 5: *The conducting of regular regional performance audits on the effectiveness of the regional network of weighing stations and the development of regional performance targets and setting of regional performance levels*

7.4.6 Personnel Involved in Overload Control Operations

Findings: The frequency and standard of training of weighbridge operators varies from country to country with each country following its own syllabus with the result that the caliber of staff involved in weighbridge operations varies considerably.

Conclusions: The quality of training in overload control operations needs to be enhanced to cater for the increased complexity of modern-days weighbridge operations.

Recommendation 1: *Undertake standardized training of weighbridge staff at a regional training institution following a regionally prescribed syllabus.* The outputs of such training should be certified and accredited with a regional educational body.

7.4.7 Weighbridge Verification and Calibration

Findings: As indicated in Table 7-4, the legal instrument that covers the verification and calibration of weighbridges in EAC Partner States is the Weights and Measures Act. These Acts prescribe the manner in which verification and calibration of weighing instruments, such as weighbridges, must be carried out. Partner States carry out verification of weighbridges on an annual basis and calibration on a quarterly basis.

In all EAC countries there is no program which is strictly adhered to for regular verification and calibration of weighbridges in full conformity with the national Weights and measures Acts as required by law. In principle, this would invalidate the legality of the weighing process and the ability to prosecute offenders.

The EAC Standardisation, Quality Assurance, Metrology and Testing Act, 2006, does not contain any provisions that deal specifically with the verification and calibration of weighbridges. However, it does provide for the establishment of National Standards Bodies to develop and publish national standards in line with internationally recognized procedures.

Conclusion: There is a need for a harmonized verification and calibration standard for weighbridge equipment in the EAC region as a supplement to the EAC Standardisation, Metrology and Testing Act, 2006. Such a standard can be based on the existing Weights and Measures Acts that exist in all the EAC Partner States and other relevant international standards.

Recommendations:

Recommendation 1: *Agreement that weighing by any weighing station will only be valid if the weighing station has been accredited on the basis of appropriate verification and calibration carried out in full compliance with a regional standard.*

Recommendation 2: *Development of a regional verification standard based on the prevailing Weights and Measures Acts in EAC Partner States as well as that adopted internationally.*

8. Formulation of a Proposed EAC Regional Legal Instrument

8.1 The Mandate

Legally, the mandate for an EAC legal instrument for the harmonization of vehicle overload control comes from The Treaty for the Establishment of the East African Community (signed by Kenya, Tanzania, and Uganda, on 30 November 1999 and entering into force on 7 June 2000),[1] specifically:

(i) Article 5, on Objectives of the Community, subparagraphs (1) and (2) of which call for the establishment of a Common Market to strengthen and regulate infrastructure relations (among others), and consolidation of cooperation in agreed fields (including transport);

(ii) Article 89, on Common Transport and Communications Policies, subparagraph (a) of which requires the Partner States (among other things) to "develop harmonised standards and regulatory laws, rules, procedures and practices"; and

(iii) Article 90, on Roads and Road Transport, subparagraph (l) of which requires the Partner States to "adopt common rules and regulations governing the dimensions, technical requirements, **gross weight and load per axle** of vehicles used in trunk roads within the Community" [emphasis added].[2]

8.2 Choice of Modality[3]

A number of modalities for legal instruments to control vehicle (over)loading in the EAC are possible, but the two main choices are between:

(i) an EAC Act[4] + EAC Regulations; and
(ii) an EAC Protocol + National Laws and Regulations.[5]

[1] Acceded to by Burundi and Rwanda in June 2007.

[2] Pursuant to this mandate from The Treaty for the Establishment of the East African Community, a number of actions have been taken and meetings held for the harmonization of vehicle overload control standards. See, e.g., EAC Secretariat, *Meeting of a Technical Working Group (TWG) on the Axle Load Harmonization in East Africa*, March 2009. Also, as was noted during the 2nd Stakeholders Meeting at Nairobi on 30-31 May 2011, Article 38(4) of the Protocol on Establishment of the East African Community Common Market requires the EAC Council to within three years of entry into force (i.e., by 1 July 2013) to issue transport regulations. East African Community, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 2nd Stakeholders Workshop to Review the Interim Report and Advise on Ways Forward, Report of the Workshop*, May 2011, p. 8, item (xiv). While there is a tripartite (now five-country) EAC road transport agreement, it does not address issues related to weights and axle loads.

[3] Much of this discussion draws upon: (i) The Treaty for Establishment of the East African Community [primary source]; and (ii) Corridor Development Consultants (Pty) Ltd., *Final Report, Study on the Legal Framework for Introducing One Stop Border Posts (OSBPs) in East Africa and the Rusumo Border Post*, prepared for the East African Community and the Japan International Cooperation Agency, 29 March 2010, pp. 7–8 and Appendix 1 (unpaginated) [secondary source].

[4] The practice of capitalization here follows that in The Treaty for Establishment of the East African Community ("EAC Treaty"), signed on 30 November 1999 and entered into force on 7 July 2000.

[5] Other modalities mentioned in the report cited in footnote 3 above include the following alternate options: (i) an EAC Act + Protocol; and (ii) an EAC Act + bilateral agreements between pairs of Partner States. Alternate option (i) would use a Protocol instead of Regulation(s) to define operational and administrative parameters and procedures, but Article 151(1) of the EAC Treaty does not seem to envisage Protocols as being sufficiently detailed for this purpose ("Protocols … shall spell out the objectives and scope of, and institutional mechanisms for co-operation and integration"). Also, a Protocol does not override national laws and regulations, which would in effect mean continuation of fragmented approaches to the issue. Bilateral agreements, as envisaged in alternate option (ii), may make sense for the implementation of one-stop border posts (which are between two countries), but make less sense

An **EAC Act + EAC Regulations** would entail the passage of an EAC Act to define the broad principles to be followed by the Partner States in controlling vehicle loading and mandate the EAC Council to promulgate Regulations covering more detailed operational and administrative parameters and procedures. The Act would be passed in accordance with Article 62 of The Treaty for Establishment of the East African Community ("EAC Treaty") on Acts of the Community, which provides for the enactment of EAC legislation "by means of Bills passed by the [East African Legislative] Assembly and assented to by the Heads of State".[6] This modality is preferred because it would provide for an integrated approach to vehicle overload control in the EAC with legal effect in the Partner States. Such a supranational Act and Regulations would override or preempt[7] contrary national laws or regulations,[8] as per subparagraphs (4) and (5) of Article 8 of the EAC Treaty.[9] The modality has been applied effectively in the past (e.g., in the case of the EAC Customs Management Act of 2004 and the EAC Standardisation, Quality Assurance, Metrology and Testing Act of 2006), and it is currently in the process of being applied in the case of the EAC One Stop Border Posts Act. This approach provides a firm legal basis and is reasonably flexible to meet the requirements of changing situations.[10] About one year may be required to pass an Act and adopt Regulations.

An **EAC Protocol + National Laws and Regulations** is the primary alternative to an EAC Act + EAC Regulations. It would entail concluding an EAC Protocol to harmonize the approach to vehicle load control. The Protocol would be pursuant to Article 151(1) of the EAC Treaty, which authorizes the conclusion of Protocols to "spell out the objectives and scope of, and institutional mechanisms for co-operation and integration". While this modality would ensure a degree of uniformity in approach, the steps required for concluding a Protocol are lengthy[11] and

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for controlling multi-country transit traffic (although the Ministry of Foreign Affairs of Kenya has argued for addressing the issue bilaterally).

[6] The Council of Ministers initiates bills (Article 14(3)(b) of the EAC Treaty), which are then reviewed by the relevant Sectoral Council, after which they are reviewed by the Legal and Judicial Affairs Committee and then put forward for consideration of the Assembly. Once enacted by the Assembly, the Heads of State assent at the Summit. After passage of the Act, Regulations may be considered first by Senior Officials, then Permanent Secretaries, and then the Council of Ministers. Approval by the Council of Ministers gives Regulations legal authority in the Partner States. Corridor Development Consultants (Pty) Ltd., *Final Report, Study on the Legal Framework for Introducing One Stop Border Posts (OSBPs) in East Africa and the Rusumo Border Post*, prepared for the East African Community and the Japan International Cooperation Agency, 29 March 2010, and Appendix 1 (unpaginated). Also see The Laws of the Community (Interpretation) Act, 2004, published in *The East African Community Acts Supplement*, No. 6, 31 January 2004.

[7] This is analogous to the doctrine or concept of preemption in the law of the United States (i.e., the displacement of state law by federal law) or the European Union (the displacement of national law by the law of the European Union). See, e.g., J.H.H. Walker, *The Doctrine of Union Preemption in the EU Single Market*, New York University of Law, Jean Monnet Working Paper 03/10, 2010.

[8] At the same time, national laws that are existing or proposed in EAC Partner States will remain in force and be unaffected by the proposed EAC Act to the extent that they are consistent with the Act. And, in accordance with the subsidiarity principle, measures provided for in EAC Acts should only be enacted if their objects can better be achieved at the EAC level. Corridor Development Consultants (Pty) Ltd., *Final Report, Study on the Legal Framework for Introducing One Stop Border Posts (OSBPs) in East Africa and the Rusumo Border Post*, prepared for the East African Community and the Japan International Cooperation Agency, 29 March 2010, Appendix 11 (One Stop Border Posts Policy Paper for the East African Community), Sections 9.1–9.2 (unpaginated).

[9] "4. Community organs, institutions and laws shall take precedence over similar national ones on matters pertaining to implementation of the Treaty. 5. In pursuance of the provisions of paragraph 4 of this Article, the Partner States undertake to make the necessary legal instruments to confer precedence of Community organs, institutions and laws over national ones."

[10] However, it has been argued that this approach may be more difficult to refine through practical experiences during implementation. Corridor Development Consultants (Pty) Ltd., *Final Report, Study on the Legal Framework for Introducing One Stop Border Posts (OSBPs) in East Africa and the Rusumo Border Post*, prepared for the East African Community and the Japan International Cooperation Agency, 29 March 2010, p. 7.

[11] The steps include: (i) submission of a draft Protocol to the sectoral council and then to workshops in the Partner States for review and comment; (ii) preparation of a final report with a revised draft Protocol as an official document; (iii) submission of the final report to the Council of Ministers for approval; (iv) article-by-article review by the Attorneys Generals of the Partner State and the Legal Department of the Secretariat; and (v) submission of the

a Protocol does not override national laws and regulations. Indeed, the process of adopting the required laws and regulations in the Partner States would likely be cumbersome and result in a fragmented approach.

Accordingly, the modality of an EAC Act + EAC Regulations is recommended.[12] Appendix K presents addresses this recommendation in more detail. **The recommendation is consistent with the position reached at the Extraordinary Task Force Meeting held in Bujumbura on 29-30 June 2011, during which the Partner States agreed that an EAC Act supported by harmonized regulations is the appropriate legal instrument for vehicle overload control in the region.**[13]

8.3 A Recommended Model

The structure of a recommended draft EAC Act is set out in Box 8-1. Draft annotated text for the EAC Act follows in Section 8.4,[14] with the draft text in italics and comments in (unnumbered) boxes. Section titles and text in "square" brackets (i.e., "[…]") present options to be considered by the Partner States.

Key points follow:

(i) The draft EAC Act includes 10 parts including Preliminary Provisions, Legal Load Limits and Overloading Fees; Management of Vehicle Loading, Enforcement; Authorized Officers; Voluntary Compliance; Network Development; Weighing Stations, Weighing Equipment, and Weighing Operations; Institutional Arrangements; and Miscellaneous Provisions. In addition, a series of Schedules are to be attached.

(ii) The draft EAC Act was prepared with reference to the SADC Model Legislative Provisions on the Management of Vehicle Load Control, as well as with reference to other good-practice models, including the Zambia Public Roads (Maximum Weight of Vehicles) Regulations (2007) and the Botswana Road Traffic (Vehicle Loads) Regulations (2008), as well as the SADC Memorandum of Understanding on Vehicle Loading. While the draft EAC Act draws on various good-practice models, the objective

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resulting draft to the Council of Ministers for signing. Corridor Development Consultants (Pty) Ltd., *Final Report, Study on the Legal Framework for Introducing One Stop Border Posts (OSBPs) in East Africa and the Rusumo Border Post*, prepared for the East African Community and the Japan International Cooperation Agency, 29 March 2010, and Appendix 1 (unpaginated)[interview with Mr. Stephen Agaba, Principal Legal Officer, EAC Secretariat].

[12] At the 2nd Stakeholders Meeting, three of the EAC Partner States (Burundi, Rwanda, and Uganda) expressed agreement with this recommendation, Kenya and Tanzania stated that they prefer a Protocol. East African Community, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 2nd Stakeholders Workshop to Review the Interim Report and Advise on Ways Forward, Report of the Workshop*, May 2011, p. 13, first item (iv). Kenya expressed concern that there are a few areas where the Partner States do not have one stand. Tanzania mentioned that the Partner States have different levels of axle load control and suggested that the issue of an act or Protocol be left pending for now. Previous source, pp. 10-11, item (xiii), and p. 12, items (xxii) and (xxii). However, the EAC Secretariat clarified that a Protocol is just a general framework. Also, the one-stop border post (OSBP) example is instructive, since the subject matter is similarly cross-cutting and requires a binding legal framework for effective implementation; there are no convincing reasons to abandon this approach. Precedence over national laws is important to avoid differences. If a Partner State is not ready, the entry into force of the Act may be delayed, but it is desirable to proceed now with preparation of the Act. Previous source, p. 11, item (xv). Also, the SADC Secretariat recalled that in 1998 SADC had already developed a legal instrument and discussed the issues. They asked if some countries are ready, why cannot they proceed, with others to follow within five years. Previous source, pp. 11-12, items (xvii) and (xviii).

[13] East African Community, *Extraordinary Task Force Meeting for the Study on the Harmonization of Overload Control Regulations in the East African Community, Report of the Meeting*, June 2011, Sections 3.4 and 4.0 (viii) and (iv) pp. 4-5.

[14] The version of the recommended EAC Act in the Final Report will be presented in the standard format of EAC Acts (i.e., with the section titles in the margins).

must be to meet the need of the EAC Partner States. Accordingly, the JICA Study Team welcomes the continued feedback, guidance, and direction of the Partner States.

(iii) The structure of the draft Act most closely follows the SADC Model Legislative Provisions, as this was a draft act (albeit intended for an individual country, not for a group of partner states comprising a regional economic community) as opposed to draft regulations or a draft regional agreement, but the recommended draft Act deviates from the SADC Model Legislative Provisions where appropriate. For example, while the SADC Model Legislative Provisions merely call for establishment of a national committee to set vehicle loading standards, the EAC Act would include specific standards, to be determined based on economic and engineering (as opposed to legal) technical inputs from the JICA Study Team, as well as discussion between and among the experts from the respective EAC Partner States. Or, to take another example, the chapter from the SADC Model Legislative Provisions on Weighing Stations was generally not adopted as it would provide for a laissez-faire approach that may lead to a proliferation of weighbridges or certainly a supply of weighbridges greater than what is economically optimal. The comments accompanying the draft legal text indicate the source(s) of specific sections.

(iv) The preparation of the draft EAC Act also took in to account the analysis of the laws and regulations of each of the Partner States, as set out in Chapter 2 of this Interim Report, as well as the comments made at the 1st Stakeholders Workshop for this study held at Arusha on 7–8 February.[15]

(v) Other sources, especially for the Preliminary and Miscellaneous Provisions, and general issues of style, include the EAC Treaty and previous examples of EAC Acts, e.g., East African Community Customs Management Act (2004) and the One Stop Border Posts Act (in process).

(vi) Standard EAC practice of structuring Acts with parts, sections, and subsections was followed. Chapters were therefore not included under parts and over sections in the structural hierarchy of the Act.

(vii) Regulation(s), which would come later, may cover detailed operational parameters, e.g., measures relating to live, dangerous, and hazardous cargo; imposition of administrative sanctions; the details of a demerit points systems; the establishment of a regional network of weighing stations; specification of different standards for different types of weighing stations; and sample forms (e.g., vehicle weighing report, weighing certificate). At this stage, however, what is important is for the Partner States to agree on an EAC framework, an EAC Act, for harmonization of vehicle overload control.[16]

[15] While at the 2nd Stakeholders Workshop Kenya suggested that only existing regulations should be harmonized, the JICA Study Team considers, as noted in paragraph (ii) above, that reference should also be made to existing good-practice models, to avoid a "lowest common denominator approach". See East African Community, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 2nd Stakeholders Workshop to Review the Interim Report and Advise on Ways Forward, Report of the Workshop*, May 2011, p. 9, item (xix).

[16] There may be a gray area in terms of what can be included as part of the Act and what can be included in Regulations, but more detailed aspects will need to be put off to Regulations (not be drafted in this study) so that the framework can be agreed on.

Box 8-1: Structure of the Draft Recommended EAC Act

Title (and associated language)

PART I: PRELIMINARY PROVISIONS

1. Short Title, Application, and Commencement
2. Interpretation
3. Objectives of the Act

PART II: LEGAL LOAD LIMITS AND OVERLOADING FEES

4. Legal Load Limits
5. Overloading Fees

PART III: MANAGEMENT OF VEHICLE LOADING

6. Obligatory Weighing of Vehicles
7. Exemption from Obligatory Weighing
8. Payment of Overloading Fee
9. [Conditions for Carriage of Abnormal or Awkward Loads]
10. [Measures Relating to Live and Dangerous Cargo]
11. Transfer of Overloading [and Abnormal Load] Fees to the Road Fund
12. Duties of the Carrier

PART IV: ENFORCEMENT

13. Liability for Vehicle Overloading
14. Demerit Points System
15. Administrative Sanctions
16. Offenses

PART V: AUTHORIZED OFFICERS

17. Appointment of Authorized Officers
18. Powers of Authorized Officers
19. Duty of Drivers to Stop Upon Instruction of an Authorized Officer

PART VI: VOLUNTARY COMPLIANCE

20. Partners in Compliance Programs

PART VII: NETWORK DEVELOPMENT

21. [Regional Network of Weighing Stations]
22. National Network Strategy
23. Outsourcing of Functions of National Road Authority
24. Agency Agreements
25. Compensation of Agents

PART VIII: WEIGHING STATIONS, WEIGHING EQUIPMENT, AND WEIGHING OPERATIONS

26. Power to Install Weighing Stations and Conduct Weighing Operations
27. Authorization of Scales and Devices
28. Certificates of Approval
29. Accreditation of Weighing Stations, Audits, and Random Inspections
30. Weighing Operations
31. Data Management

8.4 Draft Annotated Text of the Legal Instrument

8.4.1 Title (and Associated Language)

THE EAST AFRICAN COMMUNITY
ACT ON MANAGEMENT OF VEHICLE LOADING

*No. … of 201_*
*Date of assent: ……., 201_*
*Date of commencement: …., 201_*

An Act of the Community for the management and control of vehicle loading.

Enacted by the East African Community and assented to by the Heads of State.

Comment: The title follows that of the SADC Model Legislative Provisions on the Management of Vehicle Loading. The form follows standard EAC legislative drafting practice and following Article 62(3) of the EAC Treaty includes the language "enacted by the East African Community and assented to by the Heads of State". Consistent with standard EAC legislative practice, a preamble has not been provided. If requested by the Partner States, one could be drafted based on the preamble to the SADC Model Legislative Provisions.

8.4.2 Part I: Preliminary Provisions

PART I: PRELIMINARY PROVISIONS

1. *Short Title, Application, and Commencement*

(1) This Act may be cited as the East African Community Act on Management of Vehicle Loading.
(2) This Act shall apply to the Partner States.
(3) This Act shall come into force on the date as the Council may, by notice in the Community Gazette, appoint.

Comment: Subsection (1) is a standard recital of the title of the Act. Subsections 2 and 3 are typical, as for example found in the East African Community Customs Management Act (2004) and the One Stop Border Posts Act (in process).

2. *Interpretation*

In this Act, unless the context otherwise requires:

"abnormal load" means a load, which by its nature is indivisible and the dimensions of which exceed the authorized dimensions of the motor vehicle or trailer on which it is to be loaded and the weight of which when loaded onto the motor vehicle or trailer may or may not cause such motor vehicle or trailer to exceed the prescribed maximum laden weight or maximum axle weight;

"accreditation" means certification of a weighing station by a national road authority as complying with the prescribed accreditation standards;

"authorized officer" means any person authorized to provide vehicle loading control services"

"awkward load" means a load that is hazardous in nature and which although it is divisible requires special equipment and safety precautions to offload;

"Council" means the Council of Ministers of the East African Community established by Article 9 of the Treaty"

"legal load limit" means the mass that may be borne by a single axle, an axle group, or all the axles of a vehicle as specified in the First and Second Schedules;

"national road authority" means the authority responsible for the national or primary or road network in each Partner State;

"overload" means an axle load, a load from a group of axles, or gross vehicle mass on a vehicle that exceeds the prescribed legal limits for the vehicle or for any particular part of public roads"

"overloaded vehicle" means a vehicle that is detected at a weighing station as overloaded (either with regard to the permissible maximum axle or axle unit mass or permissible maximum vehicle or vehicle combination mass)

"Partner States" means the member countries of the Republic of Burundi, the Republic of Kenya, the Republic of Rwanda, the United Republic of Tanzania, the Republic of Uganda, and any other country granted membership in the East African Community under Article 3 of the Treaty; and

"Treaty" means the Treaty for the Establishment of the East African Community.

Comment: Including a glossary at the beginning of a legal instrument is good legislative practice. However, it should be limited to concepts the meanings of which are not generally and commonly known and to terms that are used in a specific meaning. The glossary should only define a concept or term and in principle should not contain any normative rule.

Definitions have been drawn from the SADC Model Legislative Provisions (accreditation, authorized officer, legal load limit, national road authority), the Zambia Public Roads (Maximum Weight of Vehicles) Regulations (abnormal load, awkward load, overload), the Botswana Road Traffic (Vehicle Loads) Regulations (overloaded vehicle), and the East African Community One Stop Border Posts Act (in process)(Council, Partner States, Treaty), all good-practice models.

3. *Objectives of the Act*

The objectives of the Act are to:

(1) [decriminalize the carriage of loads that exceed the legal load limit and to introduce administrative control of vehicle loading;]
(2) establish a direct link between road damage caused by the carriage of loads that exceed the legal load limits and the imposition of overloading fees and abnormal and awkward load fees;
(3) ensure effective enforcement
  (a) through the use of existing resources;
  (b) [by outsourcing functions to other public and private sector entities on a commercial basis to expand capacity;]
  (c) by establishing a network of strategically located and efficiently managed weighing stations equipped with state-of-the-art technology;
  (d) discourage non-compliance through a range of effective mobility sanctions and mobility restrictions;
  (e) encourage voluntary compliance
    (i) through targeted incentives providing compliant carriers with economic benefits; and
    (ii) by encouraging private sector involvement in loading management on a commercial basis and in partnership with the public sector;
(4) vest primary responsibility for the management of vehicle overloading contro in road authorities or road agencies; and
(5) promote
  (a) harmonization of legal load limits;
  (b) complementarity in overloading feeds, and abnormal and awkward load fees, and administrative practices;
  (c) complementarity in levels of compliance; and
  (d) the establishment of a regional network of weighing stations

in the EAC region as well as in with the SADC and COMESA regions.

Comment: The objectives are from the SADC Model Legislative Provisions on Management of Vehicle Loading. As noted, text in "square" brackets (i.e., "[…]") here and in other sections present options to be considered by the countries. There was some discussion of decriminalization of vehicle overloading in Section 2.2.2 of this Interim Report, with experience (e.g. Zimbabwe) indicating that the introduction of administrative adjudication procedures to deal with infringements can lead to more effective control. It should also be recalled that the Regional Workshop on Harmonization of Key Elements and Implementation of Best Practice in Overload Control (Nairobi, July 2008) agreed on a resolution supporting the decriminalization of overloading offenses.[17]

8.4.3 Part II: Legal Load Limits and Overloading Fees

PART II: LEGAL LOAD LIMITS AND OVERLOADING FEES

4. *Legal Load Limits*

(1) The legal load limit of a vehicle or trailer shall not exceed the manufacturer's permitted gross mass for such vehicle or trailer or the maximum laden mass set out in the First Schedule for such vehicle or trailer, whichever is less.
(2) The maximum mass carried on any axle of a vehicle or trailer shall not exceed the manufacturer's permitted axle mass or the mass specified in the Second Schedule, whichever is less.

Comment: This section is drawn from Regulation 4 of the Zambia Public Roads (Maximum Weight of Vehicles) Regulations on Maximum Laden Weight and Axle Weight of Vehicles. The term "mass" has been used rather than "weight".[18] The SADC Model Legislative Provisions have not been used as a reference for this section because it does not set load limits but rather establishes a Vehicle Loading Advisory Committee to carry out that task (Sections 4-8). Specification of the required schedules will require economic and engineering (as opposed to legal) technical inputs from the JICA Study Team, as well as discussion between and among the experts from the respective EAC Partner States. At the 2nd Stakeholders Meeting in Nairobi on 30-31 May 2011, all Partner States concurred with the following recommendations of the JICA Study Team: (a) a single axle load (4 tires) of 10 tons, (b) tandem and tridem limits (dual tires of 18 and 24 tons, respectively); and (c) a bridge formula. However, Kenya did not concur with a GVM/GCM of 56 tons and 7 or more axle configurations.[19]

[17] InfraAfrica (Pty) Ltd in association with Africon Limited, Council for Scientific Research (CSIR), and TMT Projects (Pty), *Regional Workshop on Harmonization of Key Elements and Implementation of Best Practice in Overload Control, Workshop Report*, Nairobi, 10–11 July 2008, p. 13.
[18] See, e.g., the usage in Australian Government, National Measurement Institute, *Weighbridge Operators Manual*, December 2010. However, it may be argued that it is inconsistent with the terms "weighbridge" or "weighing station", although Article 70 of the Republic of South Africa's Road Traffic Act of 1996 refers to a "mass-measuring bridge or other mass-measuring instrument".
[19] East African Community, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 2nd Stakeholders Workshop to Review the Interim Report and Advise on Ways Forward, Report of the Workshop*, May 2011, p. 8, item (xvii). The 2nd Stakeholders Meeting agreed to legislate in text form as per the outcomes of the Regional Workshop on Harmonization of Key Elements and Implementation of Best Practice in Overload Control (Nairobi, July 2008) and use an extensive schedule of drawings as guidelines. Previous source, p. 8, item (xviii).

5. *Overloading Fees*

[Overloading fees are set out in the Third and Fourth Schedules.]

[The Partner States shall set vehicle overloading fees taking into consideration costs related to:

(1) road use calculated on a weight-distance basis;
(2) enforcement activities;
(3) congestion factors;
(4) capital investment; and
(5) and other expenditure item borne by the national road authority relating to implementation of the Act.]

Comment: This section provides for the overloading fees, either by reference to schedules to be attached, or by a statement of factors (taken from Section 7(5) of the SADC Model Legislative Provisions) for the Partner States to consider in setting overloading fees. Specification of the fees and/or the methodology for setting them will require economic and engineering (as opposed to legal) technical inputs from the JICA Study Team, as well as discussion between and among the experts from the respective EAC Partner States.

8.4.4 Part III: Management of Vehicle Loading and Enforcement

PART III: MANAGEMENT OF VEHICLE LOADING

6. *Obligatory Weighing of Vehicles*

(1) Subject to Section 7 of this Act, a person owning or operating [a commercial vehicle] [a vehicle with a gross vehicle mass of 3,500 kg or more] must present such vehicle to be weighed at every weighing station that is situated along the route traversed by such vehicle or that is designated for this purpose by a national road authority.
(2) If a person fails to comply with subsection 1, a national road authority may impose on such person any of the administrative sanctions contemplated in Section 15 of this Act.

Comment*: This section draws from Section 11 of the SADC Model Legislative Provisions. Similar provisions are found in Regulation 3 on mandatory weighing of vehicles in Botswana Road Traffic (Vehicle Loads) Regulations (2008), a good-practice example, which among other things offers the alternative text shown ("a vehicle with a gross vehicle mass of 3,500 kg or more").*

7. *Exemption from Obligatory Weighing*

(1) Section 6 of this Act does not apply where:
(a) a person owning or operating a vehicle has presented such vehicle to be weighed at an accredited weighing station prior to the commencement of the journey and such vehicle has been fully loaded; and

(b) a weighing station contemplated in subparagraph (a) has issued a weighting certificate certifying the weight of the vehicle does not exceed the legal load limit.

(2) Despite subsection (1), a person owning or operating a vehicle that has undergone pre-journey weighing in terms of subsection (1) must ensure that the weighing certificate issued on the occasion of the pre-journey weighing is presented for verification at every weighing station situated along the route traversed by such vehicle or that is designated for this purpose by the national road authority.

(3) An authorized officer may, despite the provisions of this section, require a vehicle in respect of which a pre-journey weighing certificate has been issued, to be weighed where there are reasonable grounds for concluding that such vehicle is carrying a load that exceeds the weight indicated on such certificate.

Comment: This section is drawn from Section 12 o f the SADC Model Legislative Provisions and is intended to encourage pre-weighing by providing an incentive in terms of cost and time savings, since routine weighing along the route can be avoided.[20] Similar language is found in Regulation 3 on mandatory weighing of vehicles in the Botswana Road Traffic (Vehicle Loads) Regulations, but the Botswana example does not include the requirement of "reasonable grounds" for finding that a vehicle is overloaded and therefore may lead to abuse of authority.

8. *Payment of Overloading Fee*

(1) An overloading fee is payable by:
(a) a credit or debit card approved by the national road authority;
(b) a bank guaranteed cheque;
(c) an electronic transfer of funds into the central account designated by the national road authority; or
(d) such other means as may be approved by the national road authority.

(2) Any unpaid fees shall be recoverable by way of civil action in any court of competent jurisdiction or upon criminal prosecution. In the case of a criminal prosecution, the court passing sentence may also make an order regarding unpaid fees.

Comment: This sections draws upon Regulation 6 of the Botswana Road Traffic (Vehicle Loads) Regulations, which provides for modern payment methods such as credit/debit cards and bank transfers. In contrast, the remittance of payment regulation in the Zambia Public Roads (Maximum Weight of Vehicles) Regulations provides only for cash payment at the weighbridge.

[***9.*** *Conditions for Carriage of Abnormal or Awkward Loads*

(1) No person may carry an abnormal or awkward load on a public road unless:
(a) a prescribed pre-journey declaration has been made to a national road authority or its duly appointed agent;

[20] Southern Africa Transport and Communications Commission (SATCC), *Enabling Legal Reform: Control of Vehicle Loading*, May 2009 ["Model Legislative Provisions on Management of Vehicle Loading", p. 11].

(b) an abnormal or awkward load fee, as provided for in the Fifth Schedule, has been paid to the national road authority or its duly authorized agent; and
(c) such person has been granted an exemption, where applicable, to operate an over-dimensional vehicle on a public road in legislation dealing with vehicle dimensions,

and such person is not disqualified in terms of the conditions in subsection (2).

(2) A person is disqualified from carrying an overload if:
(a) the carriage of the overload will exceed the rated capacity of the vehicle to be used for such carriage; and
(b) such person:
(i) has an outstanding debt in respect of any monies payable under this Act due to a national road authority; and
(ii) is disqualified from carrying overloads under Section 15 of this Act.

(3) A national road authority may impose supplementary conditions on any person wishing to carry an abnormal or awkward load, including but not limited to;
(a) the presentation of the vehicle and load to be weighed;
(b) the provision of escorts;
(c) the use of warning lights and devices;
(d) travel times; or
(e) any other matter that, in the opinion of a national road authority, is necessary for the safe carriage of such load and the protection of the road infrastructure and the environment.

(4) The national road authority may prescribe a fee on any of the supplementary conditions imposed on the carriage of an overload.]

Comment: As noted during the 1st Stakeholders Workshop, this very complex subject is under the scope of a consultancy undertaken by the Bureau for Industrial Cooperation of the University of Dar es Salaam, but not this project.[21] However, a draft section (based on Sections 13 and 14 of the SADC Model Legislative Provisions) has been included here in square brackets for consideration of the Partner States. As noted, a Schedule providing an abnormal load fee would need to be specified, although such specification is beyond the scope of the current study.

[***10.*** *Measures Relating to Live and Dangerous Cargo*

(1) An authorized officer may, with regard to an overloaded vehicle, instruct the driver to:
(a) offload animals at a designated facility in order to avoid distress or suffering that may result from the detention of such vehicle; or
(b) proceed to an appropriate location to avoid a danger to the health or safety of persons or animals posed by dangerous cargo or to offload such cargo.

(2) In the event that a vehicle is [immobilized] [impounded] under Section 13 of this Act, the national road authority may direct that the cargo be sold or otherwise disposed of or destroyed, provided:
(a) the national road authority has given the owner or operator of the vehicle written notice of the intended sale or disposal; and

[21] The East African Trade and Transport Facilitation Project, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 1st Stakeholders Workshop to Review the Inception Report and Initial Study Findings*, 7–8 February 2011, p. 10, Section 2.9, paragraph xxii.

(b) the owner or operator has failed within the time period specified in such notice to take appropriate measures to dispose of the cargo.

(3) The national road authority shall refund the proceeds of a sale to the owner or operator of the vehicle after deducting the overloading fee and any costs incurred by the national road authority related to such sale or disposal.

(4) The owner or operator of an overloaded vehicle shall be liable to pay compensation for any additional costs that may result from compliance with an instruction of an authorized officer under this section.]

Comment: This useful section was drawn from Regulation 8 of the Botswana Road Traffic (Vehicle Loads) Regulations and is presented in square brackets. The EAC Partner States may opt to not include it in the EAC Act if they consider that it includes a level of detail more appropriate for the EAC Regulations envisaged in Section 39.

11. *Transfer of Overloading [and Abnormal Load] Fees to the Road Fund*

(1) The national road authority or an agent appointed under Section 24 of this Act to collect overloading fees must, on a monthly basis or within such period specified by the relevant Minister pay all overloading fees [and abnormal and awkward load fees] collected to the fines and fees account of the national Road Fund.

(2) The relevant Minister may, upon recommendation of the national Road Fund, prescribe the financial management and audit procedures that a national road authority or an agent shall implement for this purpose of this section.

(3) The Road Fund may appoint independent auditors to audit the accounts of any agent appointed to collect overloading fees [and abnormal and awkward load fees] under this Act.

Comment: This section is based on Section 15 of the SADC Model Legislative Provisions. During the 1st Stakeholders Workshop, a delegate from Kenya stated that a section providing that the collection of fees will go to the national road fund would be "welcome".[22]

12. *Duties of the Carrier*

A carrier:

(a) carries any load at the carrier's own risk and is liable for any damage, other than pavement damage, that may occur to roads, bridges, and other property as a result of such carriage; and

(b) may not remove any signs or structure along any road without the written permission of the person having jurisdiction over that sign or structure.

Comment: This section, based on Section 16 of the SADC Model Legislative Provisions, contains provisions that are normally included in road acts and may be considered unnecessary in this Act, although its inclusion would certainly not cause any harm.

[22] The East African Trade and Transport Facilitation Project, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 1st Stakeholders Workshop to Review the Inception Report and Initial Study Findings*, 7–8 February 2011, p. 13, Section 3.3, paragraph vii.

8.4.5 Part IV: Enforcement

PART IV: ENFORCEMENT

13. *Liability for Vehicle Overloading*

(1) If it is established that a vehicle is carrying a load in excess of the legal load limit, a person owning or operating such vehicle is liable to pay the prescribed overloading fee to a national road authority or duly authorized agent.
(2) If it is established that a vehicle carrying a load in excess of the legal load limit while a journey is being undertaken, the vehicle in question may not continue its journey, unless the load can be redistributed and the vehicle is, upon being reweighed, found to be within the legal load limit, or the vehicle is offloaded to lower its weight below the legal load limit and:
(i) any amounts due under subsection (1) have been paid to the national road authority or its duly appointed agent; or
(ii) a guarantee has been provided to the satisfaction of the national road authority or its duly appointed agent that such amounts will be paid within 7 days.
(3) Any amount due to a national road authority under this section may be enforced by way of a civil court order.
(4) A national road authority or its duly authorized agent is not liable for any loss or damage suffered by a carrier as a result of a vehicle being immobilized during the period contemplated in subsection (2).
(5) The provisions of this section apply in addition to any measures adopted under Section 15 of this Act.

Comment: This section draws from Section 17 on Liability for Overloading Fee in the SADC Model Legislative Provisions, which noted in its annotations that a ban on permitting a vehicle to continue a journey before overloading fees have been paid to a national road authority is an effective enforcement measure.[23] In this respect, it also addresses the detention of overloaded vehicles, which is covered by Regulation 5 of the Botswana Road Traffic (Vehicle Loads) Regulations. A provision assigning responsibility to consignors or consignees, or their managers, agents, or employees, is considered a "bridge too far" and therefore has not been provided here.

14. *Demerit Points System*

(1) The Council may issue a regulation prescribing a demerit points system providing for points to be recorded against a carrier in respect of any failure to comply with a provision of this Act.
(2) The system will provide for:
(a) overloading to be categorized according to degree of severity;
(b) a threshold or thresholds of overloading, which if exceeded, results in one or more of the administrative sections contemplated in Section 15 of this Act being used; and
(c) a reduction of demerit points in cases in which acts of non-compliance are not recorded within specified time periods.
(3) The points contemplated in this section are recorded upon payment, by a carrier, of an overloading fee under Section 5 of this Act.

[23] See source in previous footnote, p. 13 ["A carrier will be taking a significant risk in permitting a noncompliant vehicle to go on the road as the consequences are likely to have a significant impact on bottom line profits."]

Comment: This section is based on Section 18 of the SADC Model Legislative Provisions and provides for a point system similar to that for traffic offenses applied in many jurisdictions worldwide.[24] Reference may also be made to Regulation 12 of the Botswana Road Traffic (Vehicle Loads) Regulations (2008) on Frequent Overloaders, although the content of this regulation is likely too specific for insertion into an EAC Act. More specifics would be provided in a Regulation to be issued pursuant to Section 39.

15. *Administrative Sanctions*

(1) For cases in which a person fails to comply with Sections 6, 13, and 14 of this Act, the Council may issue a Regulation that in addition to recovering any overloading fees, may impose one or more of the following sanctions against the person:
- *(a) a temporary ban on the use of a specified road or route or generally;*
- *(b) the imposition of a higher scale of overloading fees in respect of any future carriage of loads in excess of the legal load limit for a specified period or indeterminately; or*
- *(c) the withdrawal of an operating license.*

(2) The imposition of higher overloading fees may be linked to the demerit points system contemplated in Section 12 of this Act.

Comment: This section is based on Section 19 of the SADC Model Legislative Provisions. Rather than providing for the sanctions to be imposed by the national road authority, it contemplates an EAC Regulation for this purpose.

16. *Offenses*

Any person who:
- *(a) fails to pay any overloading fee legally imposed in terms of this Act;*
- *(b) damages a road by carrying a load in respect of which an overloading fee is payable;*
- *(c) fails to present a vehicle for obligatory weighing as required under Section 6 of this Act; or*
- *(d) fails to comply with the direction or instruction of an authorized officer under Section 19 of this Act*

is guilty of an offence upon formal admission of guilt or conviction to a fine not exceeding USD ____, or imprisonment not exceeding ____ months, or both.

Comment: This section is based on Section 35 of the SADC Model Legislative Provisions, in which it is included perhaps inappropriately in the chapter titled Offences and Miscellaneous Provisions.[25] The offenses specified are relatively few and easy to prosecute

[24] E.g., the Canadian system is described at http://www.rcmp-grc.gc.ca/ns/prog_services/community_policing-police_communautaire/traff/demerit/demerit_explained-eng.htm; the New Zealand system is described at http://www.police.govt.nz/service/road/infringements_faq.html.

[25] The COMESA representative at the First Stakeholders Workshop observed that the parts on offenses and miscellaneous provisions should be separated. The East African Trade and Transport Facilitation Project, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 1st Stakeholders Workshop to Review the Inception Report and Initial Study Findings*, 7–8 February 2011, pp. 14–15, Section 3.3, paragraph xiii.

(i.e., not involving complicated questions of law or evidence).[26] The SADC Model Legislative Provisions do not specify the penalty or penalties for these offenses. For reference, as stated in Chapter 2 of this Interim Report, Tanzania's Road Traffic (Maximum Weight of Vehicles) Regulations (2001) provide for a fee of USD 2,000 for bypassing or "absconding" from a weighbridge (Regulation 13.-3).[27] The phrase "formal admission of guilt" is "inspired" by Part VI (Procedures for Fines and Payments) of the Zambia Public Roads (Maximum Weight of Vehicles) Regulations.

8.4.6 Part V: Authorized Officers

PART V: AUTHORIZED OFFICERS

17. *Appointment of Authorized Officers*

(1) A national road authority may [in writing] [by notice in the Gazette] appoint:
(a) an employee of the national road authority;
(b) an employee of any government agency performing functions on an agency basis under this Act;
(c) an employee of a person operating an accredited weighing station under Part VIII,
as an authorized officer and issue such officer a prescribed certificate of appointment.
(2) The notice contemplated in subsection (1) must specify the period of appointment of such officers.
(3) A national road authority may:
(a) pending an investigation into allegations of failure by an authorized officer to perform his or her duties in a fit and proper manner, suspend the appointment of such officer; and
(b) where in a properly constituted proceeding an authorized officer has been found guilty of such failure, rescind such appointment,
(4) A rescission under subsection (3) must be [made in writing] [published by notice in the Gazette.]

Comment: This section—the first of three on Authorized Officers—sets out the procedures for appointment of such officers. It draws mainly from Section 20 of the SADC Model Legislative Provisions, with reference to Regulation 37 of the Botswana Road Traffic (Vehicle Loads) Regulations (2008).

18. *Powers of Authorized Officers*

(1) An authorized officer [may] [shall have the power to]:
(a) require the driver of a vehicle to stop the vehicle for the purposes of weighing and inspecting the vehicle;

[26] Southern Africa Transport and Communications Commission (SATCC), *Enabling Legal Reform: Control of Vehicle Loading*, May 2009 ["Explanatory Memorandum", section 20 (unpaginated)].
[27] Also, these Regulations provide for a fine of at least USD 2,000 and/or imprisonment of up to six months, for offenses related to misuse of special permits issued by the Road Authority (Regulation 6 b), or seemingly "any person who … drives or uses or causes or permits to be driven … any motor vehicle or trailer on any road in contravention of any provision of these Regulations" (Regulation 6 a), although the application of criminal penalties in the latter case is not clear in the Regulations.

(b) direct a driver to proceed to a weighing station for the purposes of weighing the vehicle;
(c) enter the vehicle;
(d) inspect:
(i) any load being carried in or on the vehicle; and
(ii) any record relating to any load carried in or on the vehicle;
(e) weigh the vehicle and any load being carried in or on the vehicle;
(f) determine the mass of all axles or axle units on a vehicle or combination of vehicles;
(g) direct the driver to offload a vehicle at a place determined by the officer or to adjust the load to ensure that the vehicle is loaded within limits;
(h) detain a vehicle until such time as an overloading fee has been paid or proof, in the manner determined by the director of the national road authority, has been provided that arrangements have been made to pay the fee;
(i) direct the driver of a vehicle carrying live or dangerous cargo to proceed to any place determined by the officer to ensure the safety of the cargo, persons, or property;
(j) drive a vehicle to any place if a driver is incapable or unwilling to comply with an instruction of the officer, provided the officer holds a valid driving license for the vehicle or alternatively authorizes any other person with a valid license to drive the vehicle;
(k) inspect any record relating to, issued, or required under any transport law or regulation;
(l) make inquiries of any person who owns or operates the vehicle being inspected; and
(m) perform or cause to be performed tests or examinations of or in respect of the vehicle or any load carried in or on the vehicle.

(2) In exercising the powers contemplated in subsection (1), the officer shall not be liable for any damage to or loss in respect of a vehicle or its load, unless it is shown that the officer acted without reasonable care.

Comment: This section—the second of three on Authorized Officers—enumerates the powers of an authorized officer and provides them with immunity for damages caused unless they act without reasonable care. The first subsection is drawn mainly from the SADC Model Legislative Provisions, but particularly subsections (g) to (j) are drawn from Regulation 37 of Botswana Road Traffic (Vehicle Loads) Regulations. The second subsection is also based on Regulation 37 of the Botswana legal instrument.

19. *Duty of Drivers to Stop Upon Instruction of an Authorized Officer*

A driver of a vehicle must:
(a) on being signaled or requested to do so by an authorized officer with the prescribed identification markings; or
(b) if requested to do so by an authorized officer who has produced his or her certificate of appointment,
forthwith take the vehicle to a weighing station as directed by the authorized officer.

Comment: This section—the third of three on Authorized Officers—is based on Section 22 of the SADC Model Legislative Provisions. It establishes the duty of drivers to stop at the request of authorized officers and proceed with them to a weighing station if so directed.

8.4.7 Part VI: Voluntary Compliance

PART VI: VOLUNTARY COMPLIANCE

20. *Partners in Compliance Programs*

Each national road authority shall incrementally develop a voluntary compliance program aimed at:

(a) establishing procedures and practices that assist carriers in improving their compliance with the provisions of this Act, including measures to promote self-regulation;

(b) introducing economic or financial incentives to encourage improved rates of compliance by carriers; and

(c) encouraging investment by carriers, individually or through representative organizations, in:

(i) single or common user weighing stations; and

(ii) state-of-the-art technology applicable to weight measurement, data collection, processing, and exchange.

Comment: This section draws from Section 23 in the SADC Model Legislative Provisions but makes reference to the concept of "self-regulation" in subsection (c). This concept developed in recent years in the Republic of South Africa[28] received considerable support during the 1st and 2nd Stakeholders Workshops[29] and during the country visits made by the JICA Study Team in January–February 2011.[30] There are no comparable provisions in the good-practice Botswana and Zambian models examined.[31]

[28] E.g., since March 2007, the South African sugar industry (consisting of over 42,000 growers, more than 430 transport companies, and 13 sugar mills) has implemented a Road Transport Management System (RTMS) and internally self regulated their 21 million ton per annum sugarcane supply chain, resulting in a substantial reduction in vehicle overloading. http://www.rtms.co.za/industry-participation/sugar and http://www.selfregulation.co.za/Sugar.aspx. Also refer to Sections 6.1.4 and 6.2.4 of this report, including Box 6-1.

[29] E.g., At the 1st Stakeholders Workshop, "[t]he delegate from the Northern Corridor Transit Transport Coordinating Authority supported self-regulation. He called for installation of weighbridges at the port so that the shipper can determine that he/she is within allowable limits, and a certificate of compliance should be issued"; "a Uganda delegate pointed to the importance of innovative refinements such as in the area of self-regulation"; "[t]he Federation of East African Freight Forwarding Associations representative noted the importance of self-regulation"; "[a] private sector representative from Uganda noted the authorized economic operator (AEO) program of the World Customs Organization, which provides incentives to comply with laws and regulations; "[a]nother delegate suggested that the known mechanisms for self-regulation should be considered in legal drafting". The East African Trade and Transport Facilitation Project, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 1st Stakeholders Workshop to Review the Inception Report and Initial Study Findings*, 7–8 February 2011; and East African Community, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 2nd Stakeholders Workshop to Review the Interim Report and Advise on Ways Forward, Report of the Workshop*, May 2011, p. 9, item (xviii).

[30] E.g., Interview with Mr. Marvin Baryaruha (Legal Counsel) and Mr. William Tumwine (Legal Officer), Uganda National Roads Authority, 25 January 2011 ["self-regulation is the solution"].

[31] The draft SADC MOU on Vehicle Loading included a brief article (Article 10) on Voluntary Compliance, simply stating that "Member States agreed to adopt appropriate arrangements to support incremental voluntary compliance which may include introduction of co-operative training programmes and additional incentives to reward increased voluntary compliance." Southern Africa Transport and Communications Commission (SATCC), *Enabling Legal Reform: Control of Vehicle Loading*, May 2009 ["Memorandum of Understanding on Vehicle Loading", Article 10, p. 9]. Also see the Dar es Salaam Corridor Memorandum of Understanding on Vehicle Loading in Chemonics International, Inc. [Advisor: Evans S. Marowa, Short-term Transport Operations Specialist], *Technical Report: Proposed Harmonized System for Vehicle Overload Control*, submitted to Regional Center for Southern Africa, U.S. Agency for International Development, September 2003, p. 16.

8.4.8 Part VII: Network Development

PART VII: NETWORK DEVELOPMENT

[21. *Regional Network of Weighing Stations*

(1) The effectiveness of overloading control on a regional basis shall be ensured through the development of a regional network of weighing stations that will be effective and sustainable in respect of both domestic and international traffic.
(2) Weighing stations forming part of the regional network shall be strategically and equitably located on the regional trunk road network.
(3) In locating weighing stations, preference shall be given to the establishment of weighing stations in common control areas at border posts.
(4) The Council may issue a Regulation establishing the regional network of weighing stations.
(5) The Partner States shall monitor, on an ongoing basis, the effective operation of regional network weighing stations and related equipment and, where this is found to be inadequate, the Partner States shall maximize national and regional financial and human resources, by:
(a) promoting joint use of weighing stations and related facilities;
(b) promoting joint management of weighing stations and related facilities;
(c) exploring options for joint funding of infrastructure and equipment upgrading; and
(d) jointly procuring private investment and technology transfers for upgrading of existing facilities and establishment of new facilities.]

Comment: This section, presented in square brackets for the consideration of the Partner States, is based on Article 5 of the draft SADC Memorandum of Understanding on Vehicle Loading, [32] a draft regional agreement, as opposed to the SADC Model Legislative Provisions, which comprise a draft (national) law.

22*.* *National Network Strategy*

(1) [Each] [A] national road authority [shall][may], within six months of commencement of this Act, prepare an outsourcing strategy comprising:
(a) a weighing station strategic plan, consisting of:
(i) the identification of existing and future weighing stations sites along the major transport corridors and commercial vehicle routes;
(ii) a procurement schedule incorporating:
(aa) rehabilitation and upgrading of existing weighing stations;
(bb) construction and operation of new weighing stations;
(cc) outsourcing of operations; and
(dd) time scales for the actions contemplated in subparagraphs (i), (ii), and (iii) of this paragraph; and
(iii) an identification of options for private investment.
(b) an outsourcing plan, providing for:

[32] It also appears in the Dar es Salaam Corridor Memorandum of Understanding on Vehicle Loading in Chemonics International, Inc. [Advisor: Evans S. Marowa, Short-term Transport Operations Specialist], *Technical Report: Proposed Harmonized System for Vehicle Overload Control*, submitted to Regional Center for Southern Africa, U.S. Agency for International Development, September 2003, p. 14 (Article 5).

(i) an assessment of national road authority functions contemplated in this Act that may be outsourced, including but not limited to state-of-the-art technology applicable to:
(aa) weight measurement;
(bb) data collection, processing, and exchange;
(cc) compliance records and demerit points systems; and
(dd) performance auditing
(ii) a procurement schedule identifying time scale and priorities for outsourcing; and
(iii) an identification of outsourcing options.

(2) [Each] [A] national road authority [shall][may] present its strategy to the relevant Minister for consideration and approval.

(3) The relevant Minister may publish the strategy or extracts in the Gazette or a newspaper of national circulation for comment.

Comment: This section is drawn from Section 25 of the SADC Model Legislation Provisions, although a choice between mandatory and optional options has been provided in subsections (1) and (2). It is mandatory in the SADC model text.

23. *Outsourcing of Functions of the National Road Authority*

(1) Subject to subsection (2) and Section 24 of this Act, a national road authority may outsource any of the functions contemplated in subsection (2), by appointing:
(a) any other government agency; or
(b) any private person,
as an agent.

(2) A national road authority may outsource:
(a) the collection of overloading fees [and abnormal and awkward load fees];
(b) the operation and maintenance of databases supporting the vehicle loading management system;
(c) the provision, operation, and maintenance of weighing stations; and
(d) the performance of enforcement and compliance functions.

Comment: This section is based on subsections (1) and (3) of Article 25 of the SADC Model Legislative Provisions,[33] which in a note state that the aim is to provide maximum flexibility in assuring that adequate institutional capacity is available for governments to implement the Provisions. If a national road authority does not currently have direct responsibility for control of vehicle overloading and a transition period is required before it can assume this responsibility, this section accommodates this requirement by allowing the road authorities to appoint authorities currently responsible for the control of overloading to continue to carry out these functions as agents of the national road authority. Also, the section provides for the outsourcing of certain functions to the private sector (e.g., fee collection) as agents in return for compensation through user fees.[34]

[33] Subsections (2) and (4) relate to an Investment in Transport Act that does not apply here.
[34] Southern Africa Transport and Communications Commission (SATCC), *Enabling Legal Reform: Control of Vehicle Loading*, May 2009 ["Model Legislative Provisions on Management of Vehicle Loading", p. 17].

24. *Agency Agreements*

(1) A national road authority may conclude agency agreements to outsource any function to a person contemplated in Section 23 of this Act.
(2) An agency agreement may provide for:
(a) the setting of performance targets;
(b) bonus or incentive payments in cases in which targets are exceeded;
(c) reduced compensation in cases in which targets are not met;
(d) regular and random audits; and
(e) any other matter necessary to achieve the objectives of this Act.

Comment: This section is drawn from Section 26 of the SADC Model Legislative Provisions, and the comment on Section 23 above also applies in relation to this section.

25. *Compensation of Agents*

(1) Where any agreement is concluded to outsource a function of a national road authority, such agreement must, subject to Section 24, provide for fair and adequate compensation of an agent in line with commercial principles.
(2) An agreement contemplated in subsection (1) may in the case of the outsourcing of fee collection provide for the retention of an administrative component of the fee structure as compensation.

Comment: This section follows Section 27 of the SADC Model Legislative Provisions and assures fair compensation of a national road authority for outsourced functions. Subsection (2) is a corollary of subsection (1) and perhaps need not be stated, but does add clarity in the particular case specified.

8.4.9 Part VIII: Weighing Stations, Weighing Equipment, and Weighing Operations

PART VIII: WEIGHING STATIONS, WEIGHING EQUIPMENT, AND WEIGHING OPERATIONS

26. *Power to Install Weighing Stations and Conduct Weighing Operations*

(1) A national road authority may cause weighing stations or other devices for measurement of weights to be installed on any public road.
(2) The devices may be fixed or portable.
(3) The national road authority may approve the use of weighing devices owned or leased by institutions other than the national road authority for measurement of weights only if the devices are within the specifications approved by the national road authority and authorized by the body responsible for weights and measures.
(4) The national road authority may provide guidelines for proper use of weighing devices by drivers at a weighbridge.

Comment: This section is based mainly on the section on Constitution of Weighing Devices in the Zambia Public Roads (Maximum Weight of Vehicles) Regulations and to a lesser extent on Regulation 18 of the Botswana Road Traffic (Vehicle Loads) Regulations. It was preferred to the almost laissez-faire approach of the SADC Model Legislative Provisions, which may lead to a proliferation of weighbridges or certainly a supply of weighbridges greater than what is economically optimal. The Partner States may wish to consider closely the text on "portable" weighbridges, considering that it has been argued that portable or mobile weighbridges should be used for screening purposes only because of accuracy issues.[35]

27. *Authorization of Scales and Devices*

Only scales and devices that have been verified and calibrated according to the manufacturer's specifications and have been authorized by the body responsible for weights and measures shall be used in the enforcement of this Act.

Comment: This section is based on the section on Authorization of Devices in the Zambia Public Roads (Maximum Weight of Vehicles) Regulations and to a lesser extent on Regulation 20 of the Botswana Road Traffic (Vehicle Loads) Regulations.

28. *Certificates of Approval*

(1) The body responsible for weights and measures shall issue a certificate of approval for each and every weighing station after a test of the device or acceptance of the recommendations of the International Organisation of Legal Metrology (Organisation Internationale de Métrologie Légale, OIML).
(2) The maximum validity of such certificates of approval is one year.
(3) The certificate shall be displayed at the weighing station and allowed to be inspected by transporters on demand.
(4) A weighing station with an invalid certificate may not be allowed to be used for enforcement purposes.

Comment: This section is based on the section on Certificates of Approval in the Zambia Public Roads (Maximum Weight of Vehicles) Regulations. OIML (http://www.oiml.org/) is an intergovernmental organization established in 1955 to promote the global harmonization of legal metrology procedures. Kenya and Tanzania are members of OIML, while Rwanda is a "corresponding member". The JICA Study Team has added subsection (2) to require at least annual verification of weighing stations as called for by a resolution of the Regional

[35] At the 2nd Stakeholders Workshop, Kenya stated that, particularly along the Northern Corridor, mobile axle scales should not be used for enforcement, but only for monitoring. Kenya is also moving from single axle weighbridges to group axle weighbridges, which are more accurate. Uganda observed that a mobile weighbridge can be used in the static mode for single-axle weighing and can be accurate, if properly accredited, and therefore can be used for enforcement. East African Community, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 2nd Stakeholders Workshop to Review the Interim Report and Advise on Ways Forward, Report of the Workshop*, May 2011, p. 9, items (ii) and (iii).

Workshop on Harmonization of Key Elements and Implementation of Best Practice in Overload Control (Nairobi, July 2008).[36]

29. *Accreditation of Weighing Stations, Audits, and Random Inspections*

(1) A weighing station to be used for enforcement purposes shall be accredited by the national road authority or any institution for accreditation appointed by the national road authority.
(2) No weighing station shall be accredited for enforcement by a national road authority unless it complies with the minimum standards for accreditation issued by the national road authority.
(3) The national road authority shall issue a regulation specifying different standards for different types of weighing stations regarding:
  (a) the volume of traffic on the route along which the weighing station is or will be situated;
  (b) the category or type of vehicles that will be weighed at the weighbridge station;
  (c) whether the weighing station will be jointly managed under a bilateral or multilateral agreement between or among governments of the Partner States; and
  (d) whether the weighing station will be managed by an appointed agent to operate the weighbridge on behalf of the national road authority.
(4) The national road authority shall conduct an inspection to verify whether a weighing station complies with the standard and in the event of a positive finding issue a certificate of accreditation.
(5) An accredited weighing station shall be subject to an annual technical audit by [the national road authority] [a qualified independent audit organization appointed by the relevant Minister] to confirm that it meets the requirements for accreditation.
(6) The body responsible for operating the weighing station shall provide the national road authority with all reasonable assistance in undertaking the audit including:
  (a) any information that may be requested;
  (b) access to the documentation relating to the operation of the weighing station, including the storage of data records;
  (c) access to any part of the weighing station and facilities; and
  (d) access to any person employed with regard to the operation of the weighing station.
(7) If the findings of an annual audit are that a weighing station no longer complies with the prescribed standards, a national road authority may:
  (a) issue a directive in writing to the responsible body for operating the weighing station to ensure compliance within the period specified by the directive;
  (b) suspend the certificate of accreditation pending such compliance; or
  (c) revoke the certificate of accreditation.
(8) A certification of accreditation may be [renewed] [reissued] if a weighing station is found to comply with the prescribed standards after an accreditation inspection has been conducted.
(9) The national road authority may at any time conduct a random inspection of a weighing station for the purpose of verifying compliance with a standard applicable to the station.

[36] InfraAfrica (Pty) Ltd in association with Africon Limited, Council for Scientific Research (CSIR), and TMT Projects (Pty), *Regional Workshop on Harmonization of Key Elements and Implementation of Best Practice in Overload Control, Workshop Report*, Nairobi, 10–11 July 2008, p. 13.

Comment: This section is mainly based on the section on Fixed Weighbridges and Their Use in the Zambia Public Roads (Maximum Weight of Vehicles) Regulations and Sections/subsections 30(2) and 31 o f the SADC Model Legislative Provisions on Accreditation of Weighing Stations and Annual Audits and Random Inspections. Subsection (5) provides for an audit, at least annually, as called for by a resolution of the Regional Workshop on Harmonization of Key Elements and Implementation of Best Practice in Overload Control (Nairobi, July 2008).[37] One option, "inspired" by Regulation 39 of the Botswana Road Traffic (Vehicle Loads) Regulations, provides for audits to be performed by a qualified independent audit organization appointed by the relevant Minister.

30. *Weighing Operations*

(1) An authorized officer shall ensure that the scale is set to zero before commencing a weighing operation.
(2) The mass of a single axle shall be determined by weighing such axle individually.
(3) The mass of an axle unit shall be determined by weighing such unit in one operation. If an axle unit cannot be weighed in one operation due to the size of the scale, the mass of the unit shall be determined by weighing each axle or axle unit individually and calculating the sum of the masses of the individual axles.
(4) The mass of a vehicle or combination of vehicles shall be determined by weighing the vehicle or entire combination in one operation. If a vehicle or combination of vehicles cannot be weighed in one operation due to the size of the scale, the gross mass of the vehicle or combination of vehicle shall be determined by weighing each axle or axle unit individually and calculating the sum of the mass of the individual axle and axle units.
[(5) An axle or combination of axles shall be deemed overloaded if the load exceeds the legal load limit after addition of x% of allowable mass and then rounding down to the nearest hundred kilograms. A vehicle shall be deemed overloaded if the load exceeds the legal load limit after addition of x% of allowable mass and then rounding down to the nearest 100 kilograms.]

Comment: This section is based mainly on Regulations 22–24 of the Botswana Road Traffic (Vehicle Loads) Regulations and the part of the Zambia Public Roads (Maximum Weight of Vehicles) Regulations on the Calculation of Load and Procedures. More details, if necessary, may be specified in a Regulation to be issued by the Council in accordance with Section 39.[38]

Subsection 5 d raws from the Regulation on Overload Determination in the Zambia instrument, although in that case the tolerance (5%) only applies to an axle or combination of axles and not to gross vehicle/combination mass. As noted in Chapter 2 of this Interim Report, practice with respect to operational allowances/tolerance varies among the Partner States, although the Regional Workshop on Harmonization of Key Elements and Implementation of Best Practice in Overload Control (Nairobi, July 2008) called for a mass tolerance of 5% on axle, axle unit, vehicle, and vehicle combination mass.[39] At the 2nd Stakeholders Meeting in Nairobi on 30-31 May 2011, Kenya and Tanzania stated that they

[37] See previous footnote.
[38] At the 2nd Stakeholders Meeting, Kenya expressed support for a standardized weighbridge specification to facilitate cross-border movement. East African Community, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 2nd Stakeholders Workshop to Review the Interim Report and Advise on Ways Forward, Report of the Workshop*, May 2011, p. 9, item (ii).
[39] See previous footnote.

prefer zero tolerance on gross vehicle/combination mass, while the other countries preferred 2% (all countries accepted 5% tolerance on axles).[40] Section 7.4.2 of this report recommends that a weighing tolerance of 5% on both axles and gross vehicle/combination mass be adopted on a regional basis. However, at the Extraordinary Task Force Meeting held in Bujumbura on 29-30 June 2011, the Partner States agreed in principle that a 5% tolerance on axle weight be allowed and maximum limits for gross vehicle mass (GVM) or gross combination mass be inclusive of all tolerances.[41]

31. *Data Management*

(1) Weighing stations for enforcement purposes shall store records from operations, identifying the vehicles weighed at the stations and the data recorded locally shall be transmitted to a central database administered by the national road authority, in a mode and with the content prescribed by the national road authority.
(2) Each national road authority shall submit quarterly and annual reports collating data collected by all weighing stations to the body established in Section 32 of this Act.

Comment: This section is based on a comparable regulation on Data Storage and Operations in the Zambia Public Roads (Maximum Weight of Vehicles) Regulations and on Regulation 35 in the Botswana Road Traffic (Vehicle Loads) Regulations. The COMESA delegate at the 1st Stakeholders Workshop recommended that the legal instrument provide for (annual) reporting by management with statistics that can be shared by the EAC and other agencies.[42]

8.4.10 Part IX: Institutional Arrangements

PART IX: INSTITUTIONAL ARRANGEMENTS

32. *Establishment, Composition, and Tenure of a Regional Vehicle Loading Advisory [Committee] [Subcommittee of the EAC Transport Authority]*

(1) A Regional Vehicle Loading Advisory [Committee] [Subcommittee of the EAC Transport Authority] comprised of equal numbers from each Partner State of representatives of the competent authorities and the private sector shall be established to coordinate and monitor activities under this Act.
(2) Each Partner State shall nominate three representatives, at least one of whom shall be a representative of the private sector, as members of the [Committee] [Subcommittee] established under subsection (1).
(3) The tenure of the individual [Committee] [Subcommittee] members shall be three years.

[40] East African Community, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 2nd Stakeholders Workshop to Review the Interim Report and Advise on Ways Forward, Report of the Workshop*, May 2011, p. 13.
[41] East African Community, *Extraordinary Task Force Meeting for the Study on the Harmonization of Overload Control Regulations in the East African Community, Report of the Meeting*, June 2011, Sections 3.2 and 4.0 (iii) and (iv), pp. 4-5.
[42] The East African Trade and Transport Facilitation Project, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 1st Stakeholders Workshop to Review the Inception Report and Initial Study Findings*, 7–8 February 2011, p. 15, Section 3.3, paragraph xiii.

Comment: This section draws upon Section 49 of the One Stop Border Post Act establishing a similar body for implementation of that Act (in that case, a one-stop border posts board). At the 1st Stakeholders Workshop, the importance of providing for institutional arrangements in the Act was stressed.[43] It was observed that there is a proposal to form an EAC Transport Authority, which could be mandated to provide policy guidance on the implementation of the Act. It was noted that this is a subject for discussion by institutional experts. Article 15 of the draft SADC MOU on Vehicle Loading envisages a Regional Vehicle Overloading Control Association.[44] Once the precise title of the body is decided, it may be defined in the glossary in Section 2 of this Act so that this Part can be shortened accordingly.

33. *Responsibilities of the Regional Vehicle Loading Advisory [Committee] [Subcommittee of the EAC Transport Authority]*

Without prejudice to the generality of Section 32 of this Act, the Regional Vehicle Loading Advisory [Committee] [Subcommittee of the EAC Transport Authority] [shall] [may]:

(a) identify opportunities to integrate national overloading control systems;
(b) identify the optimal regional allocation of permanent weighing stations;
(c) identify the optimal utilization of mobile weighing stations in support of the regional weighing station network;
(d) harmonize the development of a regional overloading control information system that accommodates trucker- and shipper-based risk analysis;
(e) harmonize the design and implementation of a regional demerit points system and harmonizing penalties for vehicle offenders;
(f) monitor the incidence and levels of corruption relating to vehicle loading;
(g) harmonize regional training programs for national road authority personnel, the traffic police, and other persons involved in vehicle overloading control systems; and
(h) disseminate information on the objectives, design, functions, and procedures of a regional system of overloading control.

Comment: This section mainly draws from Article 15(1) of the draft SADC MOU on Vehicle Loading. The responsibilities may be made mandatory or optional. As indicated in the introductory text (drawn from Section 50 the EAC One Stop Border Posts Act), the list is non-exclusive.

34. *Meetings of the Regional Vehicle Loading Advisory [Committee] [Subcommittee of the EAC Transport Authority]*

(1) The Regional Vehicle Loading Advisory [Committee] [Subcommittee of the EAC Transport Authority] shall meet at least [twice][four times] a year and alternate the venues of its meetings in each of the Partner States.

[43] See source in previous footnote, p. 14, Section 3.3, paragraph ix.
[44] Southern Africa Transport and Communications Commission (SATCC), *Enabling Legal Reform: Control of Vehicle Loading*, May 2009 ["Memorandum of Understanding on Vehicle Loading", Article 15, pp. 10–11].

(2) The chair of the Regional Vehicle Loading Advisory [Committee] [Subcommittee of the EAC Transport Authority] shall rotate according to the established procedures of chairing East African Community organs and institutions.
(3) The Regional Vehicle Loading Advisory [Committee] [Subcommittee of the EAC Transport Authority] shall regulate its own meetings and rules of procedure and shall adopt its decisions by consensus. It shall keep a record of its own proceedings. In the event of a failure to reach consensus, the Regional Vehicle Loading Advisory [Committee] [Subcommittee of the EAC Transport Authority] shall refer such matters to the Council through the appropriate sectoral Councils.
(4) In the exercise of its functions, the Regional Vehicle Loading Advisory [Committee] [Subcommittee of the EAC Transport Authority] may co-opt any such persons as it deems appropriate on any matter for its consideration.

Comment: This section is based primarily on Section 51 of the EAC One Stop Border Posts Act on Meetings of the Board and secondarily on Article 15(1) of the draft SADC MOU on Vehicle Loading. The former calls for meeting twice a year, the latter for meetings four times a year.

35. *Liaison with Other Regional Economic Communities*

The *Regional Vehicle Loading Advisory [Committee] [Subcommittee of the EAC Transport Authority] shall regularly liaise with its counterparts in neighboring regional economic communities.*

Comment: This section is aimed at promoting further harmonization with the Tripartite framework (i.e., with COMESA and SADC) and beyond.

8.4.11 Part X: Miscellaneous Provisions

PART X: MISCELLANEOUS PROVISIONS

36. *Temporary Measures*

(1) This Act shall not affect the rights of any Partner State to take temporary measures in the interests of defense and security, public safety, public order, economic interests of the Partner State, and any other circumstances of a similar nature.
(2) Such temporary measures may include, but not be limited to, implementation of stricter legal load limits than provided for in this Act.
(3) The Partner State taking any temporary measures under this section shall, prior to taking such temporary measures, inform the other Partner States without delay through the exchange of diplomatic notes. In circumstances where prior notification is not practical, the Partner State taking such temporary measures shall simultaneously inform the other Partner State of the temporary measures imposed through the exchange of diplomatic notes.

Comment: This section is based on Sections 56 and 57 of the EAC One Stop Border Posts Act on the rights of Partner States to take temporary measures (Section 56) and their duty to inform others (Section 57). It responds to a suggestion by a Kenya delegate at the 1st

Stakeholders Workshop to include a provision in the legal framework to account for emergencies (e.g., if a bridge collapses).[45]

37. *Extraterritorial Performance of Duties*

(1) Any person who is authorized to exercise his or her powers and perform his or her duties in one of the Partner States in respect of vehicle loading:
(a) may independently perform all duties and powers in another Partner State in terms of the laws of his or her Partner State;
(b) may independently perform all duties and powers within his or her Partner State on behalf of another Partner State in terms of that other Partner State's laws; and
(c) may independently perform all duties and powers in another Partner State on its behalf in terms of that other Partner State's laws.
(2) The duties and powers contemplated in subsection (1), must include the power to perform any of the functions contemplated in Section 18 of this Act.
(3) Any offense under the laws of one Partner State committed at a shared weighing station facility located wholly in the territory of another Partner State is deemed to have been committed in the territory of the first Partner State.

Comment: This section is based on Section 36 of the SADC Model Legislative Provisions on Extraterritorialty. During the 2nd Stakeholders Workshop, the EAC Secretariat noted the importance of extraterritorial jurisdiction with respect to weighbridges; this will go beyond what is existing in national legal regimes, adopting international good or best practice.[46] It is required if shared weighbridges at border crossing points are envisaged.

38. *Dispute Resolution*

(1) Any dispute that may arise in the interpretation, application, and implementation of this Act and any Regulations shall be resolved by and between the Partner States amicably and in the spirit of friendship and co-operation.
(2) The Partner States shall, in resolving such disputes, primarily be guided by the need to give effect to the paramount objectives of this Act.
(3) Any dispute between or among Partner States in terms of this Act that remains unresolved for a period of more than 180 days from the time such dispute is declared shall be referred for settlement in accordance with the provisions of the dispute settlement procedure stipulated in Article 32 of the Treaty.

Comment: This section is based on Sections 58 and 59 of the EAC One Stop Border Posts Act, providing for mutual resolution first (Section 58) and reference to EAC mechanism (Section 59).

[45] The East African Trade and Transport Facilitation Project, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 1st Stakeholders Workshop to Review the Inception Report and Initial Study Findings*, 7–8 February 2011, p. 14, Section 3.3, paragraph xi. This section is analogous to Article 40 the Greater Mekong Subregion Cross-Border Transport Agreement providing that "[e]ach Contracting Party may temporarily suspend the application of the Agreement with immediate effect in the case of emergencies affecting its national safety". See http://adb.org/GMS/Cross-Border/part10.asp.

[46] East African Community, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 2nd Stakeholders Workshop to Review the Interim Report and Advise on Ways Forward, Report of the Workshop*, May 2011, p. 12, items (xx).

39. *Regulations*

The Council may make Regulations providing for any matter which by this Act is required to be prescribed or which is considered necessary or desirable to be prescribed for giving effect to the purposes of this Act.

Comment: This is a standard provision in EAC Acts allowing the Council to issue Regulations. As mentioned in the draft text of the Act, such Regulations may for example cover measures relating to live and dangerous cargo (Section 10); imposition of administrative sanctions (Section 14); the details of a demerit points systems (Section 16); the establishment of a regional network of weighing stations (Section 21); specification of different standards for different types of weighing stations (Section 29); and sample forms (e.g., vehicle weighing report, weighing certificate). However, as noted, at this stage what is important is for the Partner States to agree on an EAC framework, an EAC Act, for harmonization of vehicle overload control.[47]

40. *Act to Take Precedence*

This Act shall take precedence over the Partner States' laws with respect to any matter to which its provisions relate.

Comment: This is also a standard provision in EAC Acts. Although arguably it is not required since according to subparagraph (4) of Article 8 of the EAC Treaty such a supranational Act will take precedence over contrary national laws or regulations, inclusion of this section causes no harm and provides added clarity.

41. *Requirement of Partner States to Conform Their National Laws and Regulations to this EAC Act*

Where necessary, the Partner States undertake to conform their relevant national laws and regulations to the contents of this EAC Act.

Comment: Although not a standard provision of EAC Acts to date, this proposed section would require the Partner States to align their relevant national laws and regulations to the EAC Act. Again, although arguably it is not required since according to subparagraph (5) of Article 8 of the EAC Treaty the Partner States are to undertake the necessary legal instruments to confer precedence to EAC laws over similar national ones, inclusion of this section causes no harm and may provide added clarity.

[47] At the 2nd Stakeholders Workshop, the EAC Secretariat clarified that it has developed regional regulations on similarly technical issues, e.g., in the civil aviation subsector. Short-term expert inputs can be mobilized, if necessary. East African Community, *Study on the Harmonization of Overload Control Regulations in the EAC Region, 2nd Stakeholders Workshop to Review the Interim Report and Advise on Ways Forward, Report of the Workshop*, May 2011, p. 12, item (xxi).

8.4.12 Schedules

Schedules to be prepared include the following:

First Schedule: Maximum Gross Vehicle Mass

Second Schedule: Maximum Axle Load Limits

[Third Schedule: Overloading Fees for Overloaded Gross Vehicle Mass

Fourth Schedule: Overloading Fees for Overloaded Axles

Fifth Schedule: Abnormal or Awkward Load Fees]

As noted, specification of the required schedules will require economic and engineering (as opposed to legal) technical inputs from the JICA Study Team, as well as discussion between and among the experts from the respective EAC Partner States.