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SUB-SAHARAN AFRICA TRANSPORT POLICY PROGRAM



Guidelines on Vehicle Overload Control in Eastern and Southern Africa

Michael Ian Pinard



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in Eastern and Southern Africa

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Sub-Saharan Africa Transport Policy Program

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FOREWORD

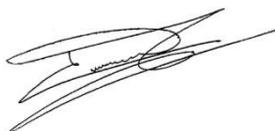
Heavy goods vehicle overloading is a serious problem across much of Sub-Saharan Africa. Such overloading not only significantly accelerates the rate of deterioration of road pavements but, when coupled with inadequate funding for road maintenance, it contributes significantly to poor road conditions and high transport costs. The indicative cost of overloading in East and Southern Africa has been estimated at more than US\$4 billion per annum. This exceeds the amounts being spent on road rehabilitation. Therefore, unless the problem is tackled head on, it will negate the expected benefits from the huge amounts of resources that countries and donors are investing into improved road infrastructure across the continent. The cost associated with vehicle overloading can be avoided through effective control measures.

The guidelines presented here are an important contribution to tackling the challenge of vehicle overloading in East and Southern Africa. The proposed solutions should be relevant to other parts of Africa as well as to other developing regions of the world. The document makes two facts very apparent: there are in various countries numerous examples of effective overload control strategies which have shown positive results and vehicle axle load control is a multidisciplinary and multi-stakeholder effort. In other words, vehicle overload control is not an intractable problem and can be tackled effectively with benefits to all road users and to society at large.

These guidelines are based on the lessons that can be learnt from different experiences, emerging good practices and technical options for dealing with various aspects of vehicle overloading in East and Southern Africa. Some of the strategies identified include incentives to encourage self-regulation by truckers, administrative controls, explicit links between penalties and actual road damage, training and strict enforcement. When effectively carried out, these measures and others will lead to operating environments that promote fair competition between service providers and reduced costs of infrastructure maintenance. Ultimately, the proposed national and regional approaches lead to improved efficiency of transport operations and better facilitation of trade along regional transport corridors.

The guidelines emphasize also the importance of recognizing that vehicle axle load control involves numerous players, both public and private. The players include politicians and policy makers, truck operators, road funding and maintenance authorities and the police, among others. Unless each of these categories of players contributes to the design and implementation of sustainable solutions, then the problem will not be properly tackled. If one of these parties does not play a constructive role then the benefits from the work of the other players will be negated. Awareness of the rationale and benefits of effective vehicle overload control is therefore important.

The Regional Economic Communities (COMESA, EAC, SADC), international bodies (UNECA, USAID, World Bank), private sector associations (FESARTA), and country experts, who contributed to this report should be commended for tackling a subject that is often ignored, but which has potentially large economic implications. In fact the three RECs have already taken the next critical step of adopting these guidelines for use in their member countries. As is usual with such seemingly difficult subjects, implementing the very sound recommendations here will require serious commitment, support and follow-up from the same parties. They should take encouragement from the fact that it is feasible and desirable to implement effective vehicle axle load control programs.

A handwritten signature in black ink, consisting of several overlapping, fluid strokes that form a cursive name.

Hachim Koumaré

United Nations Economic Commission for Africa
Chairman of the SSATP Board

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ABBREVIATIONS

AASHO	American Association of State Highway Officials
ASANRA	Association of Southern Africa National Roads Agencies
AU	African Union
BOT	Built Operate and Transfer
CBOCS	Cross border overload control system
CBRTA	Cross Border Road Transport Agency
COMESA	Common Market for Eastern and Southern Africa
CPC	Corridor Planning Committee
CSIR	Council for Scientific and Industrial Research
DCE	Department of Customs and Excise
DRTS	Department of Road Transport and Safety
EAC	East African Community
ECA	Economic Commission for Africa
ECOWAS	Economic Community for Central African States
ESA	Equivalent standard axle
FESARTA	Federation of Eastern and Southern African Road Transport Associations
FTCC	Full traffic control center
GCM	Gross combination mass
GVM	Gross vehicle mass
HGV	Heavy goods vehicle
HSWIM	High speed weighing in motion
LAP	Load Accreditation Program
LCC	Lay-by control center
LSWIM	Low speed weighing in motion
MLP	Model legislative provisions
MoU	Memorandum of Understanding
NDoT	National Department of Transport
NEPAD	New Partnership for Africa's Development
OCMI	Overload Control Management Initiative
PBS	Performances based system

PPP	Public-Private Partnership
PTA	Preferential Trade Area
RD	Road Department
REC	Regional Economic Community
RESOC	Regional system of overload control
RTRN	Regional trunk road network
SADC	Southern African Development Community
SATCC	Southern Africa Transport and Communications Region
SCOM	Standing Committee
SPV	Special purpose vehicle
SSA	Sub-Saharan Africa
TMC	Traffic management center
TTC	Traffic control centre
VELAC	Vehicle Loading Advisory Committee
VOCWG	Vehicle Overloading Control Working Group
vpd	Vehicles per day
WCC	Weighbridge clearance certificate
WIM	Weighing in motion

STRUCTURE OF DOCUMENT

1	Introduction
2	Selection, installation and operation of weighbridges
3	Data collection, analysis and reporting
4	Private sector involvement and financing mechanisms
5	Cross border overload control
6	Training of weighbridge personnel

1 Introduction

2 Selection, installation and operation of weighbridges

3 Data collection, analysis and reporting

4 Private sector involvement and financing mechanisms

5 Cross border overload control

6 Training of weighbridge personnel

1. INTRODUCTION

1.1. Project background

General

1.1.1. The Common Market for Eastern and Southern Africa (COMESA), Southern African Development Community (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) have identified vehicle overload control as one of the priority areas to be addressed in their 2006-2007 Work Program. In this regard, a project has been proposed to prepare a synthesis report on constraints, issues and prevailing best practices in overload control in the SADC and COMESA regions.

1.1.2 This initiative has been prompted by the limited success at regional level in the implementation of the SADC/COMESA proposals on vehicle overload control and the recent surge of activity in a number of countries where substantial investments are being made or planned for the procurement of weighbridge infrastructure.

1.1.3 While there are several instances of successful vehicle overload control programs in some countries, problems and constraints also remain in others. Therefore, it is important to identify the bottlenecks and adopt appropriate measures that can address the problem especially at regional level. Despite the existence of what could be examples of best practice, information has not been adequately shared. As a result, costly practices are being pursued in some countries.

1.1.4 The challenges that arise from the absence of a harmonized framework for overload control management are most apparent along regional transport corridors. The challenges manifest themselves at two levels; firstly, in lack of regional harmonization of axle load limits which makes management difficult, and secondly, in lack of faith in the systems used in different countries, such that vehicles are

sometimes weighed frequently, including at weighbridges a few kilometers apart but on different sides of a common border. Differences in the infrastructure used contribute to varying perceptions of the integrity of the overload control systems crossed by the regional transport corridors, so that each country has to weigh vehicles again as soon as they enter its territory.

1.1.5 The above issues underscore the importance of a synthesis report as a key input to the transport and trade facilitation initiatives in Eastern and Southern Africa. This approach is likely to increase the chances of regional agreements being reached and implemented at both national and transit transport corridor levels.

1.2. Goal and objective of the project

1.2.1 Against the above background, the main goal of the project is to contribute to the general efforts to better facilitate trade along regional transport corridors. The overall objective is to accelerate the implementation of the overload control program based on a thorough appreciation of the underlying issues involved and knowledge of prevailing best practices in the region.

1.3. Scope of the project

1.3.1 In pursuit of the above aim and objective of the project, the following activities constitute the scope of work:

- (a) Preparation of a synthesis report on effective overload control practices;
- (b) Selection and documentation of best practices prepared as case studies being an integral part of the synthesis report;
- (c) Preparation of draft guidelines on overload control practices, facilities and infrastructure;
- (d) Presentation of the synthesis report and guidelines at a regional workshop, and preparation of a final report incorporating the comments and recommendations of the workshop.

1.4. Outputs of project

1.4.1 Following from the above scope of work, the outputs are as follows:

- (a) A synthesis report which identifies and addresses various key issues and concepts pertaining to overload control in Eastern and Southern Africa.

- (b) Preparation of case studies for presentation at a regional workshop.
- (c) A harmonized regional strategy on various aspects of overload control developed by stakeholders and in line with regional instruments.
- (d) Draft regional guidelines and specifications on various aspects of overload control, designed to facilitate the implementation of fundamental elements of the existing regional instruments.
- (e) Proposals on institutional arrangements for ensuring sustainable implementation of the guidelines and specifications for the fundamental elements.

1.5. Regional guidelines and specifications

1.5.1. Regional guidelines and specifications have been prepared with the objective of facilitating the implementation of fundamental elements of the existing regional instruments on overload control. To this end, the following guidelines have been developed:

- (a) Selection, Installation and Operation of Weighbridges
- (b) Weighbridge Data Collection, Analysis and Reporting
- (c) Private Sector Participation and Financing Mechanisms for Weighbridges
- (d) Cross Border Overload Control
- (e) Training of Weighbridge Personnel

1.5.2. The above guidelines, as distinct from manuals, are of a generic nature in that they provide guidance to practitioners on the various aspects of overload control indicated above. Such guidance will need to be customized to the specific environment in which it is being applied and which will vary significantly between the various countries of Eastern and Southern Africa.

1.5.3. In order to secure an efficient overload control system it is necessary to consider all elements of such a system. While the issues addressed in these guidelines cover some of the important elements of a complete system, the following elements also need to be addressed:

- Legislation and regulatory framework
- Enforcement regulations
- Public support and awareness campaigns

1.5.4. The above elements are comprehensively addressed in the SADC Memorandum of Understanding (MoU) and the Model Legislative Provisions on Management of Vehicle Loading which complement the five elements addressed in these guidelines. In addition, there is also a need for an over-arching policy in each country that is harmonized with regional policy and integrates the various elements of an overload control system discussed above.

- 1** Introduction
- 2** Selection, installation and operation of weighbridges
- 3** Data collection, analysis and reporting
- 4** Private sector involvement and financing mechanisms
- 5** Cross border overload control
- 6** Training of weighbridge personnel

2. SELECTION, INSTALLATION AND OPERATION OF WEIGHBRIDGES

2.1. Introduction

Background

2.1.1. The selection, installation and operation of weighbridges constitute important elements of any country's overload control activities. In this regard, the SADC Memorandum on Vehicle Loading (SADC, 1999) requires member states to ensure the effectiveness of overloading control through harmonized approaches to the development of a regional network of appropriately selected, installed and operated weighing stations.

2.1.2. Unfortunately, there are a number of instances in the Eastern and Southern Africa region where insufficient attention has been paid to the proper selection, installation and operation of weighbridges. Common examples include: the selection of a relatively expensive multi-deck scale for installation on a lightly trafficked road where a less expensive 3.2 m x 4 m axle unit scale would have been far more appropriate; or the procurement of weighbridge equipment for which there is no readily available technical and maintenance support in the region leading to long delays in sourcing spare parts.

Purpose and scope of the guideline

2.1.3. Against the above background, the main purpose of this section is to provide guidance on the selection, installation and operation of weighbridge facilities within the context of a national or regional strategy which is effective and sustainable in respect of both domestic and international traffic. Accordingly, the importance of having a national or regional overload control strategy which guides the selection and location of weighbridge facilities is stressed. In addition, brief technical details of weighbridge types and their site layout are provided as well as guidance on various aspects of weighbridge operations.

Structure of the guideline

2.1.4. The guideline is structured as follows:

Section 1 (this section): Provides the background to the guideline as well as its purpose, scope and structure.

Section 2: Presents an outline strategy for the selection, installation and operation of weighbridges.

Section 3: Provides guidance on weighbridge types and their selection.

Section 4: Provides guidance on weighbridge facilities layout and installation.

Section 5: Provides guidance on weighbridge operations and related control procedures.

2.2. Need for an overarching strategy

Key Issues to be considered

2.2.1. The selection of a weighbridge is largely determined by the purpose it will serve. The purpose will, in turn, be determined by the strategy adopted by the relevant institution. In the light of the preceding paragraphs it is clear that any national strategy dealing with the selection and location of weighbridges should be set within the parameters agreed to in the SADC Model Legislative Provisions on Management of Vehicle Loading and the Memorandum of Understanding on Vehicle Loading (SADC, 1999).

2.2.2. Before a weighbridge site or type is selected a number of critical aspects need to be addressed:

- (a) **National strategy:** It is necessary and important for the institution responsible for overload control to have a comprehensive strategy that deals, as a minimum, with matters of policy and regulation, operational approach and in this context provides some guidance on available budget. If this aspect is not addressed, the tendency is to utilize funds on infrastructure in an incoherent way resulting in weighbridge facilities being sub-optimally located, improperly operated and inappropriately equipped. This all leads to ineffectiveness and waste.

- (b) **Operational strategy:** The design of a weighbridge facility is the direct result of the intended operational strategy – or in simple language, the weighbridge must be designed for the way it will be used.
- (c) **Prioritization:** Within this overall national strategy, prioritization can be undertaken with regard to the deployment of weighbridges across the country’s road network. It is recommended that the 80:20 principle or “Pareto Principle” be adopted. The application of this principle with regard to the prioritization of weighbridges countrywide will result in weighbridges being located on roads with the highest heavy vehicle traffic volumes and where the greatest impact can be achieved with the least cost and effort.

2.3. Weighbridges types and selection

Overview of weighbridge types

2.3.1. There is a wide array of weighbridge types and related methods of weighing that can be used for overload control purposes. In general, there are two types of weighbridges and two methods of weighing as follows:

- Types of weighbridge: Fixed versus mobile scales
- Methods of weighing: Static versus dynamic

Table 2.1. Weighbridge types and methods of weighing

Type of weighbridges Method of weighing		Fixed weighbridges	Mobile weighbridges
			<ul style="list-style-type: none"> • Easy to operate • Minimum personnel • Cargo off-loading • High installation costs • Limited placement
Static	<ul style="list-style-type: none"> • More precision • Accepted for legal enforcement • Slower 	<ul style="list-style-type: none"> • Easiest to operate • Highest level of precision • Can weigh and register axle groups 	<ul style="list-style-type: none"> • Lowest investment • Optimal for enforcement
Dynamic	<ul style="list-style-type: none"> • Rapid monitoring • Lower precision • Not acceptable for enforcement 	<ul style="list-style-type: none"> • Rapid monitoring • Requires large installation • Requires careful direction of vehicles • Generally not accepted for enforcement 	<ul style="list-style-type: none"> • Minimum disruption of commercial traffic • Lowest accuracy • Excellent for statistical monitoring

The relative characteristics of the types of weighbridges and methods of weighing are illustrated in Table 2.1.

Fixed weighbridges

2.3.2. (a) **Single axle weighbridge:** These weighbridges – irrespective of the technology used to conduct the weighing operation – are widely used throughout the region. They are small transversal devices that weigh one axle of a vehicle at a time. The weighing operator then has to add the masses of the individual axles to determine the total vehicle mass; total combination mass; and axle unit masses. Due to their small size, these scales can be moved from site to site where they are installed in a pre-prepared recess.



3.2 m x 4 m axle unit scale – Zeerust, S. Africa



3.2 m x 1 m single axle scale – Pioneer Gate, Botswana

Although single axle scales have proven to be effective in the past, they have certain drawbacks:

- The sites have to be constructed to very precise level requirements which are not easily met.
- Weighing of multi-axle vehicles is cumbersome and time-consuming.
- Placing the required number of test weights on the small deck area is difficult and dangerous.
- They are very heavy to transport from one site to another.
- Setting up the site for overloading enforcement is time consuming.

Due to pressure from the courts with regard to the accuracy of these scales/sites, as well as other shortcomings, as indicated above, it is recommended that this type of scale should be phased out in the Eastern and Southern Africa.

(b) **Axle unit weighbridges:** These weighbridges consist of a single deck supported on the weighing mechanism (usually 4 load cells). The size of these weighbridges is typically 3.2 m x 3 m to 3.2 m x 4 m. Some of the benefits of the axle unit scale are as follows:

- They can weigh any axle unit of a truck (single axle, tandem or tridem unit).
- Level tolerances on the approach slabs do not have to be as accurate as for the single axle weighbridge, as all axle units (tandems and tridems) are weighed in single operations.
- Testing the weighbridge is easier (in terms of limitations for stacking of test weights).
- It is far quicker to weigh multi-axle vehicles.

The main disadvantage of a single deck scale is that it takes a number of operations to weigh a single multi-axle vehicle. It is however still considerably more efficient than a single axle scale.

Axle unit scales are typically placed on strategic routes that carry less than 500 heavy vehicles per day. These scales are simpler, cheaper and easier to maintain than multi-deck scales. The cost estimate for an axle unit scale, a small office and a graveled park off area is of the order of US\$ 0.3 million and is recommended for low traffic volume routes.

(c) **Multi-deck scales:** These scales comprise a number of decks of different lengths. Each deck is individually supported by its own weighing mechanism (typically four load cells, one on each corner). The main benefit of a multi-deck scale is that it enables the majority of multi-axle heavy vehicles to be weighed in one operation. Their length therefore is determined by the permissible maximum length of vehicle combinations in the country or the region. Multi-deck scales are usually equipped with four decks although some have five, three or even two decks. Two deck scales, however, negate the main advantage of a multi-deck scale, namely throughput.



Brakwater weighbridge Namibia – 3.2 x 22 m multi-deck scale

Some of the benefits of a multi-deck scale are as follows:

- Level tolerances on the approach slabs are no longer a problem for as in most cases the whole vehicle is weighed in one operation.
- Vehicle weighing is very efficient.
- Short calibration tests can easily be done without test weights (any axle or axle unit is weighed on each of the weighbridge decks and the results should be consistent).
- It is more difficult to “manipulate” the weighing process, as in most cases the whole vehicle is weighed in a single operation (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).

The decision with regards whether a single or a multi-deck scale should be installed is mostly influenced by the throughput requirements of the weighbridge facility. On routes where large numbers of heavy vehicles need to be weighed (see Table 2.3), it is recommended that multi-deck scales are installed.

The type and cost of weighbridge facilities can vary considerably depending on the level of requirement which might include:

- Small office or many offices (i.e. also used as a regional office)
- Size of park-off area
- Canopy over the weighing area for protection against inclement weather
- Staff accommodation facilities

Typical weighbridge cost estimates are indicated in Table 2.2.

Table 2.2. Typical weighbridge cost estimates

<i>Weighbridge type</i>	<i>Cost estimate (US\$ - 2008)</i>
Single axle scale	0.4 to 1.0 million
Axle unit scale	0.4 to 1.0 million
Multi-deck scale (four decks)	1.0 to 2.0 million
Multi-deck scales (four decks)	2.0 to 4.0 million
Multi-deck scale (both sides of freeway)	6.0 to 8.0 million

Mobile weighbridges

2.3.3. (a) **Portable weighing equipment:** Portable weighing equipment consists of wheel scales, which are placed on the road surface. The axle load is obtained by summing the wheel loads. Although these are sometimes used to weigh the wheels on only one side of a vehicle, it is far more accurate to weigh all the wheels of a vehicle simultaneously. A number of different types of technology are used in this category of weighing device of which three are discussed below:

- One of the older types is based on the deformation of a spring brought back to its initial position by turning a crank the number of revolutions to which the load corresponds.
- The capacitance pad makes use of the variation of electric capacity due to the fact that two copper sheets, which are separated by a rubber dielectric, draw nearer to each other when subjected to a wheel load. This principle permits a particularly thin design (7 mm) which has little sensitivity to the position of the wheel on the pad.
- The hydraulic pad also meets these two requirements. It makes use of the pressure variable of a liquid (water and glycerin) contained in a coil which is protected by a base plate and a load distributing plate.

Portable weighing equipment in use is usually light and can be set-up by two operators in a few minutes. They can be transported in a light truck together with the accessories such as leveling mats, computer and cables.

Leveling mats or ramps are required to align the levels of all the axles in an axle unit, unless the scales are used in a specially constructed pit in a lay-by. If the levels of all the axles in the axle unit are not within the required tolerance, the scale readings will not be sufficiently accurate for law enforcement purposes.

Due to the many variables inherent in the total weighing system that constitutes a portable weighing system, e.g. the irregularity of the road surface, the interaction of different axles in an axle unit (only one axle is weighed at a time and the sum of the masses of the different axles are added to provide the mass of the axle unit), the consistency of the installation (the placement of the scales and the levelers on the road surface and in relation to one another), portable scales are not recommended to be used to prosecute overloaded heavy vehicles. The recommended use of portable scales is in conjunction with a fixed weighbridge scale. Roaming traffic officers can use portable scales to detect possibly overloaded heavy vehicles on alternative routes and then escort or send them to the weighbridge facility for accurate weighing on a fixed weighbridge scale.



Portable weighbridge system



Measurement of rear axle using portable weighbridge

Weigh-in-motion scales

2.3.4. (a) **High speed weigh in motion scales:** High speed weigh in motion (HSWIM) scales are axle load scales that are placed in the road surface and designed to weigh the axles of heavy (and other) vehicles travelling at normal operating speeds.

The most common HSWIMs on the market make use of bending plate technology. The scale deck consists of a metal plate that bends as a wheel travels over it and the variation in electrical current due to the changing properties of the metal is measured and translated into a mass. A HSWIM installation usually consists of elec-

tromagnetic loops in the road before and after the scales. This total system is able to weigh each axle as it moves across the scale at a constant speed, classify the configuration of the vehicle and calculate if the heavy vehicle is potentially overloaded. Variation in speed does affect accuracy of measurements and heavy vehicle operators are known to manipulate the measurements by either braking or accelerating across the scales. A number of parameters can be measured simultaneously including total vehicle mass, steering axle mass, axle unit mass, axle spacing, vehicle speed, etc.

Because the HSWIM measures the mass of a dynamic system (the vehicle is moving as it is weighed) these systems have to date not been used for prosecution purposes. The number of variables that reduce the accuracy of the system are numerous such as the road surface leading to and from the scales, the movement of the heavy vehicle especially when fluids or livestock are weighed, wind forces on the vehicle, braking and acceleration forces and weight transfer between different axles as a function of the movement and the specifics of the vehicle's suspension.

The two primary uses of a HSWIM system are screening and data collection.

- At weighbridges where large numbers of heavy vehicles have to be processed, the use of a HSWIM as a screening device is valuable. In this application only the potentially overloaded heavy vehicles are screened (sent to the fixed scale) to be weighed statically. This type of application is also a good way of reducing the human factor in the selection of vehicles to be weighed.
- The second use of a WIM system is for data collection. Road authorities need traffic loading data for their pavement management systems and long term maintenance planning. HSWIMs provide this information. HSWIMs could – and should – be used for both the above purposes simultaneously. Continuous data collection on alternative routes by WIMs is also useful to detect patterns of weighbridge avoidance.

(b) **Low speed weigh in motion (LSWIM) scales:** This is a relatively new type of technology in the region and is essentially a small fixed scale. It operates optimally at constant speeds of about 5 km/h. It is also equipped with a rigid deck, supported on four load cells designed to weigh one axle at a time. The weighing algorithms are similar to those of a HSWIM as all axle loads are recorded and the vehicle's dimensions are derived from the movement across the scale. LSWIMs are purported to be more accurate than HSWIMs but less accurate than fixed scales, due to the dynamic loads induced by the moving vehicle.

To date LSWIMs have not been used for prosecution, but studies are being conducted to accredit these scales for prosecution purposes. The advantages that could be accrued from the use of LSWIMs are cost and ease of operation. They are cheaper than large multi-deck scales and potentially increase throughput (heavy vehicles can be weighed faster).

On-board load indicators

2.3.5. Another type of weighing system that has more recently become available on the market is the on-board load indicator/scale. They are not common on vehicles in Africa because of their high cost. The system consists of load measuring devices that are composed of one or more sensors inserted into bearing parts of the vehicles structure and of an electronic unit with load display on the dashboard. These systems are intended to meet the need of transport operators wanting to load their vehicles optimally while respecting the legal limits for vehicle loading. They are particularly useful for the optimal loading of commodities with a high variable density such as timber, sugar cane, coal and sand.

Weighbridge mechanisms

2.3.6. (a) **Mechanical scales:** A mechanical weighbridge is a fixed installation for weighing vehicle axles, axle units or the whole vehicle when stopped. It consists of a metal or sometimes concrete-metal composite deck or decks, based normally in concrete, which forms a bridge, either flush with the surface or elevated with drive-on-ramps. The bridge deck rests on supports.

A series of levers cascade to a single mechanical indicator that shows the total weight. This system is currently used in the majority of weighbridges in the region.

Although these scales are very robust and have stood the test of time for decades in many rural areas of Africa, they have become outdated and the technical knowledge to maintain them has largely been lost. The major operational disadvantage of these scales is that they give a mechanical read-out of the measured weight and cannot provide an electronic reading of the weigh transaction that could be imported into a computer. The whole weighing process is manual, cumbersome and potentially fraught with fraud.

Although widely used in the region, mechanical scales are increasingly being replaced by newer generation electronic scales. It must be cautioned that **if the maintenance support for the newer generation electronic scales is not readily available,**

such as in remote areas, an electronic scale could be put out of action for weeks or even months as a result of a single lightning strike.



Manually operated weighing system at Livingstone, Zambia



(b) **Electromechanical or hybrid scales:** Electromechanical scales are mechanical scales that concentrate the weight into a single force applied to a single load cell. There are some advantages in the use of electromechanical scales. The above-mentioned shortcomings of the mechanical scales with regard to data, readout and production of prosecution documentation are largely eliminated. The positioning of the load cell is usually inside the scale house building; the load cell is thereby protected against vandalism, the elements, moisture, and temperature, especially lightning. Another major advantage of using this type of scale is that should the weighbridge experience a power outage – such as regularly occurs in rural Africa – the scale could still function as a mechanical scale. This adaptability makes this type of scale very robust for use in remote areas where maintenance support is scarce and maintenance response times are long.

(c) **Hydraulic load cell scales:** Scales equipped only with load cells differ in design from mechanical scales in that each scale deck is supported on four load cells (one at each corner of the deck) working together.

Hydraulic scales are also hybrids as two types of technology are used. Multiple hydraulic load cells support a weighbridge deck. From each cell, a line is run to a slave cylinder in an accumulator. The slave cylinders are placed on top of one another in series so that the forces from the load cells under the weighbridge are added together. The total force acts on an analogue load cell. Hydraulic load cells

have traditionally found favor in hazardous areas where a stray spark or an overheated electrical component could ignite a fire or cause an explosion. The use of hydraulic scales is limited and is being phased out.

(d) **Analogue load cell scales:** An analogue load cell operates according to the following principle: the changes in electrical current through a piece of metal—that changes its shape as a force (mass) is applied—is measured. The change is monitored by electrical strain gauges that generate an analogue signal which varies with the load. Four load cells, one at each corner of the weighbridge platform, is the minimum required for a weighbridge.

The sensitive microvolt signals generated are transmitted by wire from the load cells of each module to one or more junction boxes under the weighbridge. The combined signal is transmitted by wire to a device in the scale house that can read and translate the value into a number that represents the vehicle masse. The analogue signal is subject to disruption caused by radio or electromagnetic interference.

The sensitivity of this technology makes a weighbridge equipped with this type of load cell finicky and fraught with potential malfunctions. These types of weighbridges are being re-equipped with newer generation digital load cell technology that is more robust.

(e) **Digital load cell scales:** A digital load cell is one that generates an analogue signal that is immediately converted to a digital signal within the load cell itself. The digital output is very robust compared with the analogue output. The digital signals that leave the cells are not subject to disruption as in the case of analogue output signals. In a digital system, it is easier to carry out a performance check of each cell in the weighbridge. In many countries, digital load cells are the most common technology for new weighbridges as well as in the case where old scales are rehabilitated.

Selection of weighbridges

2.3.7. The selection of a weighbridge is largely determined by the purpose that it will serve. In this regard, the expected heavy vehicle traffic on a route is the most important determinant. The type of weighbridge scale and other equipment, the size of the buildings, parking areas, queuing space, the number of staff required, etc. are all determined by the current and future traffic. Even secondary design parameters, such as office space, furniture or office equipment, size of water and

sewerage handling facilities, number of telephones, etc. are determined by the heavy vehicle traffic.

2.3.8. A weighbridge facility that is inadequate to cope with traffic on a busy route is ineffective and a waste of resources whereas a facility that is too large on a quiet road could be regarded as a white elephant. Similarly, a weighbridge kept open 24 hrs when there is hardly any night time traffic would be wasteful. Table 2.3 provides guidance on the type of weighbridge that is most suited for handling various heavy vehicle traffic volumes on different road classes.

Table 2.3. Type of weighbridges in relation to heavy vehicle traffic volumes and road class

<i>Weighbridge type</i>	<i>Traffic volumes (Heavy vehicles/day)</i>	<i>Road class</i>
Multi deck scale (both sides of freeway)	> 4 000	A
Multi deck scales (four decks)	1 000 – 4 000	B
Multi deck scale (four decks)	500 – 1 000	C
Axle unit scale	< 500	D
Single axle scale	< 500	D

2.3.9. Weighbridges on Class A and B roads are relatively costly due to the required equipment and site facilities, such as type of scale, the use of pre-screening WIMs, the size of parking and stacking facilities and the type office accommodation required to handle larger numbers of heavy vehicles and staff. These weighbridges will have the greatest impact on heavy vehicle overloading and thus justify larger capital and operational expenditure.

2.3.10. Weighbridges on Class C or D roads require smaller facilities and less equipment. Their value in terms of the potential impact on overload control has to be offset against the projected lifetime cost. Benefits not always directly measurable are difficult to quantify compared with the costs. There are however other benefits such as improved road safety and fairer competition in the freight industry that should be considered before deciding whether or not to construct a weighbridge facility on a Class C or D road.

Ultimate choice of weighbridge facility

2.3.11. Although traffic is the most important determinant in the decision to procure a particular type of weighbridge there are other factors that should also be considered. They include:

- Experience with equipment already in use
- Manufacturer's guarantee
- Maintenance, calibration and operation complexity

In the final analysis, 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:

- | | |
|--|--|
| <ul style="list-style-type: none">▪ Project costs<ul style="list-style-type: none">▫ Initial costs▫ Operating costs▫ Maintenance costs | <ul style="list-style-type: none">▪ Project benefits<ul style="list-style-type: none">▫ Fees collected for overloading▫ Saving in road damage |
|--|--|

2.3.12. With effective overload control there will be a reduction in the income from fees as the incidence of overloading reduces. Thus, as a project, overload control is normally not self sustainable based on income from fees. It is therefore critically necessary that road authorities appreciate this important point and take it into account when considering different funding mechanisms – a topic which is outside the scope of these guidelines but is considered in a companion guideline on Private Sector Participation and Financing for Weighbridges.

2.4. Weighbridge facility layout and installation

Weighbridge layout

2.4.1. The layout of weighbridges can vary considerably depending on a variety of factors including:

- Purpose of the facility
- Prosecution of overloaded heavy vehicles
- Screening heavy vehicles only
- Screening and prosecution of heavy vehicles
- Volume of heavy vehicles to be weighed

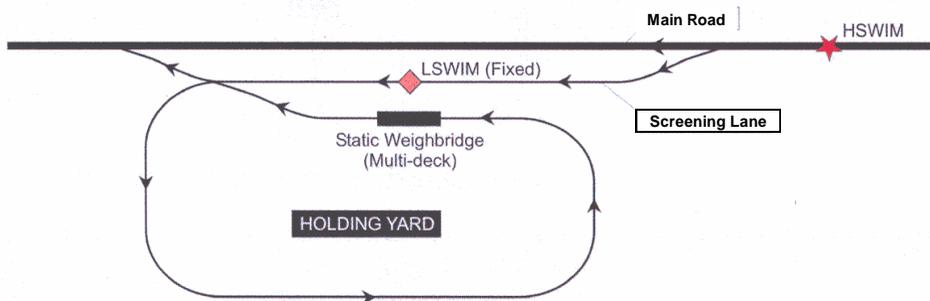
2.4.2. The types of facility that can be provided in relation to the factors indicated above include:

- Full Traffic Control Center (FTCC)
- Type 1 Traffic Control Center (TCC 1)
- Type 5 Traffic Control Center (TCC 5)
- Lay-by Control Center (LCC)

2.4.3. (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 2.1. Typical layout of a full traffic control center (FTCC)



2.4.4. The capacity of a FTCC for undertaking various aspects of the overload control process is given in Table 2.4.

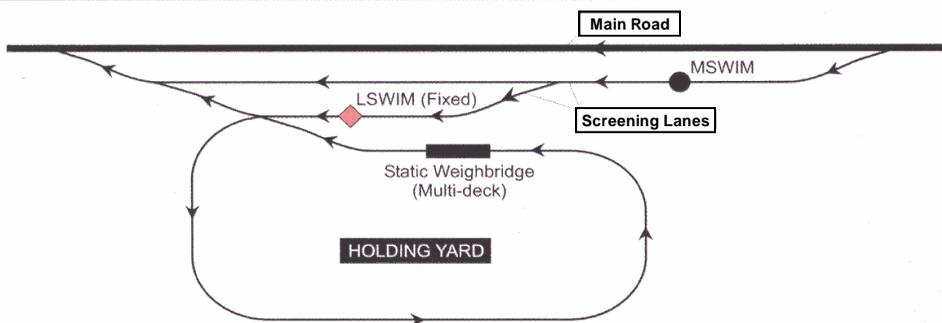
Table 2.4. Capacity characteristics of a FTCC facility

<i>Activity</i>	<i>Typical capacity</i>
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

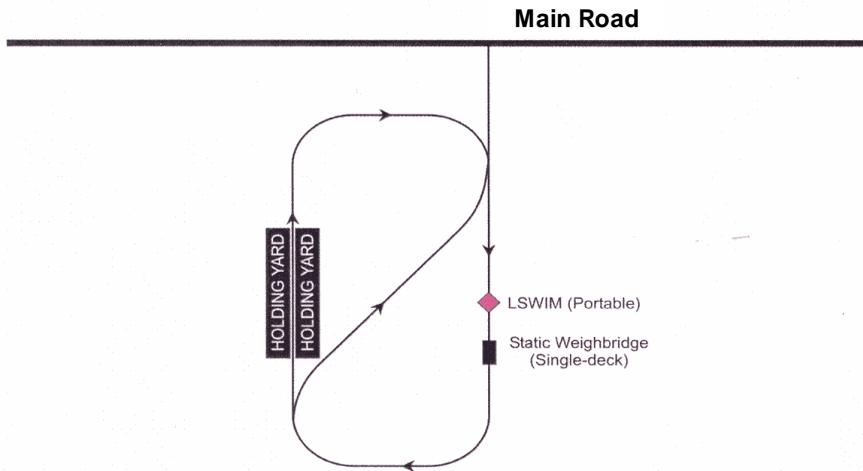
2.4.5. (b) **Type 1 Traffic Control Center (TCC 1)**: A TCC 1 is essentially the same as a FTCC except that it operates on only one side of the road and the HSWIM in the main road is located on an internal screening lane. The drawback of this system is that any vehicles travelling in one direction that 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 2.2. Typical layout of a TCC 1 facility



2.4.6. The capacity of a TCC 1 is very similar to that of an FTCC (see Table 2.4). This type of facility is less costly to operate than an FTCC as only one team is required to control the station.

Figure 2.3. Typical layout of a TCC 5



2.4.7. (c) **Type 5 Traffic Control Center (TCC 5):** 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 LSWIM. In this layout arrangement (see Figure 2.3) legally loaded vehicles can immediately continue with their journey, but overloaded vehicles must proceed to the static weighbridge for weighing and prosecution.

2.4.8. The capacity of a TCC 5 for undertaking various aspects of the overload control process is given in Table 2.5.

Table 2.5. Capacity characteristics of a TCC 5 facility

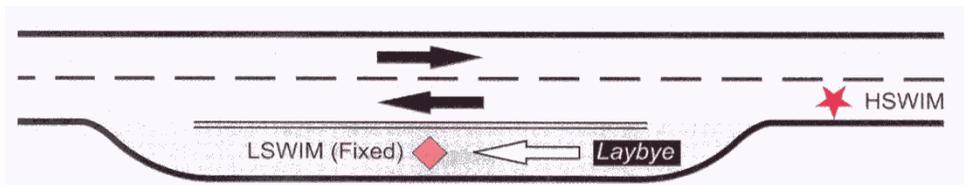
<i>Activity</i>	<i>Typical capacity</i>
Screening capacity (veh/h)	40
Weighing capacity (veh/h)	15
Prosecution capacity (veh/h)	5
Max system ADTT	400

Source: Mikros Systems, South Africa

2.4.9. As indicated in Table 2.3, 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 where the traffic stream carries up to 1,000 heavy vpd in both directions.

2.4.10. (d) **Lay-by Control Center (LCC):** A LCC facility essentially consists of a road lay-by at which either a static or mobile weighbridge is installed (see Figure 2.4). 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 2.4. Typical layout of lay-by with HSWIM screening device



Weighing and Prosecution Software

2.4.11. A number of variants of weighing and even prosecution software can be used with various types of weighbridge facilities. The primary purpose of the software is to assist the scale operator and the prosecuting officer with their tasks by automatically preparing the correct forms and populating the computer screen with the correct permissible masses and charge codes.

2.4.12. A feature of the weighing and prosecution software not fully exploited is the data collection and reporting feature. Valuable information is collected and should be used as management information to improve operations on site as well as provide the relevant institution with management information in their network-wide overload control operations. Habitual offenders are identified in this way and can be targeted and prosecuted more effectively. This is covered in more detail in Section 3 *Weighbridge Data Collection, Analysis and Reporting*.

Weighbridge installation

2.4.13. As already indicated, the layout of a weighbridge requires very careful consideration by the Client. Once this aspect has been decided, the responsibility for designing the facility and specifying the weighbridge requirements would normally be entrusted to a consultant. Thereafter, the normal project cycle would be followed including the tender process, selection of the contractor and supervision of the construction of the facility.

2.4.14. It is critically important that the weighbridge manufacturer's specification for installation of the weighbridge are rigidly adhered to during construction. Scales can be installed either in a shallow pit, a deep pit or above ground. Most scale manufacturers offer any of the three options.

2.4.15. Above ground installations are advantageous because they are easy to keep clean, easier to maintain and cheaper to install. Potential problems due to drainage are eliminated. However, they are vulnerable to damage – either maliciously or accidentally – and are therefore not favored. They also require up and down ramps to get to the scale and make operations more difficult.

2.4.16. Shallow pit installations are only recommendable in places where drainage of the scale pit would be problematic. Keeping the scale pit clean is very difficult and as a result is neglected.

2.4.17. Deep pit installations – deep enough to allow a technician to stand upright below the scale deck – are favored because the sensitive mechanisms are protected, maintenance is easier than for the shallow pit and the scale is constructed at ground level. If not properly designed, drainage can be a problem.

2.5. Weighbridge operations

Operational aspects

2.5.1. The operation of a weighbridge facility is multi-faceted in that it involves a variety of processes to be carried out by well trained personnel with a range of skills applicable to all aspects of overload control. Issues dealing with such training are covered in Section 6 *Training of Weighbridge Personnel*.

2.5.2. Each country should prepare guidelines on the interpretation of their laws regulating overload control. Guidelines could take the form of a General Ma-

nual for the Operation of Weighbridges or be a general information document. The following should be addressed.

2.5.3. (a) Legislative guidelines

Typically legislative guidelines should include:

- (1) An interpretation of the legislation – specifically a simplification of what the purpose of the specific portion of the legislation is, how it should be applied in practice and how it relates to other pieces of legislation

This is especially important if and when legislation changes to introduce the Administrative Fee System as propagated in the SADC MLP.

- (2) The powers, roles and responsibilities of overload control officers, private sector operator's staff, the police and other role players

2.5.4. (b) Procedural guidelines

Procedural guidelines should cover aspects such as:

- (1) Screening – what it is, how to do it, when to do it and common problems
- (2) Weighing of a heavy vehicle – how it should be done (this is usually particular to the type of vehicle, scale and legislation)
- (3) The determination of the permissible mass of a vehicle and the identification of offences
- (4) How to charge an offender and / or warning and release procedures
- (5) How to deal with arrest cases
- (6) How to deal with dangerous goods
- (7) How to deal with accidents and incidents at weighbridges
- (8) How to deal with moving loads and abnormal loads
- (9) How to deal with the public
- (10) Guidelines on the use and understanding of Overload control documentation
- (11) Data collection and reporting

2.5.5. (c) Institutional, management and maintenance guidelines

Guidelines assisting with giving direction and providing consistency with regard to the institutional (personnel), management and maintenance of weighbridge sites are also site specific and should include:

- (1) Specification of type and number of personnel required at each site
- (2) Signs and signals, type and location for the slowing down and stopping of vehicles to be checked
- (3) Legitimacy of the authorized control personnel including the use of proper uniforms
- (4) Behavior of the control personnel in carrying out their duties
- (5) The roles and responsibilities of the weighbridge personnel including weighbridge manager, supervisors, administrative staff and maintenance staff
- (6) Job descriptions and training requirements for each post
- (7) Maintenance procedures, specific to each item of equipment
- (8) Routine preventative maintenance procedures
- (9) Guidelines for maintenance term-contracts with specialists for specialist maintenance including Scale maintenance and calibration, software systems maintenance, etc.
- (10) Emergency procedures and incident management
- (11) Health and safety requirements
- (12) Site security
- (13) Environmental management
- (14) Asset management

2.5.6. The preparation of guidelines and training of staff in their application is often neglected as a result of which, the optimal use of the weighbridge facility is jeopardized.

- 1** Introduction
- 2** Selection, installation and operation of weighbridges
- 3** Data collection, analysis and reporting
- 4** Private sector involvement and financing mechanisms
- 5** Cross border overload control
- 6** Training of weighbridge personnel

3. WEIGHBRIDGE DATA COLLECTION, ANALYSIS AND REPORTING

3.1. Introduction

Background

3.1.1. Law enforcement operations are carried out at weighbridges primarily to check the loads on heavy vehicles and to apprehend those vehicles that are found to be overloaded in accordance with road traffic regulations. During such operations, various data items associated with each weighed vehicle are recorded, either manually or electronically. The collection, analysis and reporting of such data is an essential function if the monitoring of the effectiveness of overload control operations is to be done properly.

3.1.2. The exchange of information on weighbridge data is also encouraged in the SADC Memorandum of Understanding on Vehicle Loading (SADC, 1999) which requires member states to promote a common understanding of the vehicle loading system and its enforcement in the region through on-going exchange of information, and the conducting of public awareness campaigns. This underscores the importance of undertaking weighbridge data collection, analysis and reporting in a proper manner.

Purpose and scope of the guideline

3.1.3. Against the above background, the main purpose of this document is to provide guidance for the collection and analysis of weighbridge data and a minimum standard for the data items that should be recorded for each weighed vehicle. Such standards, once implemented throughout the region, would allow the consolidation of overload control data and hence the production of uniform, accurate and extensive regional statistics. The main aim of such analyses would be the evaluation of various trends on a regional basis as well as the comparison of overloading trends in various parts of the region. This would furthermore enable the assessment of the impact of various overload control policies per country, per border post, per corridor, etc.

Structure of the guideline

3.1.4. The guideline is structured as follows:

- **Section 3.1** (this section): Provides the background to the guideline as well as its purpose, scope and structure.
- **Section 3.2:** Presents an overview of data collection, analysis and reporting requirements.
- **Section 3.3:** Provides information on data collection systems, requirements and processing.
- **Section 3.4:** Outlines the approach to data verification and analysis.
- **Section 3.5:** Highlights the importance of effective presentation of data and indicates the types of reports that can be produced in relation to the target audience.
- **Section 3.6:** Addresses the monitoring of private sector operated weighing facilities.
- **Section 3.7:** Summarizes the main issues dealt with in the guideline.

3.2. Overview of data collection, analysis and reporting requirements

Data collection

3.2.1. The collection of data from the weighbridges that fall under the responsibility of the law enforcement authority or agency is an essential function if the monitoring of the effectiveness of overload control operations is to be done properly. In the case of computerized weighbridges, which are currently the most common in use, data collection is usually straightforward. In the case of manual weighbridges, the data has to be captured by a data capturer from the weighbridge field sheets into a computerized database. This method introduces an additional step in the data collection process, which is susceptible to typing errors.

Data analysis

3.2.2. Once the weighbridge data for a specific period, usually one month, has been collected and stored in an electronic format (database), analyses should be carried out in order to determine various overload control statistics, including long term trends. Such analyses should produce statistics and reports that will be

of interest from various perspectives (strategic, management, administrative, financial, technical, cross-border).

3.2.3. Before analysis of the data can commence, adequate verification must be done to ensure that invalid data is excluded. This would include records with obvious incorrect data input such as unrealistic permissible masses, abnormal loads and reweighs. Due to the nature of the vehicle weighing process, invalid data is common, particularly in the case of computerized weighbridges where a vehicle weighing process is aborted for one or other reason.

Reporting of data

3.2.4. The final step in a data collection process is the presentation and reporting of data. Without effective methods of presentation and reporting, the considerable effort and expense of collection and analysis can be all but wasted. Data is usually best presented both in the form of tables (so that actual figures can be viewed) and graphs (to effectively illustrate long-term trends or dramatic changes in performance).

Benefits of an Overload Control Management System

3.2.5. As in the case of many management systems, the main purpose of collecting and analyzing overload control data is to improve the effectiveness of the operations. Where vehicle screening is done, the efficiency thereof can be evaluated. Where the weighbridge is fed by vehicles on various (alternative) routes, the extent and degree of overloading on each route can be assessed. Monthly reports can indicate the weighing activities on an hourly basis. This enables the assessment of overloading patterns during a 24-hour period and per day of the week as well as a performance evaluation of the weighbridge personnel.

3.2.6. Overloading patterns in terms of the different mass regulations (axles, axle units, vehicle and combination masses) can be assessed. In cases where new regulations or policies are implemented, the impact on the heavy vehicle transport industry can be assessed. Analysis of weighing data per operator can be used to identify transport operators applying a policy of deliberate overloading as well as operators that control their vehicle loading. This information can be used to focus law enforcement activities on “frequent offenders”. Analysis of weigh data per commodity type can assist law enforcement authorities to focus on problem

commodities as well as to target particular origins of these commodities e.g. certain mines, quarries, etc.

3.3. Data collection

General

3.3.1. The rapid developments in electronics and information technology during the past two decades have resulted in the widespread use of electronic scales for heavy vehicle weighing as well as computerized weighing systems. These developments have made the collection and analysis of large amounts of vehicle weighing data easily possible and cost effective. By far the majority of weighbridges constructed during the past 10 to 15 years in sub-Saharan Africa are of the electronic/computerized type. Generally speaking, when a Road Authority decides to upgrade an existing weighbridge facility, serious consideration should be given to installing an electronic scale and computerized weighing system at sites where manual equipment is still in use.

Data collection systems

3.3.2. Various off-the-shelf weighing software packages are available from weighbridge suppliers and other vendors for capturing data emanating from the weighing process; it is essential that the software is properly customized to meet the needs of the road authority, particularly in terms of the heavy vehicle mass regulations. This includes making provision for standard permissible masses for axles and axle units, tyre and vehicle manufacturer's ratings, mass limitations in terms of the engine power rating, mass limitations in terms of road structures ("bridge formula"), etc. In the current scenario, weighing software needs to be specifically customized for the country in which it is used, due to the varying mass regulations. An additional enhancement to a weighing system is a charging module, which is used to print charge sheets, usually on pre-printed stationery for authorized personnel (e.g. police officers) to issue to offending drivers. This software is even more road authority specific with regards charge codes and wording.

Data requirements

3.3.3. The data captured can cover a number of aspects of the overload control operations including:

- Vehicle screening

- Static vehicle weighing
- Penalties issued (overloading as well as other traffic offences)
- Activities in the holding yard
- Administrative aspects (shift records etc.)

3.3.4. The most important aspect of the above activities is the data regarding the static vehicle weighing. During the process of static vehicle weighing for law enforcement purposes, certain data should be collected for record and analysis purposes. The minimum data that should be recorded are as follows:

- Sequence number
- Date and time of weighing
- Vehicle registration number(s)
- Truck/truck tractor make
- Name of operator
- Axle configuration
- Permissible axle/axle unit masses
- Actual axle/axle unit masses
- Commodity transported

3.3.5. In cases where the vehicle is found to be overloaded, the following data should also be captured:

- Origin
- Destination
- Road/route number where the vehicle was stopped
- Charging officer (if the vehicle is overloaded and charged)

3.3.6. In cases where the number of vehicles weighed per hour is relatively low, and time permits, the above additional data can be captured for all vehicles weighed (legal and overloaded). In particular, the origin/destination data of all vehicles weighed could be useful for O-D analyses.

3.3.7. Information required to determine the permissible maximum axle, axle unit, vehicle and vehicle combination masses, may include:

- Country mass limits (refers to road damage limitations)
- Vehicle manufacturer's ratings (GA, GAU, GVM and GCM)
- Tyre manufacturer's ratings
- Power rating of prime mover
- Distances between axles (where bridge formula, or similar, is applicable)

Data export

3.3.8. Once data has been captured at the weighbridge, the data can be used as input for analysis. Whether the analysis is comprehensive or basic, a minimum amount of weigh data is required to perform any type of analysis. To enter the data from field sheets is not a practical option, especially if a large number of vehicles are weighed. This approach should only be used if the computerized weighing system is not available for a short period for whatever reason. The field sheets of the weighing data that are captured manually should either be sent to the head office for capturing into the Overload Control Management System or the data should be captured into the system at the weighbridge. This must be done prior to the commencement of the data analysis.

3.3.9. Before the data can be transferred to the office where the analysis will be done, the relevant data (e.g. for a particular month) must be exported to a file of manageable size. For example, a vehicle weighing system may utilize a single database for storing vehicle weighing data, which accumulates in size over time. At the end of each specified period (e.g. every month), only the data for the specified period should be exported to a smaller file for transfer to the central database. The recommended method is to export the data into a comma-delimited text file, as most computer applications are able to import and export such files. The first line of the comma-delimited file should contain the field names of the exported data, as the field headings will assist when the data is imported into a spreadsheet, database application or an analysis system.

3.3.10. Some work has been done on creating a standard for vehicle weighing data in South Africa by the SA National Roads Agency. An RSW format (South African Standard Weighbridge Data Format) has been developed and is being used by some road authorities in South Africa.

3.3.11. In the case of server-based systems, the data accumulated at each site is replicated at the central server on an ongoing basis, in which case the data export and transfer procedures are not applicable.

3.3.12. Depending on the analysis requirement and the application being used, two options exist for the type of data to be exported. The first option is to export only the input data as described in the section on *Data requirements*. In this case, smaller export files are created but an application to calculate the overloading is then required. The second option is to export the input data as well as the calcu-

lated data. In this case, no application is required to calculate the overload values but the export file size will be larger. The second option also allows for the viewing of the data in a spreadsheet.

Data transfer

3.3.13. Once the data export has been carried out at the end of each period, normally at the end of each month, the exported data files must be transferred from each weighbridge to a central office (normally the head office) where the data analysis will be done. In order for the data analysis and reporting to be effective, the data need to be received timeously.

3.3.14. Various options for the transfer of data that are available include:

- Copy data onto a CD or stiff disk and send the CD/disk
- E-mail data file(s) from the weighbridge
- Copy data file(s) onto a memory stick or CD and E-mail from an office where E-mail facilities are available (in cases where there is no E-mail access at the weighbridge)
- Upload the data file(s) to a FTP server via the internet/intranet
- Copy onto a memory stick or CD and upload the data file to a FTP server via the internet/intranet from an office where FTP access is available (in cases where there is no FTP access at the weighbridge)

3.3.15. One method should be used for the regular transfer of data and one or more alternative methods can be used when the usual method is not available.

3.3.16. Where the software is connected to a server, the monthly export data file(s) can be extracted directly from the database on the server i.e. data transfer is not required.

3.4. Data verification and analysis

Data verification

3.4.1. The first (and very important) step of building a credible overload control database is data verification. This should as far as possible occur during the data capture (vehicle weighing) process at the weighbridge. The computer weighing software should incorporate checks for invalid data as well as warnings for unrealistic ones (e.g. very high percentage of overloads). Pick lists (drop down menus) should be used to ensure uniform spelling of various data items such as name of operator, make of truck tractor, commodity, origin and destination. Adequate data verification during the weighing process significantly simplifies the task of data verification at the data analysis stage.

3.4.2. Once the data from all the weighbridges has been consolidated into a single database, further data verification and other checks should be performed to ensure data integrity as far as is possible. This process would include checking for unrealistically high overloads (in terms of axles, axle units, total vehicle mass and total combination mass) and correct spelling of operator names and commodities. In the case of incorrect spellings, a routine for the automatic correction of common incorrect spelling errors should be built into the *Overload Control Management System*. In the case of suspect data, the manager at the weighbridge in question should be contacted in order to verify the data record in question.

3.4.3. The importance of data validation (at the weighbridge during the weighing procedure) and verification (at the weighbridge and/or at the central office) cannot be overemphasized. Weighing data that has not been adequately checked and corrected will obviously result in inaccurate reports during the data analysis phase.

Data analysis

3.4.4. Once the data verification process has been completed, data analysis can proceed. The tool (computer software) that is used for such analysis is usually referred to as an *Overload Control Management System* or *Overload Management System*. The outputs should include basic statistics (such as number of vehicles weighed and overloaded during the period being analyzed) as well as more detailed statistics (such as overloading information regarding specific transport operators and commodities).

3.4.5. Limited value can be obtained from the analysis of a short period of weighing operations (e.g. data for one month or one year), but the real power and usefulness of an *Overload Control Management System* is only realized once a number of years of data have been collected, allowing short, medium and long term trends to be observed and evaluated.

3.4.6. In most cases, the calculations required for reports are not complex. Maximum overloads should be calculated, particularly per operator. Average overloads should be calculated per weighbridge, selected operators, selected commodities and per vehicle class. The road damage impact (average E80s) per vehicle class can also be calculated.

3.5. Presentation and reporting

Importance of effective presentation of data

3.5.1. The presentation of data for reporting purposes is perhaps the most important stage of a data collection process, as inappropriate representation of data will be ineffective in communicating the necessary information to the reader. Generally speaking, reports should be concise, avoiding the danger of overwhelming the reader with volumes of data. Where substantial statistics are warranted or required, these should be included in appendices.

Types of reports

3.5.2. The most common types of reports emanating from overload control operations are monthly and annual reports. These should focus operational aspects for lower management; technical (engineering) aspects for middle management; and policy aspects for top management.

3.5.3. In the case of monthly reports, processed data, in the form of tables and/or graphs, should either indicate statistics for the current month together with statistics for the previous 11 months or monthly statistics from the beginning of the financial or calendar year, as preferred by the road authority. Annual reports should summarize the overload control operations both on a monthly basis (for the year being reported on) as well as comparing the annual statistics with previous annual data (if available). Once data have been collected for a number of years, medium and long terms trends can be evaluated. This could include the

impact of a change in legislation, the implementation of an overload control strategy or the construction or upgrading of one or more weighbridge sites.

Presentation of reports

3.5.4. The outputs resulting from the analysis of overload control data can be represented in tables and/or graphs. In most cases, both tables and graphs should be provided. Tables indicate the exact values calculated whilst graphs are effective in illustrating long and short term trends.

3.5.5. The following statistics extracted from a typical annual report (KwaZal-Natal Department of Transport, 2007) (with an indication of the level of management it is intended for) should be calculated from the overload control data:

- (a) **Vehicles weighed, overloaded and charged per month and per annum:** (see Figures 3.1 and 3.2 and Table 3.1). In countries where a tolerance or allowable grace (e.g. 5%) is allowed before a penalty (fine or fee) is applied, a distinction should be made between the number of vehicles overloaded within the allowable tolerance and those that exceed the tolerance. The number (and percentage) of overloaded vehicles that fall within the tolerance should be monitored (Figure 3.3). A more detailed analysis is to monitor the percentage of overloaded vehicles that are within the tolerance due to overloads on axles or axle units only, those that are overloaded due to overloads on vehicle or combination mass only and those that are overloaded due to overloads on axles/axle units *and* vehicle or combination mass (*monthly data for lower and middle management and annual data for top management*).
- (b) **Vehicles weighed, overloaded and charged per weighbridge:** This analysis enables the responsible authority to evaluate the performance of individual weighbridges (see Table 3.2) (*monthly data for middle management and annual data for top management*).
- (c) **Daily and hourly weighing statistics:** (Figures 3.4 and 3.5). These statistics are useful for evaluating the operational performance of a weighbridge, both on an hourly and a daily basis. In the case of weighbridges involving public-private partnerships, these statistics can be used to calculate bonuses/penalties if part of the contract (*for lower and middle management*).

Figure 3.1. Number of vehicles weighed, overloaded or charged (2006)

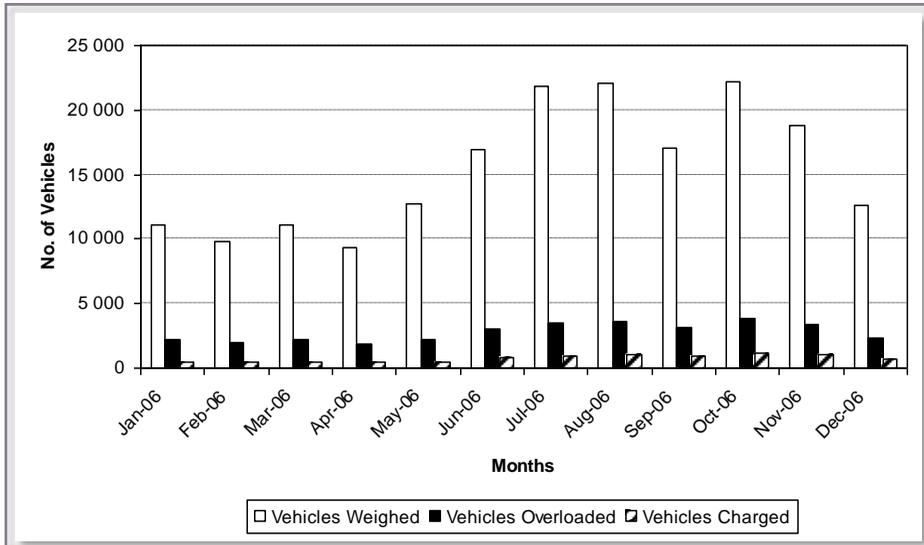
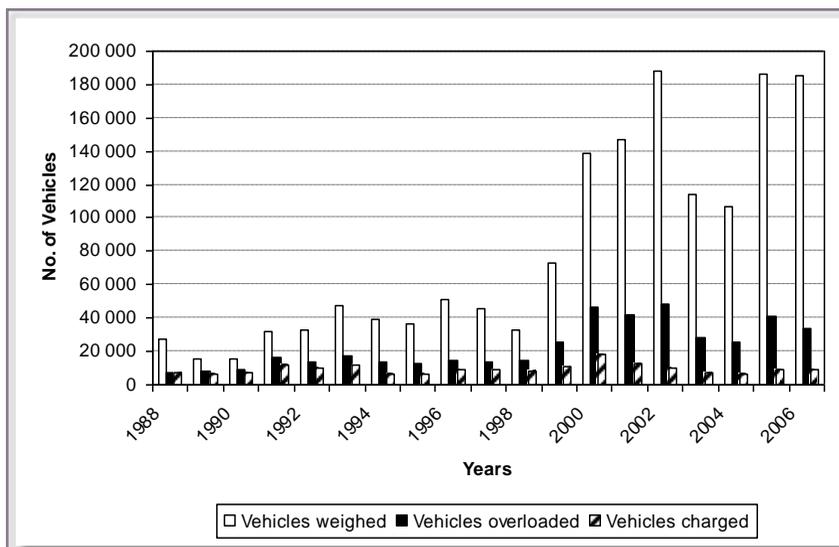


Figure 3.2. Numbers of vehicles weighed, overloaded and charged (1988-2006)



- (d) **Average overloads:** (Figures 3.6 and 3.7). Average overloads in terms of the various regulations relating to permissible maximum axle, axle unit, vehicle and combination masses should be calculated in order to monitor trends in the degree (severity) of overloading. Monitoring the degree of overloading is essential as in some cases the extent of overloading (percentage of vehicle overloaded) may remain constant or decrease, whereas the degree of overloading could have a completely different trend. (*monthly data for middle management and annual data for top management*).

Table 3.1. Numbers of vehicles weighed, overloaded and charged (2004-2006)

	2004	2005	2006	% change 2005 to 2006
No of vehicles weighed	106 619	186 488	185 710	0.4
No of vehicles overloaded	25 432	40 899	33 648	- 17.7
Percentage overloaded	24	22	18	- 17.4
No of vehicles charged	6 166	9 118	8 977	- 1.6
Percentage charged	5.8	4.9	4.8	- 1.1

Figure 3.3. Percentage of overloaded vehicles exceeding or within the tolerance

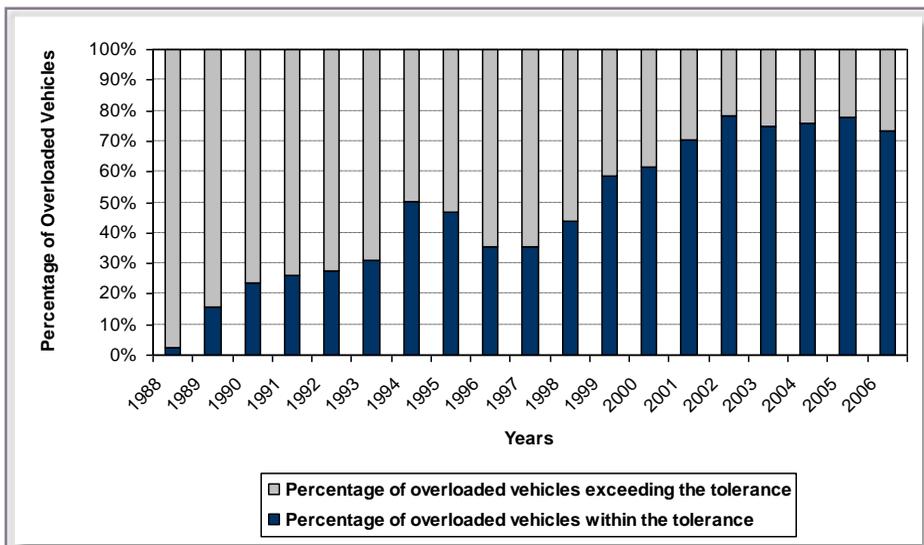


Table 3.2. Individual Weighbridge Statistics (2006)

<i>Locality</i>	<i>Vehicles weighed*</i>	<i>Legal limits</i>			<i>Tolerance limits</i>	
		<i>vehicles over-loaded*</i>	<i>% over-loaded</i>	<i>Average overload (Kg)</i>	<i>vehicles charged*</i>	<i>% charged</i>
Empangeni	610	255	42	1 974	158	26
Greytown	3 670	588	16	998	223	6
Groutville	5 530	1 263	23	1 112	452	8
Ladysmith	7 729	872	11	877	255	3
Marburg	7 211	1 602	22	972	686	10
Midway	58 245	8 811	15	805	1 624	3
Mkondeni	51 223	8 838	17	897	2 232	4
Newcastle	3 443	1 131	33	1 033	366	11
Park Rynie	7 577	1 746	23	876	612	8
Umdloti	13 706	2 462	18	932	557	4
Vryheid	2 185	730	33	1 373	317	15
Westmead	17 485	3 697	21	860	956	5
Winkelspruit	7 096	1 653	23	901	539	8
Total	185 710	33 648	18	906	8 977	5

*expressed in numbers

Figure 3.5. Number of vehicles weighed, overloaded or charged per day over a month

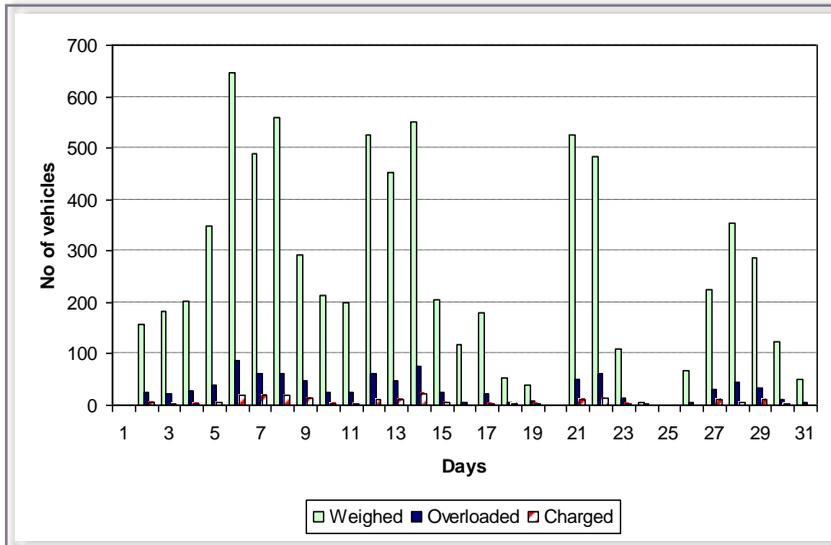


Figure 3.6. Annual average overloads for single axles, tandems and tridems (1988-2006)

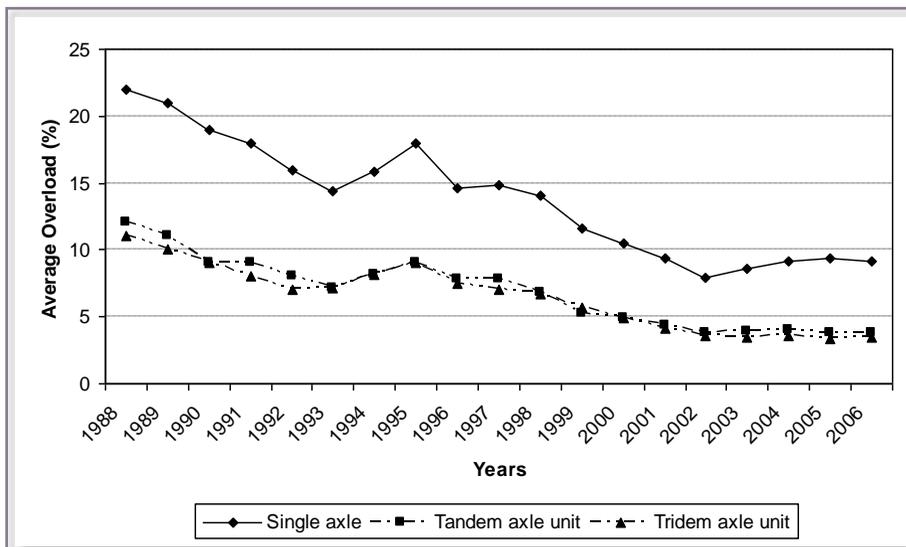
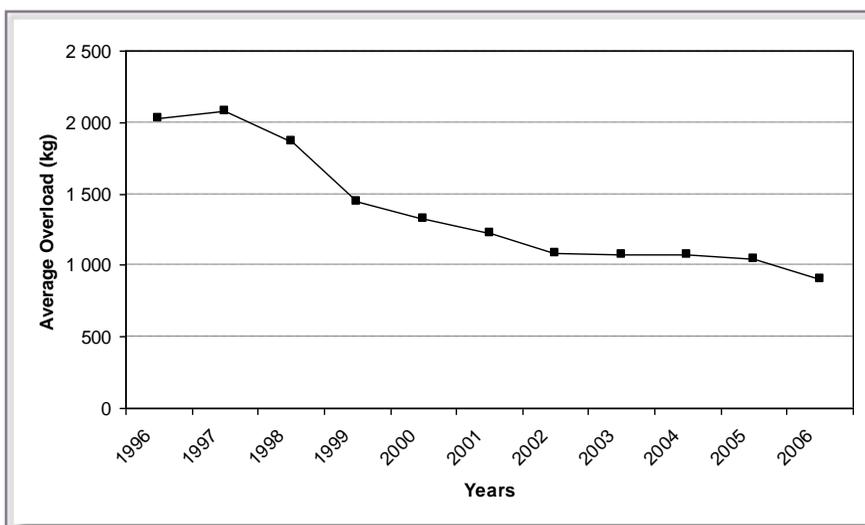


Figure 3.7. Annual average overloads per vehicle (1996-2006)



- (e) **Maximum overloads:** The maximum overloads in terms of the regulations relating to axles, axle units, vehicles and combinations should be identified (Table 3.2). The average of the 100, 500 and 1 000 maximum overloads for a given period can also be used as an indicator for monitoring trends in the degree of overloading (Figure 3.8) (*monthly data for middle management and annual data for top management*).
- (f) **Distribution of vehicle overloads:** Monitoring the distribution of overloading can also be used to evaluate trends in terms of the degree of overloading. The percentage of overloaded vehicles in various kilogram bands (e.g. 0 – 500 kg, 501 – 1 000 kg etc.) over a period of time will give an indication of any trends – increases or decreases in the degree of overloading. Figure 3.9 shows that the percentage of overloaded vehicles in the 0 – 500 kg band has increased from 21% in 1996 to 46% in 2006 and in the 501 – 1 000 kg band from 16% to 26% during the same period. Similarly, the percentage of overloaded vehicles in the 2001 – 3000 kg band has decreased from 16% in 1996 to 5% in 2006, with similar decreases in the 3001 – 4000, 4001 – 5000 and 5001 – 10 000 kg bands (*monthly data for middle management and annual data for top management*).
- (g) **Transport operator statistics:** Various statistics to evaluate the extent and degree of overloading of selected transport operators should be determined. Two criterion should be used for the selection of operators: (1) those that have had more than a specified number of vehicles weighed during the period being analyzed (e.g. a minimum of 100 vehicles) and with a high percentage of vehicle overloaded and charged and (2) those with a much lower minimum number of vehicles weighed (e.g. 10 or 20 vehicles), but with high average overloads (Table 3.4) (*monthly data for lower and middle management and annual data for top management*).

Table 3.3. Ten maximum overloads in KwaZulu-Natal, South Africa (2006)

Regulation	Overload (Kg)	Operator	Cargo	Locality
237	33 930	Company A	Logs	Mkondeni
240	27 860	Company B	Diesel	Midway
240	27 380	Company C	Goods	Westmead
239/37/41/42	24 160	Company D	Chemicals	Umdloti
239/37/4142	22 360	Company E	Scrap Metal	Midway
239/37/41/42	22 140	Company F	Stone	Newcastle
240	18 900	Company G	Sand	Westmead
240	16 380	Company H	Mixed Load	Midway
239(3)	15 600	Company I	Zinc	Mkondeni
240	15 220	Company J	Chemical	Marburg

Figure 3.8. Averages of maximum overloads (1996-2006)

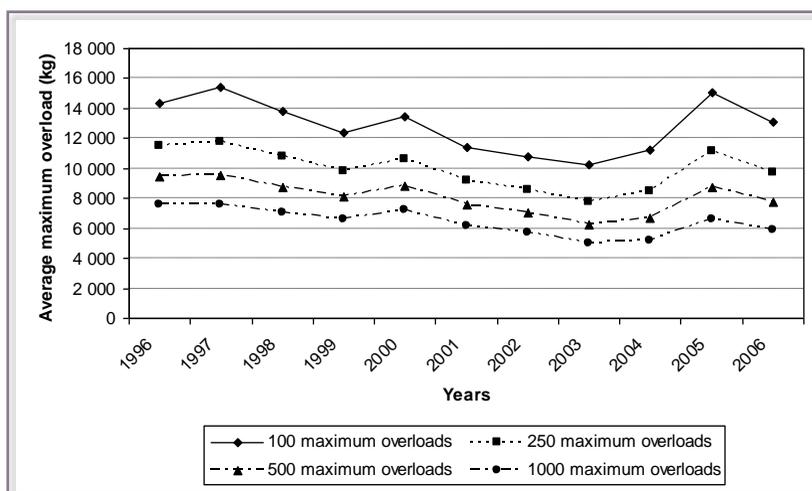


Figure 3.9. Distribution of vehicle overloads (percentage) (1996-2006)

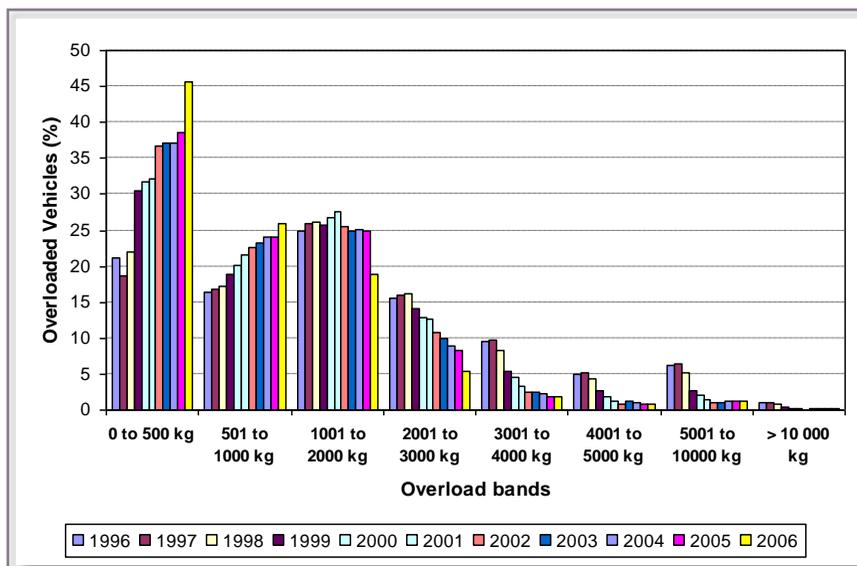


Table 3.4. Frequent offenders in terms of average overloads*

Operator	Average overload (kg)	Vehicles weighed	Vehicles overloaded	Percentage overloaded	Vehicles charged	Percentage charged
Company A	2 230	169	40	23.7	27	16.0
Company B	1 645	126	39	31.0	23	18.3
Company C	1 266	870	98	11.3	33	3.8
Company D	1 183	736	140	19.0	38	5.2
Company E	1 154	196	102	52.0	38	19.4
Company F	1 148	832	397	47.7	100	12.0
Company G	1 112	447	237	53.0	25	5.6
Company H	1 033	275	143	52.0	24	8.7
Company I	1 018	1 402	166	11.8	58	4.1
Company J	1 011	283	197	69.6	44	15.5

* Criteria: Minimum of 30 vehicles overloaded and 20 vehicles charged

- (h) **Vehicle class statistics:** These statistics are used to evaluate the overloading characteristics and trends of vehicles with various axle configurations such as a 6-axle articulated vehicle (class 123), a 5-axle articulated vehicle with a two-axle drawbar trailer (class 12211) and a seven-axle interlink (class 1222). Average E80s per vehicle class can also be determined to assess the damaging effect on pavements of various vehicle classes (Table 3.5). These statistics can also be used to monitor trends in the

utilization of various vehicle classes. Significant changes can often be attributed to changes in the legislation regarding vehicle mass and/or dimensions (Table 3.6) (*monthly data for middle management and annual data for top management*).

- (i) **E80 statistics:** The average E80s per vehicles class, axle, axle unit (or other parameter) can be determined, assuming a specific damage co-efficient (e.g. 4.0). See Table 3.5 and Figure 3.10 (*monthly data for middle management and annual data for top management*).

Table 3.5. Top eight vehicle classes weighed (2006)

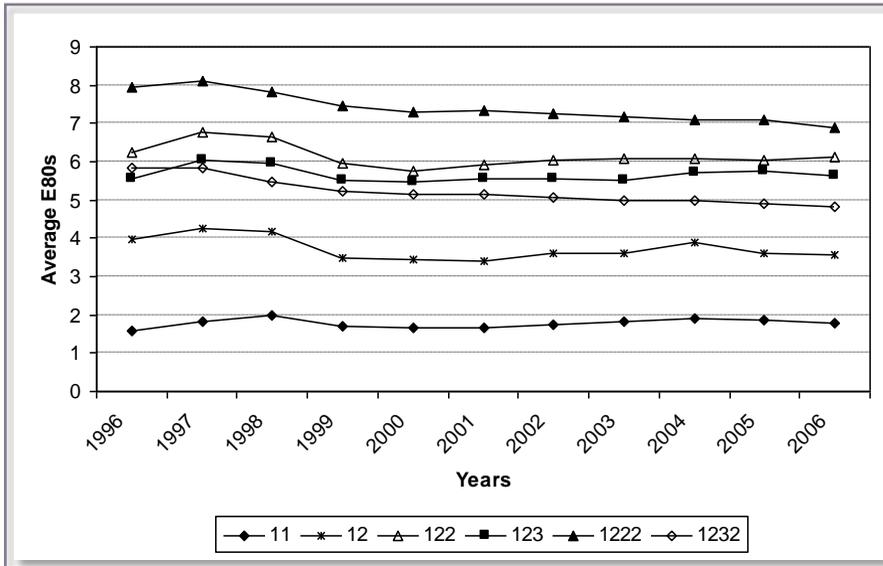
Vehicle class	Vehicles weighed*	Vehicles overloaded	Percentage overloaded	Average over-load (kg)	Max GCM (kg)	E80's (ave) overloaded veh only
1222	73 884	16 720	23	865	67 940	6.9
123	45 097	6 657	15	898	64 540	5.6
11	29 221	3 416	12	881	27 060	1.8
12	8 713	1 666	19	936	32 580	3.5
122	8 304	1 076	13	1 214	55 640	6.1
112	4 747	460	10	910	40 760	3.6
113	3 100	1 308	42	954	53 800	4.8
1223	774	207	27	1 168	61 600	4.9

* Expressed in numbers

Table 3.6. Number of vehicles weighed per vehicle class(2004 to 2006)

Vehicle Class	2004	2005	2006	% Change 2005 to 2006
1222	42 273	73 991	73 884	- 0
123	20 575	42 204	45 097	+ 7
11	19 197	29 464	29 221	- 1
12	4 825	7 982	8 713	+ 9
122	4 796	8 269	8 304	+ 0
112	3 419	5 429	4 747	- 13
113	3 010	4 798	3 100	- 35
1232	2 345	3 772	774	- 79

Figure 3.10. Annual Average E80s per vehicle class (overloaded vehicles only)



- (j) **Commodity statistics:** These statistics are used to evaluate the overloading characteristics of the most common commodities transported (Table 3.7) (*annual data for top management*).

Table 3.7. Cargo statistics: 2006

<i>Locality</i>	<i>Vehicles Weighed*</i>	<i>Legal limits</i>			<i>Tolerance limits</i>	
		<i>vehicles over-loaded*</i>	<i>% over-loaded</i>	<i>Average overload (Kg)</i>	<i>vehicles charged*</i>	<i>% charged</i>
Goods	75 855	11 766	16	716	1 686	2
Container	11 670	648	6	1 157	215	2
Mixed Load	10 927	1 497	14	709	172	2
Unknown Cargo	9 888	1 425	14	674	120	1
Containers	9 532	479	5	1 402	174	2
Dangerous Goods	4 884	1 091	22	624	106	2
Chemicals	3 822	944	25	610	78	2
Steel	3 387	619	18	964	215	6
Fuel	3 056	990	32	636	96	3
Logs	1 790	856	48	1 330	247	14
Sand	1 644	866	53	1 681	546	33
Coal	1 586	805	51	1 050	217	14
Vehicles	1 558	118	8	732	50	3
Paper	1 529	430	28	917	114	7
Timber	1 374	412	30	1 271	151	11
Coils	1 370	316	23	1 101	117	9
Cement	1 311	569	43	971	163	12
Cars	1 094	81	7	671	30	3
Meat	1 013	253	25	884	155	15
Oil	969	302	31	803	92	9
Machinery	887	115	13	1 463	56	6
Chemical	837	223	27	877	55	7
Bricks	794	215	27	1 425	128	16
Furniture	776	72	9	1 154	46	6
Boxes	761	61	8	979	24	3
Flammable Liquids	739	262	35	534	18	2
Petrol	671	232	35	618	23	3
Sugar	580	251	43	963	77	13
Maize	542	242	45	1 000	43	8
Soya	535	281	53	926	84	16
Beer	526	48	9	1 001	15	3
Milk	456	64	14	776	23	5
Rice	454	190	42	1 102	92	20
Tiles	415	116	28	1 233	78	19
Tanks	401	92	23	658	8	2
Lime	396	203	51	1 252	99	25
Pipes	385	47	12	1 162	28	7

*expressed in numbers

3.6. Monitoring private sector operated weighing facilities

Need for performance indicators

3.6.1. Increasingly, the private sector is becoming involved in the management and operation of weighbridges. This is in keeping with the SADC MoU on Vehicle Loading (SADC, 1999) which encourages member states to embark on broad-based private sector investment in the provision and operation of weighing stations. In such a scenario there will be a requirement for the roads agency to monitor the performance of private sector operated weighing facilities through the use of appropriate performance indicators.

Types of indicators

3.6.2. A number of indicators may be used to monitor the performance of private sector operated weighing facilities in terms of the efficiency and effectiveness of the contractor's performance as well as the impact of their operations on the incidence overloading. Typical indicators would include:

- Efficiency of the contractor's performance
 - Number of vehicles weighed per day
 - Weighbridge availability (operational hours per day)
- Effectiveness of overload control operations
 - Effectiveness of overload control operations (percentage of overloaded vehicles)
 - Average overloads

Specification for performance indicators

3.6.3. In order to ensure that the indicators operate in a consistent manner in the Eastern and Southern Africa region, it is important that they are defined and specified in a unique manner and that the data for calculating them is collected in a harmonized manner. This will require the preparation of a specification for each PI in terms of such aspects as:

- Indicator code
- Name of indicator
- Type of indicator
- Purpose
- Desired goal
- Description of the indicator
- Formula for calculating the indicator

Example of calculation

3.6.4. The following example illustrates the manner in which a typical indicator related to overload control should be defined and specified so as to ensure harmonization within the region.

Strategic area	<i>Efficiency of utilization of transport corridor</i>
Indicator name	<i>RO</i>
Type of indicator	<i>Road transport corridor loading</i>
Purpose of indicator	<i>Monitor incidence of overloading on road transport corridor</i>
Desired goal	<i>Minimize/reduce incidence of overloading on road transport corridor</i>
Indicator description	<i>Reduction in incidence of overloading (percent overloaded vehicles)</i>
Indicator definition	<i>RO = N_o/N_w, where N_w = Number of vehicles weighed N_o = Number of vehicles overloaded</i>
Comments	<i>This measure is suited to comparisons over time and between corridors and regions</i>
Illustrative case	<i>In 2008, at weighbridge A located along corridor B 2000 vehicles were weighed and 50 were found to be overloaded.</i>
Illustrative calculation	<i>$N_o = 50$ $N_w = 2000$ $RO = N_w/N_o = 50/2000 * 100 = 2.5\%$</i>

3.6.5 The approach outlined above should be undertaken for each indicator identified. The final selection of indicators should be agreed at regional level based on the following typical selection criteria (InfraAfrica, 2001):

- Reflect stakeholder needs
- Provide a broad picture of the efficiency of utilization of road corridors in terms of the incidence of overloading
- Measure the efficiency and effectiveness of overload control interventions on road corridors
- Enable valid comparisons to be made over time between different corridors and different countries
- Be sufficiently clear to indicate major differences in performance of overload control operations
- Be policy oriented, in that the measure should assist or lead to action designed to rectify a situation or modify or maintain policy direction
- Be cost-effective in that the potential benefits to be obtained from addressing a particular indicator should not exceed the costs.

3.6.5. Meeting the selection criteria listed above will ensure that the indicators are selected on a consistent, defensible basis and do not become an end in themselves, but rather the means to a justified end. In the final analysis, there must be a genuine demand for their use

and an explicit allocation of resources for their development and sustainability as an integral component of measuring road corridor performance. In this regard, the weighbridge data collection, analyses and reporting should make provision for these additional parameters.

3.7. Summary

3.7.1. The current situation with regard to overload control operations, including data collection and reporting, in Sub-Saharan Africa is highly variable. On the one hand, there are some countries that utilize sophisticated and advanced equipment and associated overload control management systems for reporting, the outputs of which are used in the short term to evaluate and plan overload control operations, and in the medium and long term, to develop overload control strategies. On the other hand, there are road authorities in some countries that carry out overload control operations using a fairly haphazard or ad hoc approach without analyzing and evaluating the data that is being collected during each overload control operation. In this case, the opportunity for making good use of potentially very valuable information for a variety of purposes is lost.

3.7.2. In order to properly quantify and monitor the overloading of heavy vehicles in Sub-Saharan Africa, a harmonized approach with regards to overload control operations is recommended in the region. This includes a uniform approach to data collection, analysis and presentation of data as follows.

3.7.3. Participating countries must agree on the minimum data requirements (as proposed in these guidelines) and then implement these requirements within their own country. Each country should identify a host for their national overload control database. This could be the ministry of roads or transport, the roads agency (if one exists) or other government department or parastatal. The host would be responsible for consolidating all overload control data within the country on a regular (monthly) basis as well as performing data analysis and reporting.

3.7.4. Participating countries should also agree on a minimum standard and format for reporting. This standard would be the minimum requirement for the reporting of overload control operations. Additional information (graphs and tables) would be optional. The standard for reporting could be updated from time to time based on input from users of the information.

3.7.5. A host (such as SADC or COMESA, or another organization) should be identified for consolidating a regional overload control database and for compiling reports. These could be on a quarterly and/or annual basis.

3.7.6. Such an approach would pave the way for the establishment of a regional overload control database, the generation of regional overload control statistics and the compilation

of annual overload control reports for the whole region. This would be useful in assessing the status of heavy vehicle overloading from a regional perspective and for promoting cooperation between two or more countries with regards overload control facilities and operations.

3.7.7. The use of carefully chosen performance indicators can enable the performance of private sector operated weighing facilities to be monitored in terms of the contractor's performance as well as the impact of their operations on the incidence overloading.

3.8. References

InfraAfrica (2001): *Road Sector Performance Indicators for Selected Transport Corridors*. Report prepared for UNECA, Sub-Regional Development Center for Southern Africa.

KwaZulu-Natal Department of Transport (2007). *Annual Report: Overload Control 2006*. Pietermaritzburg.

- 1** Introduction
- 2** Selection, installation and operation of weighbridges
- 3** Data collection, analysis and reporting
- 4** Private sector involvement and financing mechanisms
- 5** Cross border overload control
- 6** Training of weighbridge personnel

4. FINANCING MECHANISMS FOR WEIGHBRIDGES

4.1. Introduction

Background

4.1.1. There are different specialist disciplines required in the area of weighbridge management, operations and maintenance. Most of these specialist disciplines are not core functions of the typical transport department. There is therefore much room for increasing efficiency by procuring private sector participation in these areas.

4.1.2. While there are several instances of successful vehicle overload control programs involving the private sector in some countries, problems and constraints remain with regard to the involvement of the private sector in overload control in others.

4.1.3. Despite the existence of what could be examples of best practice, information has not been adequately shared. As a result, costly practices are being pursued in some countries.

Purpose and scope of the guideline

4.1.4. Against the above background, the purpose of the guideline is to provide information on the involvement of the private sector in overload control in order to assist road and traffic law enforcement authorities with the structuring of successful contractual arrangements with the private sector in the field of overload control. The guideline also covers various forms of private sector involvement in public sector projects, a range of options for private sector involvement in overload control, the allocation of functions between the public and private sector, and some issues pertaining to private sector involvement in overload control. Finally, the risks associated with private sector involvement in overload control are identified and discussed; financing mechanisms, including sources of project funding and financing models are also described.

Structure of the guideline

4.1.5. This section is structured as follows:

Section 1 (this section): provides the background to the guideline, as well as its purpose, scope and structure.

Section 2: Describes the private sector participation in overload control with reference to the forms of private sector involvement in public sector projects, the range of options for private sector involvement, allocation of functions and some issues pertaining this involvement.

Section 3: Identifies and discusses some of the risks associated with this involvement.

Section 4: Looks at financing mechanisms, sources of project funding and financing models, and recommends an appropriate financing mechanism for weighbridge operations.

4.2. Private sector involvement in overload control

Introduction

4.2.1. There are a number of different specialist disciplines required in the area of weighbridge management, operations and maintenance (MOM) namely:

- Legal
- Electronic systems
- Computer systems
- Mechanical systems
- Traffic signaling systems
- Facilities management
- Staff management
- Operations management
- Maintenance management

4.2.2. There are also a number of more conventional engineering disciplines involved with weighbridges, namely:

- Roads – including pavement engineering
- Road signs
- Buildings
- Utility services such as water, sewerage and electricity provision

4.2.3. Most of the above are not core functions of the typical transport department and the private sector is probably better equipped to provide these services. It is however important to keep in mind that overload control on its own will never be financially self-sufficient. The private sector involvement should therefore be structured such that the government department will “buy” the services rendered by them. However, as the overloading abates over time, the contract between the private sector and the government could provide for a broader range of traffic related services to be undertaken at the weighbridge site after which the weighbridge could then start to operate as a full-fledged *Traffic Management Center* (TMC).

These services include:

- roadworthiness of vehicles
- truck and driver license inspections
- driver fitness and competence
- crime prevention
- traffic data collection
- other aspects of road traffic safety such as speeding and driving under the influence of alcohol

4.2.4. There are a range of levels of private sector involvement that can be implemented with different advantages and disadvantages. These forms of involvement, and their applicability (or not) to overload control will be discussed in the following paragraphs.

Forms of private sector involvement in public sector projects

4.2.5. The generally accepted range of contract types through which the private sector can be involved in public sector projects includes the following:

- Service contract
- Management contract
- Lease contract
- Concession
- Full privatization

4.2.6. **Service contracts:** Service contracts are aimed at the involvement of the private sector with the operational and maintenance activities of a facility for a specific period. The public sector is responsible for the following activities:

- Setting performance criteria (tender documents)
- Evaluation of tenders received
- Supervision and control the private sector partner

4.2.7. The private sector partner can be paid on a lump sum, time-and-cost or other basis as stated in a competitive tender. Capital investment is usually not the responsibility of the contractor. The typical duration is 1 to 3 years. However, these contracts should at least be awarded for the period it would take to write-off any equipment purchased, such as vehicles (approximately four years).

4.2.8. **Management contract:** Management contracts are different from service contracts in terms of the amount of responsibility being transferred to the private sector. Commonly, the private firm manages the total operational and maintenance activities of a public sector facility without investing any capital or accepting commercial risk. Two factors are very important for the success of such contracts.

4.2.9. Sufficient autonomy must be devolved to the private sector partner to implement commercial reforms. Incentives and penalties for adherence and non-adherence to agreed performance goals should also be in place.

4.2.10. Management contracts should generally be for a period of five years. This allows the private sector partner to implement changes and show the benefits and performance thereof.

4.2.11. **Lease contract:** A private organization rents facilities from the government and assumes responsibility for operation and maintenance. The lessee finances working capital and replacement of capital components with limited economic life, but usually not fixed assets, which remain the responsibility of the government. Under a lease, the private sector operates and maintains the public owned facility at its own commercial risk.

4.2.12. The private sector is under no obligation to invest any capital. It derives income from tariffs (fines). Lease contracts are usually fixed for between six and ten years to ensure that the capital investment for the replacement of short-lived assets can be written off. Leasing requires the public sector to commit to tariffs that will cover the operating and maintenance costs and gives the private sector sufficient incentives to ensure that tariffs are collected and that operating and maintenance costs are minimized. Leases have a stronger private participation than management contracts.

4.2.13. **Concession:** Under a concession, the private sector takes responsibility for managing, operating at commercial risk and investing in the reconstruction, upgrading, rehabilitation and maintenance of an existing facility or the construction and maintenance of a new facility. A private organization handles operations and maintenance while financing investments (fixed assets) in addition to working capital. Assets are usually owned by the public sector and leased and managed by the concessionaire for the period of the concession. At the end of the contract the assets are returned to the public sector in a specified condition.

4.2.14. The project is designed to generate sufficient revenues to cover the concessionaire's investment and operating costs, plus an acceptable rate of return. Government exercises a regulatory and oversight role and receives a concession fee for this arrangement. These contracts are generally endorsed for a period of 25 to 30 years allowing the private sector to recover investment capital expenditure. Examples of concession models are the *Build-Own-Operate-Transfer* (BOOT), *Build-Operate-Transfer* (BOT), *Build-Transfer-Operate* (BTO), *Build-Lease-Transfer* (BLT), *Rehabilitate-Own-Operate* (ROO) and *Rehabilitate-Operate-Transfer* (ROT) projects.

4.2.15. **Full privatization:** The privatization of public sector owned facilities constitutes the sale of the facility as a whole to the private sector.

Range of options for private sector involvement in overload control

4.2.16. The options for private sector involvement are summarized in Table 4.1.

Table 4.1. Summary of private sector involvement options in overload control

	<i>Service contract</i>	<i>Management contract</i>	<i>Lease contract</i>	<i>Concession contract</i>	<i>Full privatization</i>
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	Operation and management costs	O&M costs and working capital	O&M costs, working capital and financing of fixed assets	

4.2.17. 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
- remuneration of the private sector

4.2.18. If no financing is required from the private sector, a service or management option could be selected. On the other hand, if a project could generate sufficient revenue, a concession option may be chosen.

4.2.19. A lease contract or a concession option will not be viable mainly due to the lack of sustainable income. In both these two options less revenue will be generated the more successful the overload control operation becomes. The two most viable options for private sector involvement in overload control are therefore the service contract and the management contract. However, a disadvantage of these two options is that the government still has to provide the financing of the fixed assets and the working capital. Since overload control is not a core function of most roads or transport departments, other roads and transport issues may get a higher priority on the budget.

4.2.20. Full privatization is currently also not an option, as the law enforcement part of overload control has to be carried out by the public sector (traffic officers or police). If overloading is decriminalized and enforcement becomes an administrative process through the levying of an administrative charge, it could be possible to consider privatization, although the long term revenue income could still remain a problem.

4.2.21. The ideal would be a “hybrid” option between a management contract and a concession. Such an option will be discussed in more detail in the section on *Financing Models*.

Some issues pertaining to private sector involvement in overload control

4.2.22. A number of issues should be taken into account when considering private sector involvement in overload control.

4.2.23. **Law enforcement officers:** The availability of law enforcement officers (traffic or police officers) on a continuous basis is essential. If law enforcement officers are called away for other duties by higher authority, weighing operations will be curtailed and the private partner could be entitled to compensation. It is preferable that law enforcement officers are dedicated exclusively to the specific overload control operation.

4.2.24. It is also greatly important that the law enforcement officers are motivated and dedicated in order to ensure the success of overload control projects involving the private sector. The perception can easily be created that the law enforcement officers are required to perform their duties only to assist the private sector partner to make money. Law enforcement officers should receive intensive training and technical knowledge. Performance-based incentives could ensure their positive participation. It should also reduce the temptation to accept bribes.

4.2.25. The public sector partner must give a commitment that it will deal with cases of corruption and fraud immediately. The selection, placement, replacement and number of law enforcement officers must be agreed upon and must be clearly described.

4.2.26. **Performance contracts:** A performance contract is required whereby the private sector partner is measured against certain criteria and is then rewarded or penalized accordingly. This should also apply to the public sector partner. All parties should be subject to clearly defined performance criteria. The performance-based contract should at least spell out the following:

- the government department’s responsibilities to the service provider
- the duties of the private sector service provider
- the remuneration of the private sector service provider and the basis for reward (bonus) or penalties. (an example is provided in Figure 4.1)
- by how much overloading should be reduced at the weighbridge site

- the efficiency of the weighbridge operation (e.g. less than 20 percent of fines should be challenged in court)
- prescribed period that the weighbridge should be operational (e.g. 80 percent)
- the monitoring of heavy vehicle traffic on the surrounding road network (e.g. 80 percent of the heavy vehicles measured 3 km before and 5 km after the weighbridge should be screened and/or weighed at the weighbridge)
- the number of screened heavy vehicles that should enter the weighbridge to be weighed (e.g. at least 95 percent)

4.2.27. Service agreements that reward contractors for simply providing manpower should be avoided. This approach leads to a lot of money being paid with no guarantee of performance. The implementation of performance measures in this regard is propagated but must be well understood and managed. The performance measured approach is well in line with world trends with regard to management, maintenance and operations of infrastructure and has proved immensely successful and sustainable.

4.2.28. **Courts:** It is essential that both public prosecutors and magistrates be sensitized, orientated and trained with regard to overload control legislation, the operation of traffic control centers and the impact that overloading has on the road infrastructure. This will ensure effective prosecution and the imposition of appropriate fines. If at all possible, the magistrate and public prosecutors should be included in the public-private partnership (PPP) in some way and should be committed to the project.

4.2.29. In order to ensure that only the law enforcement officer issuing the charge notice has to testify in cases that appear before court, it will be necessary for him to avail himself of all the facts. When a vehicle is therefore found to be overloaded, the law enforcement officer must personally check the readings on the scale and do the necessary measurements.

4.2.30. In some cases it would be necessary for staff from the private partner to also appear in court. They should therefore be well trained and coached in what to expect and how to conduct themselves in court.

4.2.31. **Traffic measuring points:** In order to evaluate the effectiveness of overload control undertaken at a weighbridge, it is desirable to have traffic information on the surrounding road network, including all possible escape routes. Measuring points that operate with inductive loops, capacitive-mats or piezo-electric weighing sensors should be installed. The installation, maintenance and monitoring of such traffic measuring points should be included in the contract as part of the private sector partner's responsibilities.

4.2.32. **Reporting:** In order to evaluate the performance of the private sector partner and to supply information for a national and even regional database on overload control, it must be required from him to supply a monthly report of weighing activities. An independent check

or audit of weighing undertaken by the private partner would also be required from time to time.

4.3. Risk associated with involvement of the private sector

Introduction

4.3.1. The involvement of the private partner in overload control also involves the transfer of risks (financial, technical and operational risks). To ensure the success of a partnership it is important that the various risks be transferred to the partner best suited to deal with such risks.

4.3.2. In this section some of the risks applicable to overload control projects are discussed with recommendations on where such risks should lie.

Availability risk

4.3.3. This is the risk that the services provided by the private sector party may be less than required under the contract with the public sector. This risk is borne by the private company and contract conditions will penalize the private sector provider should a problem not be rectified in the prescribed time. This will typically include requirements regarding the operating hours of a weighbridge and the staff that must be available during such operating hours.

Counter-party risk

4.3.4. Counter-party risk is the most obvious and common risk, and is associated with the other parties to an agreement being unable to meet their contracted obligation. This risk is usually a credit risk and exists with suppliers, construction companies, customers or any other party that commits to meeting certain obligations in the future. Counter-party risk is generally managed by undertaking a thorough due diligence (review of the credit rating) and, where required, obtaining a performance bond. Although the expense related to the performance bond will be passed on to customers, the bond enables entities in the business of taking counter party risk (e.g. banks and insurance companies) and of performing the due diligence, to assume the risk. A third party may cover the performance bond totally or in part by funds or other liquid assets in a special purpose (escrow) account or by a guarantee. The third party guarantee is usually provided by an independent financial institution, but may also be given by an affiliate of the counter-party to the transaction.

4.3.5. Due to legal requirements, an important counter-party in any overload control project will be the law enforcement officers. In this case the counter-party risk will not be a credit risk, but an availability and performance risk. In order for a weighbridge to operate, it

is necessary that law enforcement officers are available to divert vehicles to the weighbridge, to issue the charge notices and to detain overloaded vehicles. Due to a general shortage of law enforcement officers, there is a real risk that law enforcement officers will not be available at all times that a weighbridge is supposed to be operational. The public sector partner should carry this risk. It can be covered in terms of guaranteed payment to the private sector partner or waiving of penalties for periods that the weighbridge is not operational due to the absence of law enforcement officers.

4.3.6. The availability and commitment of law enforcement officers are important success factors. Their non-performance can be a huge risk to the private partner. The availability and commitment of the law enforcement officers can be negatively influenced by the non-performance of administrative and other systems of the public sector partner. These include the handling of disciplinary cases, administration, replacement of law enforcement officers, payroll issues, etc. Clear performance parameters for all parties to the overload control project must be developed.

Force majeure risk

4.3.7. This risk reflects the occurrence of unexpected and uncontrollable natural and/or man-made conditions, such as earthquakes, typhoons, flooding or war, which may negatively affect the construction or operations of a project. These risks are generally taken on by the public sector and investors for at least a limited time or amount of investment.

Demand risk

4.3.8. Demand risk relates to the demand for services to be provided by the project. It may be affected by factors such as increases in the cost of raw material (e.g. residual oil or natural gas in the production of electricity), the development of a substitute service (e.g. a new road that parallels rail tracks), overall economic conditions, governmental policy (e.g. taxes), political developments, developments in the customer industries (e.g. tourism), and environmental concerns. In the case of overload projects the demand will be reflected by the number of vehicles weighed at the weighbridge as well as the number of overloaded vehicles apprehended. Both these will reduce over time.

4.3.9. If the weighbridge is operated effectively, overloading on the route covered by the weighbridge should reduce, which is the ultimate aim of control operations. The other possibility is that vehicles will start to use alternative routes to avoid the weighbridge. To mitigate this risk, the private sector partner may request certain conditions in their management agreement, especially if their payment is linked to the number of vehicles weighed and the number of overloaded vehicles apprehended. Another way of reducing this risk would be to monitor the alternative routes using portable weighing equipment. This would require input from both the private sector partner (supplying and operating the portable weighing equip-

ment) and the public sector (traffic officers to stop and direct the vehicles and to escort vehicles that are identified as being overloaded to the weighbridge).

Operating risk

4.3.10. Operating risk applies to the various resources that are important to the operations of the project. This risk may be directly controlled by management (labor issues), or be due to external conditions (exchange rates on imported resources), inadequate maintenance, or design, engineering or construction faults that adversely affect the project's eventual operations. These problems may prevent the project from meeting the scheduled quantity or quality of services. Methods for mitigating operating risk include implementing employee-friendly labor policies (e.g. training, personal advancement, equity interest in project), long-term labor contracts that are acceptable to all parties, long-term fixed price supply contracts that support the projected profit margins, proper insurance, and adherence to all environmental laws and regulations.

4.3.11. Operating risk is one of the main reasons for involving the private sector in the operations of weighbridges. Due to nature of the public sector policy and procedures it is not possible to react on short notice to operational problems such as equipment failure or staff shortages. This often results in weighbridges being out of operation for long periods due to, in some cases, minor problems. This risk should be taken on by the private sector partner who must ensure that the necessary maintenance and replacement of equipment takes place and that the necessary staff is always available. The contract with the private sector partner must therefore include a requirement regarding the maximum time that a weighbridge may be out of order for any reason, excluding force majeure.

Regulatory risk

4.3.12. Overload control is regulated by law. Changes to the current acts and regulations or the promulgation of new acts and regulations could have an effect on the way that overload law enforcement is done.

4.3.13. An important regulatory risk in overload control is the judicial system. The court system forms an integral part of the overload control process and can have a huge negative impact on the whole effort if not handled correctly. The complex nature of overload control regulations together with the evidential and procedural requirements to bring an overloading matter to the court usually result in a low conviction rate. Prosecutors, and in many cases the officers giving evidence, do not always have a detailed knowledge of the relevant regulations. Many court cases are lost because of technicalities, such as aspects regarding the accuracy of the scales. Magistrates do not always appreciate the economic rationale behind overload control and often do not fully understand the very technical nature of the regulations.

Courts often face a backlog of cases and this often results in a prosecution process that is frustratingly slow and often inefficient.

4.3.14. There further appears to be reluctance on the part of some prosecutors to tackle overloading cases. This attitude can be attributed to one or more of the following factors: a misconception that the crime is not serious, a considerable workload, a probable lack of expertise or knowledge on the subject of overloading, a belief that, as the crime does not contain any heinous or violent element, it should not be treated with the same proper consideration, a lack of knowledge of the extent and remarkable consistency with which overloading takes place and a lack of access to the information and evidence of expert witnesses with suitable technical background to assist the State in showing aggravating circumstances, so that appropriate fines may be imposed. In the legal process, the public prosecutor is a key decision maker and should be equipped with appropriate resources to carry out the prosecution function.

Technology risk

4.3.15. This risk refers to the possibility of changes in technology resulting in services being provided with sub-optimal technology. This risk is difficult to control. However, when better technology decreases the cost of providing the services, the private sector provider will almost certainly implement such changes. Contracts may address this risk and set out a method for rectifying related problems.

4.4. Financing mechanisms

Introduction

4.4.1. When considering financing mechanisms, the total life-cycle cost of a facility or facilities should be taken into account. The life-cycle costs include the following costs:

- Initial costs:
 - Planning and design
 - Land acquisition
 - Construction
 - Equipment
 - Vehicles
 - Furniture
 - Commissioning
 - Initial training of staff
- Operating costs:
 - Staff

- Management
- Stationery
- Consumables
- Vehicles
- On-going staff training
- Verification of scale and other equipment
- Cleaning of buildings
- Cleaning of site and garden services
- Maintenance Costs:
 - Buildings
 - Site
 - Equipment
 - Vehicles

4.4.2. Funding is one of the make or break aspects to be dealt with. Capital expenditure is usually determined accurately and fully funded, but the sustainability of overload control is largely dependent on committed funds for operating and maintenance expenditure. This is usually the greatest challenge as it is usually underestimated leading to poor maintenance and eventual deterioration and partial or full suspension of operations.

Sources of project funding

4.4.3. The approach to the funding of overload control should be multifaceted. Project funding can be obtained from various sources. The three main types of project funding are public, corporate and project finance.

4.4.4. **Public Finance** means the government funds a project by using existing surplus funds or issued debt (government bonds) to be repaid over a specific period. This is the traditional way in which governments fund projects.

4.4.5. **Corporate Finance** means the private sector partner uses its own credit for raising funds due to its capacity and the limited size and nature of the project. This option is often used for shorter, less capital-intensive projects that do not warrant external financing.

4.4.6. **Finance** means the project's assets and/or future revenues are used as the basis for raising funds. The private sector partners developing the project (sponsors) will usually create a special purpose, legally independent company in which they are the principal shareholders. This type of project funding is used for larger projects.

4.4.7. In the case of overload control, the future revenue stream required for the project financing option will be the fines for overloading that are collected. The saving in road damage due to effective overload control can be regarded as an indirect income and should be reconciled in the life-cycle cost analysis. There are generally several legal requirements per-

taining to the collection of fines for traffic offences that usually make it difficult to allocate such income to a specific project. With effective overload control there will furthermore be a reduction in the income from fines as overloading reduces.

4.4.8. Overload control can therefore not normally be self sustainable based on income from fines or fees. It is imperative that road authorities and funding agencies appreciate this important point and take it into account when considering different funding mechanisms.

Financing models

4.4.9. For overload control projects, the most appropriate sources of funding are public finance and corporate finance. Where no private partner is involved, all funding will be via public finance.

4.4.10. If a private partner is involved by way of a service contract or a management contract, capital expenditure will be funded with public finance. Corporate finance will be used as bridging finance, as the private partner will finance operations, maintenance and the replacement of certain equipment (if included in the contract) for a certain period before receiving payment from the public partner. In essence the whole project will still be funded with public finance.

4.4.11. Sources of public finance are existing surplus funds from tax revenue, issued debt (government bonds) and the income from fines. Dedicated road funds (where these exist) are another source of public finance. Donations from donor countries could be used as a substitute for public finance. A requirement from donor countries is usually that donations only be used for capital expenditure. The host country would still have to use public finance for the operating and maintenance costs.

4.4.12. With concession roads, it is proposed that overload control be part of the responsibility of the concessionaire and be included with the financial model of the concession.

Recommended financing model

4.4.13. The successful and sustainable implementation of an overload control system depends as much on the road authority's implementation capacity as on the availability of the necessary capital, operational and maintenance funds.

4.4.14. Public sector revenues are normally under severe pressure and are insufficient for the provision of all the required infrastructure and services. In developing countries in particular, meeting basic needs and providing poverty-relief measures tend to take precedence over more sophisticated infrastructure and services (such as weighbridges) which are vital for the protection of economic infrastructure (i.e. roads), which in turn are vital for economic development and improved quality of life.

4.4.15. Another drawback in developing countries, apart from the general lack of funds, is the shortage of personnel having the necessary expertise and experience to plan, implement and operate overload control facilities. The financing model should therefore complement the implementing authority's capabilities.

4.4.16. The limited success at regional level in the implementation of the SADC/COMESA proposals on overload control suggests that "business-as-usual" will not ensure efficient implementation of overloaded control measures.

4.4.17. The recent surge of activity in a number of countries where substantial investments are being made, or planned, for the procurement of weighbridge equipment and infrastructure, raises the question to what extent duplication of scarce resources and "re-inventing the wheel" are part of these overload control activities.

4.4.18. Another reason for the limited success rate could be that individual countries in a region such as SADC, plan, implement and operate their overload control facilities in isolation from one another. Thus, in an attempt to improve the success rate of overload control initiatives in Eastern and Southern Africa, the following changes in the institutional and financing arrangements are proposed:

- Establishment of a Special Purpose Vehicle (SPV) to co-ordinate and plan overload control on a regional (e.g. SADC) or development corridor basis (e.g. Maputo-Walvis Bay or the Northern Corridor from Mombasa to the Democratic Republic of Congo). The advantage of an SPV is that it can prevent the duplication of scarce resources and establish real coordination between countries in a region. In the case of SADC, the SPV could fall under the SADC Secretariat in Botswana.
- Adopt a financing model which is a hybrid of a *Concession Contract* and a *Management Contract*. In such a contract the private sector would provide the capital finance as well as the working and maintenance capital. The contract will not generate sufficient revenues to cover the concessionaire's investment and operating costs, plus an acceptable rate of return. The government will still have to buy the services from the concessionaire at a predetermined monthly price over a period of (say) 15 to 20 years, depending on the capital layout and the agreed acceptable rate of return. The advantages of such a financing model are that:
 - the implementation of overload control will be put on a "commercial" footing for the first time;
 - it will promote continuity in the financing of overload control operations since the government will now be bound contractually to remunerate the private sector service provider; and
 - it will enable financiers, such as banks and the International Financing Corporation, to become partners in the financing of overload control initiatives. Their in-

volvement will encourage financial discipline and improve the establishment of long-term sustainability of overload control projects.

- The government department could pay the private sector service provider from the following sources:
 - government funding for road infrastructure
 - a possible road user charge
 - possible donor grants
 - indirectly, from savings in road maintenance costs

4.5. References

1. Public-Private Partnerships: A manual for South Africa's national and provincial government departments and Schedule 3 public entities. October 2002. Pretoria. The PPP Unit, National Treasury.
2. Guidelines for Private Sector Involvement in Overload Control. March 2004. Pretoria. Department of Transport.

- 1** Introduction
- 2** Selection, installation and operation of weighbridges
- 3** Data collection, analysis and reporting
- 4** Private sector involvement and financing mechanisms
- 5** Cross border overload control
- 6** Training of weighbridge personnel

5. CROSSBORDER OVERLOAD CONTROL

5.1. Introduction

Background

5.1.1. The SADC Memorandum of Understanding on Vehicle Loading (SADC, 1999) envisages the development of a regional network of weighing stations which is effective and sustainable in respect of both domestic and international traffic. Moreover, the MoU requires that in locating weighing stations, preference shall be given to their establishment in common control areas at border posts.

5.1.2. In accordance with the guidance given in the MoU, a pilot cross-border overload control project was undertaken at the Groblersbrug/Martin's Drift (South Africa/Botswana) border post in 2004 in order to investigate how best to curb the problem of overloaded vehicles crossing one country's border into another country. Based on the success of the project, a cross border overload control system has been developed which has the potential for achieving similar success at many border locations in the region.

Purpose and scope of the guideline

5.1.3. The purpose of this guideline is to provide information and guidance on how to implement a *cross border overload control system* (CBOCS) by adopting a more collaborative, streamlined and professional approach between the roads authority, Customs and transport agency (hereafter referred to, for convenience, as the Cross Border Road Transport Agency (CBRTA) in dealing with commercial vehicles that wish to cross a border from one country to another. The guideline provides guidance on the design of the CBOCS including the institutional arrangements, operational procedures and other facilitative measures that should be observed in administering a CBOCS.

Structure of guideline

5.1.4. The guideline is structured as follows:

- **Section 1** (this section): Provides the background to the guideline as well as its purpose, scope and structure.
- **Section 2:** Outlines the system design and procedures

- **Section 3:** Addresses the institutional arrangements necessary for initiating the CBOCS
- **Section 4:** Addresses the operational aspects of the CBOCS
- **Annex A:** Example of a Typical Procedures Guide Between a Road Transport Agency and Customs
- **Annex B:** Example of a Typical Memorandum of Understanding Between a Road Transport Agency and Customs
- **Annex C:** Typical Weighbridge Forms

5.2. System design

Basic principles

5.2.1. Organizations involved: The objective of the CBOCS is to improve the effectiveness of cross border overload control in any ESA country at very little, if any, additional cost to the status quo. Such a system would involve closer collaboration between the following organizations:

- The roads authority and its weighbridge unit
- Customs and Excise
- The Cross Border Road Transport Agency (CBRTA or equivalent)
- Road transport industry (e.g. FESARTA)

5.2.2. System features: The CBOCS is based on the following features:

- Adherence to more clearly defined roles, closer working relationships and streamlining of operations between the Weighbridge Unit, Customs and CBRTA;
- Reliance on both physical weighing of vehicles and imposition of administrative disincentives and penalties on offenders;
- Adoption of more clearly defined weighing procedures including the issuance of a Weighbridge Clearance Certificate;
- Establishment of more formalized communication procedures between the Weighbridge Unit, Customs and the CBRTA (or equivalent);
- Ensuring that the system does not significantly delay commercial vehicles crossing the border.

5.3. System procedures

System attributes

5.3.1. In compliance with the criteria set by the Federation of Eastern and Southern African Road Transport Associations (FESARTA), the system design for the CBOCS is:

- Relatively simple to administer
- Does not incur significant additional costs to the status quo operations
- Is effective in terms of curbing overloading
- Requires a short lead time for implementation
- Supplements rather than replaces existing procedures
- Does not cause any significant additional delays to commercial vehicles

System procedures

5.3.2. The various procedures to be followed by the organizations involved in the CBOCS should be documented in a *procedures guide*. An example of such a guide is presented in Annex A and may be summarized as follows:

- The **Weighbridge Unit** is responsible for weighing vehicles in the usual manner and would issue a Weighbridge Clearance Certificate of Weight (WCC) only to those vehicles that are legally loaded.
- **Driver:** In the case of an illegally loaded vehicle, the driver must take the necessary action to adjust the load or off-load some of the load to achieve compliance with the legal limits. After so doing, the vehicle weighing process and related activities can be repeated.
- **Customs** would require the driver of any commercial vehicle to produce documentary evidence that it is not overloaded, in the form of a WCC, before attending to the normal clearance procedures for crossing the border.
- **CBRTA:** WCCs would be monitored by CBRTA officials and used as a regulatory tool for issuing permits. For example, a first overload offence may trigger a written warning threatening suspension or revocation of a permit; a second offence may trigger suspension or revocation of the permit while a third offence may bar a transporter from obtaining additional permits either for a stated period of time or permanently.

5.3.3. The above procedures supplement rather than replace the existing procedures that are normally applied at both a typical weighbridge and Customs. These supplementary pro-

cedures are simple to administer and their implementation does not incur significant additional resources.

5.4. Siting of weighbridges

Use of common control areas at border posts

5.4.1. The CBOCS initiative is in accordance with the SADC MoU on Vehicle Loading (SADC, 1999) which requires that member states agree that, in locating weighing stations, preference shall be given to their establishment in common control areas at border posts. Thus, ideally, when new border facilities are being planned, provision should be made for not only locating the weighbridge within the customs area but, also, for sharing the weighbridge facility between the adjacent countries in a one-stop border post arrangement. The layout of the one-stop border control facility would require careful consideration to cater for both inbound and outbound commercial vehicles before customs processing takes place.

5.4.2. The CBOCS can also be operated successfully in cases where the weighbridge is not located in close proximity to customs. In such a situation, the weighbridge could be operated many kilometers away from the border. However, there is a possibility that after weighing and being issued with a weighbridge clearance certificate, the driver may pick up additional load and still be cleared by customs. Nonetheless, the risk of this occurrence should not detract from the principle of operating the system which, on balance, is likely to provide more benefits than dis-benefits.

5.5. Institutional arrangements

Legal support for CBOCS

5.5.1. Ideally, there should be specific provision in the Customs or Road Traffic Acts that legally empowers Customs to act on behalf of the road agency in respect of the CBOCS mandatory requirement for all drivers to produce a WCC as a pre-condition for border clearance processing by Customs.

5.5.2. Most Customs or Road Traffic Acts pre-date the CBOCS concept and do not contain the provisions indicated above. Thus, when the opportunity presents itself, the Customs and Road Traffic Acts should be amended accordingly.

5.5.3. In the absence of the preferred legal provisions outlined above, the CBOCS requirement can be accommodated by treating it as an internal Customs procedure which can be amended and formalized on the basis of a MoU between Customs and the Road Agency (as was the case with the pilot project). An example of such a MoU is included as Annex B.

5.6. Operational issues

Synchronization of working hours

5.6.1. The CBOCS requires that both the weighbridge and Customs operating hours should be synchronized so that all heavy vehicles wishing to cross the border should not be delayed from doing so by shorter or non-synchronized weighbridge operating hours. This may entail increasing the number of shifts operating at the weighbridge.

Communications

5.6.2. Although not mandatory, it would be very desirable to establish an electronic link between the weighbridge and Customs. Such a link would serve to forewarn Customs of the details of vehicles weighed at the weighbridge prior to the vehicle arriving at Customs and, in so doing, would also improve the efficiency of the CBOCS operations.

Weighbridge clearance certificate

5.6.3. Some form of weighbridge report, either manually written or computer generated is normally issued to drivers after their vehicle has been weighed. In principle, any overloaded vehicle is required to either have its load adjusted or some of it off-loaded to achieve compliance with the legal limits, after which such a report is issued.

5.6.4. The format of the typical weighbridge reports may not be suitable to act as a WCC. Ideally, an electronically generated WCC should be produced at each weighbridge for presentation to Customs. Pending such a development, it is feasible to use existing weighbridge reports which can simply be stamped "Vehicle/combination legally loaded" which would be signed by the weighbridge supervisor. Examples of WCCs are presented in Annex C.



Billboard at the border between Botswana and South Africa

Weighbridge signs

5.6.5. In addition to the weighbridge traffic signs marked "Zero tolerance to overloading" and indicating that "Only vehicles with a *weighbridge clearance certificate* stamped 'vehicle legally loaded' will be allowed to transit this border" should be erected at the entrance to the Customs area. An example of such a bill board that was used in the pilot project is shown in the picture above.

5.7. Implementation issues

Prerequisites

5.7.1. Before embarking on the implementation of a CBOCS, the following provisions should be observed (InfraAfrica, 2006):

- There is commitment and support from the national stakeholders in the host country, particularly from Customs, the roads agency and the weighbridge unit.
- There is a national champion who is committed to drive the implementation of the CBOCS from its inception to operational stages.
- There is a signed Memorandum of Understanding in force between the roads agency and Customs which empowers Customs to act on behalf of the roads agency in terms of requiring the drivers of all heavy vehicles to present a WCC as a pre-condition for undertaking border clearance activities.
- The weighbridge is located close to the border post, without being so close that it adversely affects the vehicle parking or movements at the border post.
- The weighbridge is at least a 4m x 3.2m axle unit scale (single axle platforms are inherently unsuitable for overload control purposes).
- The weighbridge operating system is computerized, has a modern design and can produce an electronically printed WCC. It should not be possible for the weighbridge staff to override the system output.
- The weighbridge should be assized at least every 12 months.
- The weighbridge operations should begin no later than the border opening time and should end no earlier than the border closing time.
- There is adequate staff to man the weighbridge for the full duration of the Customs operating hours. This may require at least two shifts of weighbridge operators.
- There is adequate road signage located near both the weighbridge and Customs warning drivers of the CBOCS and its requirements.
- There is an electronic link between the weighbridge and the border post, so that weighbridge Certificates of Weight can be electronically transmitted to Customs at the border post and so reduce the chance of corruption.
- An amendment to Customs internal procedures which makes it mandatory for all drivers of commercial vehicles to present a weighbridge clearance certificate as a pre-condition for processing Customs documents.
- Synchronization of working hours between the weighbridge Unit and Customs whereby the weighbridge operating hours are at least as long as the border opening hours

(this may require a two-shift operation and not just overtime of a single-shift operation.

- Customs to be advised when the weighbridge is not functioning so that in such a situation drivers can still be processed to cross the border.

Training

5.7.2. Relatively simple training is required prior to the introduction of the CBOCS. Such training would entail familiarizing key stakeholders with the underlying concept behind the new system so that they fully understand their new roles and responsibilities in the process.

Publicity

5.7.3. Before the CBOCS is implemented, it is essential that all stakeholders, especially transporters and drivers, are made aware of the requirements of the new system. This can be accomplished by mounting a publicity campaign utilizing the press, radio and pamphlets handed out at weighbridges and Customs at least one month prior to the commencement of the new system.

Auditing of system

5.7.4. In order to assess the performance of the CBOCS, an audit should be carried out 12 months after the commencement of the new system. This would provide valuable information of the operations of the new system, its impact on the incidence of overloading and any aspects that need to be modified in light of the experience gained from its operation.

5.8. References

InfraAfrica (Pty) Ltd (2006): Review of Cross Border Overload Control Pilot Project at Martins Drift/Groblers Bridge. Report prepared for USAID Hub, Gaborone, Botswana.

SADC (1999): Enabling legal reform: Control of Vehicle Loading. SADC Secretariat, Gaborone.

Annex A

**Example of a typical procedures guide
between a road transport agency and customs**

1. INTRODUCTION

1.1 The Department of Road Transport and Safety (DRTS) has embarked on an initiative of upgrading weighbridges nationally for purposes of combating overloading. The actual operation of weighbridges is undertaken by Roads Department (RD) on behalf of DRTS.

1.2 The Department of Customs and Excise (DCE) being the authority responsible for monitoring and controlling the movement of goods across all the borders in the Republic of Botswana is best suited to monitor and enforce compliance with the relevant legislation administered by the DRTS pertaining to overload control at borders.

1.3 The DRTS, RD and DCE (“the Parties”) have entered into a Memorandum of Understanding on Cross-border Vehicle Overload Control which lays the foundation for cooperation between the parties.

1.4 Having regard to the above background, the parties hereby agree to cooperate as specified hereunder.

2. OBJECTIVES

2.1 The objectives of this agreement are to:

2.1.1 Specify the operational procedures to be followed by both parties in monitoring and controlling cross-border vehicle loading to ensure compliance with the relevant section of the Road Traffic Act and to avoid any significant delays to commercial traffic crossing the border.

3. PROCEDURES

3.1 RD on behalf of DRTS will:

3.1.1 Weigh all commercial goods transporters (“transporters”) transporting goods out of the borders of the Republic of Botswana.

3.1.2 Record the weights of all axles on a prescribed Weighbridge Report.

3.1.3 Issue a copy of the Weighbridge Report as well as a Weighbridge Clearance Certificate to those transporters whose axle loads do not exceed the legal limits.

3.1.4 Inform those transporters whose axle loads exceed the legal limits that they must both off load from the overloaded vehicle to another vehicle to reach the permissible load on all axles and pay the stipulated fine only after which will they be issued with a Weighbridge Report and WCC.

3.2 The transporter will:

3.2.1 Proceed to the border post and present the necessary documentation to Customs, including the Weighbridge Report and WCC.

3.3 Customs will:

3.3.1 Process the documentation only of those transporters that produce a Weighbridge Report and WCC. Those transporters without the Weighbridge Report and WCC will be informed that they must first obtain such documentation from the RD before they can be considered for clearance across the border.

3.3.2 Retain the Weighbridge Report and WCC for information sharing with other parties to the agreement.

4.1 ANNEXURES TO THIS AGREEMENT

4.1 This is a founding general agreement between the parties. Further details with regard to matters agreed to in terms of this agreement will be dealt with between the parties.

4.2 Such other specific additional agreements will be in writing and form annexures to this agreement and will only come into effect after being signed by authorized representatives of both parties.

5. COMMUNICATION

5.1 Each party will be responsible for sensitizing and acquainting their relevant officers with this agreement and its subsequent addenda.

6. NON WAIVER

6.1 No part of this agreement should be construed as authority for the parties to exercise their powers and duties contrary to the provisions of their respective Statutes and Regulations.

7. NON ENFORCEABILITY

7.1 This agreement as well as its subsequent addenda is not enforceable in a court of law.

8. TERMINATION

8.1 Notwithstanding anything to the contrary contained herein, either party may terminate this agreement on 1 (one) months written notice to the other.

8.2 The termination of this agreement will only be in force if it is in writing.

9. REVIEW

9.1 This agreement will be reviewed annually to determine and make any changes which may be necessary.

9.2 An amendment to this agreement is subject to the written approval of both parties herein.

SIGNED ON THIS THEDAY OF..... 20xx

For and on behalf of DRTS

Witness

Witness

For and on behalf of RD

Witness

Witness

For and on behalf of DCE

Witness

Witness

Annex B

**Example of a typical Memorandum of Understanding
between a Road Transport Agency and Customs**

1. INTRODUCTION

1.1 The Department of Road Transport and Safety (DRTS) has embarked on an initiative of upgrading weighbridges nationally for purposes of combating overloading. The actual operation of weighbridges is undertaken by Roads Department (RD) on behalf of DRTS.

1.2 Upon weighing of vehicle loads on weighbridges by the Weighbridge Division of RD, a Weighbridge Report is issued which records the load on each axle of a vehicle as well as the Gross Combination Mass (GCM) of the vehicle. In addition, a Weighbridge Clearance Certificate (WCC), which serves as proof of compliance with the relevant section of the Road Traffic Act, is issued only to drivers whose vehicles are legally loaded and

1.3 The Department of Customs and Excise (DCE) being the authority responsible for monitoring and controlling the movement of goods across all the borders in the Republic of Botswana is best suited to monitor and enforce compliance with the relevant legislation administered by the RD on behalf of DRTS pertaining to overload control at borders.

1.4 DCE endeavors to constantly improve its monitoring and control of goods imported, or exported or in transit into or out of the Republic of Botswana in terms of the Customs and Excise Act No. xx of 19xx (“Customs and Excise Act”). The enforcement of Weighbridge Clearance Certificates by DCE is one such measure which will improve the control and monitoring of the goods referred to in terms of the provisions of the Customs and Excise Act.

1.5 DRTS, RD and DCE (“the Parties”) acknowledge that they mutually stand to benefit by entering into this agreement which will strengthen the control of overloading in the Republic of Botswana as well as in the SADC region.

1.6 Having regard to the above background, the parties hereby agree to cooperate as specified hereunder.

2. OBJECTIVES

2.1 The objectives of this agreement are to:

2.1.1 Lay the foundations for co-operation between the parties.

2.1.2 Optimize compliance with the relevant laws administered by each party.

2.1.3 Ensure effective enforcement of the laws administered by the parties.

2.1.4 Avoid any significant delays to commercial traffic crossing the border.

3. PRINCIPLES

3.1 RD on behalf of DRTS will:

3.1.1 Issue WCCs to all compliant commercial goods transporters (“transporters”) transporting goods into and out of the borders of RSA.

3.2 The Director of DCE will:

3.2.1 Before signature hereof, prescribe in terms of the relevant section(s) of the Customs and Excise Act that WCCs should be produced at all the border posts by transporters on exportation of goods. (N.B Whilst it is the intention to control vehicles leaving or entering the country, initially it will only practical to control those leaving the country. It is also the intention for neighboring countries to control those entering the Republic of Botswana.)

3.2.2 Prescribe operational procedures whereby the documentation of vehicles of transporters who fail to present a WCC will not be processed until such a certificate is presented together with the other requisite Customs documentation.

4. INFORMATION SHARING

4.1 Both parties will subject to 4.2 supply each other with all information pertaining to the contravention of the laws which they administer.

4.2 Should either of the parties be unable to furnish the requested information due to legislative hindrances, then such party will facilitate the amendment of the hindering provision or take such other measures which are appropriate to enable it to supply the said information.

4.3 Should information and/or testimony be required by either party for litigation purposes, either party will upon formal request, supply such information and/or person who is required for testimony in court.

4.4 The WCC required in terms of this agreement may be supplied in an electronic or manual format.

4.5 Each party will treat the information supplied by the other party as confidential unless otherwise agreed.

5. TRAINING

5.1 The parties will assist one another to plan and implement training programs designed to share expertise in common areas.

6. ESTABLISHMENT OF THE JOINT COORDINATING COMMITTEE

6.1 The parties hereto will establish a Joint Coordinating Committee, which will be responsible for the implementation, compilation of annexures, input to policy formulation and enforcement of this agreement between the parties.

6.2 The Joint Coordinating Committee will comprise of three members made up as follows:

- (a) 1 (one) official from DRTS
- (b) 1 (one) official from RD
- (c) 1 (one) official from DCE
- (d) 1(one) representatives from other Stakeholders (e.g. the national Transporters' Association)

6.1.2 The Directors of DRTS, RD and DCE will be responsible for the appointment of their respective officers who will serve on the Joint Coordinating Committee.

6.1.3 The Joint Coordinating Committee chairmanship will rotate between the parties representing Government.

6.1.4 Should any of the appointed officers be unavailable for any reason whatsoever, the respective Directors of DRTS, RD and DCEG will appoint a substitute.

6.1.5 The Joint Coordinating Committee will meet not less than three times in a calendar year on a date and place to be agreed to by the parties from time to time. However, any party may on reasonable notice call for a special meeting of the Joint Coordinating Committee when there is a need.

6.1.6 The Joint Coordinating Committee will also be mandated to co-opt any additional member on an ad hoc basis, to assist with specific expertise/input required.

6.1.7 The Joint Coordinating Committee will be appointed within 7 (seven) days after the signature of this agreement.

6.3 Roles and responsibilities:

6.3.1 The Joint Coordinating Committee will be responsible for:

- (a) the enforcement of this agreement.
- (b) serving as a link with the management of the parties.
- (c) resolving disputes between the parties.
- (d) receiving and forwarding requests and/or initiatives to the relevant authority within each of the parties.
- (e) facilitating high level meetings where appropriate.
- (f) coordinating any projects carried out by one or both parties.

6.3.2 Decisions of the Joint Committee affecting policy and processes will be subject to a written approval by the management of each party prior to implementation thereof.

6.4 Contact officers

Each party will appoint one contact officer to provide information or other avenues of assistance to the other party.

7. OPERATIONAL PROCEDURE

7.1 The Coordinating Committee will develop operational procedures in terms of which the parties will operate in discharging their obligations in terms of this agreement and reduce the said procedures into a Operation Agreement which will form an annex to this agreement.

7.2 The parties will, through the Coordinating Committee, agree on the amendment of the said procedures from time to time as and when there is a need.

7.3 The agreed operational procedures will be adhered to by both parties at all times.

8 ANNEXURES TO THIS AGREEMENT

8.1 This is a founding general agreement between the parties. Further details with regard to matters agreed to in terms of this agreement will be dealt with between the parties.

8.2 Such other specific additional agreements will be in writing and form annexures to this agreement and will only come into effect after being signed by authorized representatives of both parties.

9. COMMUNICATION

9.1 Each party will be responsible for sensitizing and acquainting their relevant officers with this agreement and its subsequent addenda.

10. NON WAIVER

10.1 No part of this agreement should be construed as authority for the parties to exercise their powers and duties contrary to the provisions of their respective Statutes and Regulations.

11. NON ENFORCEABILITY

11.1 This agreement as well as its subsequent addenda is not enforceable in a court of law.

12. TERMINATION

12.1 Notwithstanding anything to the contrary contained herein, either party may terminate this agreement on 1 (one) months written notice to the other.

12.2 The termination of this agreement will only be in force if it is in writing.

13 REVIEW

13.1 This agreement will be reviewed annually to determine and make any changes which may be necessary.

13.2 An amendment to this agreement is subject to the written approval of both parties herein.

SIGNED ON THIS THE _____ DAY OF _____ 2004

For and on behalf of DRTS

Witness

Witness

For and on behalf of RD

Witness

Witness

For and on behalf of DCE

Witness

Witness

Annex C

Typical weighbridge forms

Weighbridge form from South Africa

*GROBLERSBRUG TRAFFIC CONTROL CENTER**

AXLE WEIGHING
ROAD TRAFFIC INSPECTORATE - PROVINCIAL ADMINISTRATION

st mass date : 04/04/2003 12:27 Transaction no. : R059
 reg. no. 1 : NTW852GP
 reg. no. 2 : NCZ608GP
 reg. no. 3 : NCZ611GP
 Axle group config.: SSD2T2T2 1-2-3-3
 Company/Name : ATS AMALGAMATED
 Make : VOLVO
 Route : N11
 Destination : BOTSWANA
 Origin : JOHANNESBURG
 Cargo : MIXED GOODS
 Vclass : 1233
 Gross mass : 83300 Kg

Comment :

	ACTUAL MASS GROUP	PERM MASS	PERM TOL.	OVER LOAD KG	CHARGE OVER KG	REGUL NUMBER
S 1	6940	7700	8085	0	LEGAL	234(1)
2	21560	18000	18900	3560	3560	235(1)
2	29040	24000	25200	5040	5040	240(G)
2	25760	24000	25200	1760	1760	240(G)
	83300	56000	58800	24500	10360	362/364

NOTICE TO DRIVERS OF VEHICLES PARKED OFF AT GROBLERSBRUG TESTING CENTRE

OVERLOADED VEHICLES - No vehicles shall leave the premises unless the load is rechecked on the weighbridge
 No load or part of a load is allowed to be offloaded in the YARD. load may be moved from one vehicle onto another in the yard.
 Any vehicle parked off on the premises will not be released if the area is not clean of bottles, tins, paperbags etc. :

MASS BRIDGE OPERATORISSUEING OFFICER.....

Weighbridge form from Botswana



Republic of Botswana
Ministry of Works and Transport

Certificate of Weight (Ref. Road Traffic Act CAP. 69.01 Regulation 94)

General details

Weighbridge Station:	Load Type:	Unit	Tare (kg)	Reg. No.
Ticket No:	Transport Type:	Horse/Truck		
Date and Time:	Configuration:	Trailer 1		
Company:	Width: m Length: m Height: m	Trailer 2		
Permit No:		Trailer 3		
Origin:		Semi-Trailer 1		
Destination:		Semi-Trailer 2		

Vehicle load details

Axle Group	Permissible Mass (kg)	Permissible Mass + 5% (kg)	Actual Mass (kg)	Overload (kg)	Chargeable Overload (kg)	Overload Fine (Pula)
1						
2						
3						
4						
5						
6						
7						
8						
Permissible Combination Mass (PCM)						
PCM						

Action taken

None. Vehicle loads fully compliant with permissible limits Vehicle load adjusted to be fully compliant with permissible limits
Vehicle off-loaded to become fully compliant with permissible limits

Certification of vehicle mass

This is to certify that the undersigned has physically weighed all axles and checked all information on this report and declares it is true and correct: Name of operator:..... Signature of operator:.....	Vehicle/Combination Legally Loaded	This is to certify that the undersigned is aware that it is necessary to present this weighbridge report to the Customs authority as a pre-requisite for customs processing. Name of driver:..... Signature of driver:.....
	This is to certify that the vehicle/combination with the above registration details is legally loaded and is eligible for processing by Customs.	

Notwithstanding the above certification, the authority concerned in a transit country may weigh the vehicle to check its compliance with national vehicle loading regulations.

Notice to drivers of vehicles

1. No overloaded vehicles shall leave the premises unless the load is rectified and the mass rechecked on weighbridge
2. No load, or part of a load, is allowed to be off-loaded in the yard. Loads may only be transhipped from one vehicle onto another in the yard.
3. Any vehicle parked off on the premises will not be released until the area surrounding the vehicle is clean of bottles, tins, paper bags, etc.
4. Any vehicle left in the yard for more than 7 days, whether overloaded or not, will be liable to a parking fee of P.....per vehicle per day.

- 1** Introduction
- 2** Selection, installation and operation of weighbridges
- 3** Data collection, analysis and reporting
- 4** Private sector involvement and financing mechanisms
- 5** Cross border overload control
- 6** Training of weighbridge personnel

6. TRAINING OF WEIGHBRIDGE PERSONNEL

6.1. Introduction

Background

6.1.1. To successfully implement an overload control program or to operate properly a weighing facility, such as a weighbridge or a traffic control center, requires well trained and experienced staff. Unfortunately, however, the type and standard of training varies significantly in Eastern and Southern Africa as a result of which the quality and competence of weighbridge staff also vary considerably and overload control operations are generally not carried out efficiently and effectively.

6.1.2. From the above, it is clear that a sufficient number of appropriately trained weighbridge personnel must constitute a critical element of any country's overload control strategy. Without such personnel, the existence of all the other attributes of a sound overload control strategy, such as appropriate legislation and regulations or relatively expensive state-of-the-art infrastructure, will count for little in the country's quest to curb overloading.

Purpose and scope of guideline

6.1.3. Against the above background, the main purpose of this guideline is to provide guidance on various aspects of training for overload control personnel. Inevitably, such guidance can only be of a generic nature and will need to be customized to the specific environment in which it is being applied—an environment that will vary significantly between the various countries of Eastern and Southern Africa. The ultimate aim of such training is to ensure that overload control is carried out in a harmonized, consistent manner and to a standard that will instill public confidence in this important aspect of any roads agency's operations.

Structure of guideline

6.1.4. The guideline is structured as follows:

- **Section 1** (this section): Provides the background to the guideline as well as its purpose, scope and structure.

- **Section 2:** Presents an overview of training in overload control based on the guidance given in the SADC Memorandum on Vehicle Loading (SADC, 1999).
- **Section 3:** Indicates the training arrangements currently available in Eastern and Southern Africa as well as proposed future training arrangements.
- **Section 4:** Provides the scope of the training program considered appropriate for meeting the needs of personnel involved in overload control.
- **Section 5:** Outlines a training syllabus that covers various aspects of overload control for various categories of staff.

6.2. Overview of training requirements

SADC MoU on vehicle loading

6.2.1. Guidance on training requirements for the SADC region is contained in the SADC Memorandum of Vehicle Loading (SADC, 1999) which states that:

- (1) States, in support of voluntary compliance and the promotion of a common understanding of the vehicle loading system and its enforcement in the region through the ongoing exchange of information, must endeavor to promote, through appropriate training, a high standard of professionalism amongst authorized officers, operators, drivers, consignors and consignees.
- (2) To this end, member states agree to
 - (a) encourage programs aimed at promoting a common understanding of
 - (i) the regulation and enforcement of vehicle loading;
 - (ii) the manner in which any goods may be loaded and carried on a vehicle, including driving practices; and
 - (iii) weighing practices and procedures;
 - (b) share existing training facilities and investigate the feasibility of establishing a regional training centre;
 - (c) harmonize training programs bearing in mind the need to ensure adequate levels of expertise and professionalism;
 - (d) coordinate human resource development policies and programs through a regional plan for the transfer of knowledge, skills and technology;
 - (e) provide for the mutual recognition of qualifications; and
 - (f) encourage practical on-the-job joint training.

6.3. Current and proposed training arrangements

6.3.1. Currently, the relatively little formal training carried out in Eastern and Southern Africa takes place at national level, usually in-house by the authority concerned. As indicated in Section 3.1, such training leaves a lot to be desired in terms of quality, content and inconsistent nature of the syllabus followed.

6.3.2. The alternative to carrying out training at national level is to do so at a regional training center or centers as recommended by the SADC MoU on vehicle loading. This option enjoys wide-spread support by most, if not all, member states of SADC and COMESA, and offers the following significant advantages:

- Provision of a facility for which there is much demand by a large number of countries in Eastern and Southern Africa, some of which would find it very difficult to provide adequate facilities at national level.
- Adoption of a common syllabus that would ensure consistency in all aspects of training in overload control as well as mutual recognized qualifications.
- Achievement of economies of scale and cost-effectiveness derived from the avoidance of provision of duplicative facilities and staffing at national level.

6.3.3. Whilst there appears to be no existing capacity for carrying out training in overload control on the scale envisaged above, it is also apparent that there is suppressed need for such training. For example, from the Overloading and Truck Taxation Survey carried out for SADC and COMESA in 2003 (Gicon and InfraAfrica, 2003), there were about 165 weighbridges of various types operated in the SADC region, excluding Angola and the Democratic Republic of Congo. Based on a typical figure of about 10 – 15 staff per weighbridge (depending on the type of facility and comprising both managerial and technical staff) it is estimated that the total number of staff involved in overload control in the SADC region and requiring training or re-fresher training would be of the order of 1,650 to 2,500. This conservative estimate, which will increase as the full complement of weighbridges is installed in each country, suggests that the feasibility of establishing a regional training center is sound in relation to benefits likely to derive from such an investment.

6.4. Scope of training program

Disciplines to be covered

6.4.1. The efficient and effective control of overloading utilizing increasingly sophisticated equipment is closely related to the quality of the enforcement and enforcement staff. Such staff need to be conversant with a wide range of disciplines which may be grouped under the following headings:

- Transport environment
- Data management

- Legislation and regulations
- Weighbridge equipment
- Weighing operations
- Software operation
- Management reporting
- Staff management
- Operations management
- Maintenance management
- Safety

Classification of staff to be trained

6.4.2. The above disciplines are varied and in some cases specialized. Thus, weighbridge staff should be categorized in terms of the functions that they are to perform and should receive training specific to those functions. Weighbridge staff can generally be classified in the following categories:

- Law enforcement staff
- Operational staff
- Administrative staff
- Maintenance staff
- Management

Approach to training

6.4.3. Depending on the size of the weighing facility, weighbridge staff could be required to perform functions in all the categories. Thus, they would need training specifically relating to overload control as well as generic training relating to the aspect of overload control in which they are involved. Also, the training to be provided would in most cases consist of both theoretical and practical training. Practical on-the-job training should, as far as possible, take place under operational conditions at weighing facilities.

6.5. Training syllabus

Training modules

6.5.1. The following courses with related durations are recommended to be undertaken by the target audience indicated. As indicated in the tables below, the length of the training course is dependent on the scope and content of the module and would range typically from one day to one week.

COURSE 1

<i>Title</i>	Transport environment
<i>Target audience</i>	All staff
<i>Objectives</i>	To impart a basic understanding of the transport environment and the reasons why overload control is important
<i>Content</i>	<ul style="list-style-type: none">• Introduction• The importance of the transport sector for the economy of a country• The importance of a country's road network for economic and social development• Basic principles of road design;• What is overloading• The effect of overloaded vehicles on the road infrastructure, including bridges• The effect of overloaded vehicles in terms of road safety• Why operators overload and the profits made.
<i>Duration</i>	1 Day

COURSE 2

<i>Title</i>	Legal basis and environment
<i>Target audience</i>	Law enforcement staff Operational staff
<i>Objectives</i>	<ul style="list-style-type: none">▪ To impart a thorough understanding and knowledge of the acts and regulations that control the loading of vehicles, including the terminology and definitions that are used in the legislation.▪ To ensure that law enforcement and operational staff fully understand the various clauses and regulations and how they fit together.▪ To enable law enforcement and operational staff to apply the clauses and regulations and perform the various calculations without the aid of a computer program.
<i>Content</i>	<ul style="list-style-type: none">▪ The terminology being used in overload control and overload control legislation▪ The clauses and regulations relating to overload control▪ The powers of traffic officers as they relate to overload control▪ Prosecution versus administrative system▪ Prosecution of road traffic cases▪ Giving evidence in court cases<ul style="list-style-type: none">▫ How courts function▫ Criminal/civil procedures and evidence▫ Giving evidence in court▫ Arrest procedures▪ Handling of the property of the accused after he/she has been arrested▪ Information plates that should be displayed on vehicles, including what information is required on these plates and how to interpret the information and apply it correctly during the overload control process▪ Presumptions that are applicable to overloading prosecutions and the implications of these presumptions▪ Application of the tolerance margins
<i>Duration</i>	5 Days

COURSE 3

<i>Title</i>	Weighing operations
<i>Target audience</i>	Law enforcement staff Operational staff
<i>Objectives</i>	To impart a thorough understanding and knowledge of all the steps required in the overload control process and to ensure that overloading control occur in a uniform manner throughout the region, resulting in a standard approach that provides clarity and certainty to everyone concerned with the loading and control of goods vehicles.
<i>Content</i>	<ul style="list-style-type: none"> ▪ Screening of vehicles <ul style="list-style-type: none"> ▫ The definition and aim of screening ▫ Types of screening processes ▫ Use of screening devices ▫ Visual screening hints ▪ Referring vehicles to a weighbridge or Traffic Control Centre ▪ Weighing procedures in terms of the apparatus used <ul style="list-style-type: none"> ▫ Determination of the actual axle masses, axle unit masses and vehicle or combination masses ▪ Weighing of the vehicle ▪ Calculation of overloads <ul style="list-style-type: none"> ▫ Weighing forms and computer readouts ▫ Max vehicle dimensions ▫ Axle loads ▫ Total vehicle or combination mass ▫ Bridge formula ▫ Overload fee structure ▪ The identification of offences <ul style="list-style-type: none"> ▫ The application of tolerance ▪ Releasing of legally loaded vehicles ▪ Dealing with overloaded vehicles <ul style="list-style-type: none"> ▫ Warning overloaded vehicles within the tolerance ▫ Charging overloaded vehicles outside the tolerance ▫ Adjustment of loads on overloaded vehicles ▫ Arrest of drivers of severely overloaded vehicles ▫ Seizure of vehicles in cases of severe overloading ▪ Dealing with moving loads <ul style="list-style-type: none"> ▫ Liquids ▫ Animals ▪ Dealing with special loads <ul style="list-style-type: none"> ▫ Sealed containers ▫ Perishable goods ▫ Hazardous materials ▪ Dealing with abnormal loads <ul style="list-style-type: none"> ▫ Abnormal Dimensions ▫ Abnormal Mass ▫ Permits for abnormal loads ▫ Weighing procedure for abnormal loads
<i>Duration</i>	2 Days

COURSE 4

<i>Title</i>	Software operations
<i>Target audience</i>	Law enforcement staff Operational staff Administrative staff
<i>Objectives</i>	To train law enforcement and operational staff to use weighing software during the overload control process and to interpret the results and output obtained from such software, and to train administrative staff to maintain the weighing software
<i>Content</i>	<ul style="list-style-type: none">▪ Basic computer skills▪ Basic Windows or other operating systems operations▪ Introduction to the weighing software▪ Opening the weighing software▪ System modules of the weighing software▪ Menu layout and selection procedures▪ Starting a weigh session▪ Capturing vehicle data▪ Capturing scale masses▪ Processing data▪ Interpreting results▪ Printing weigh slips▪ Maintenance of the software, such as the updating of pick-lists for:<ul style="list-style-type: none">▫ operators▫ vehicle types▫ manufacturers▫ origins▫ destinations▫ routes▫ cargo types, etc.▪ Running of reports▪ Extraction of data
<i>Duration</i>	3 Days

COURSE 5

Title: Weighbridge equipment

Target audience: Law enforcement staff
Operational staff

Objectives: To train operational staff and law enforcement staff in the correct use, testing and routine maintenance requirements of all the equipment at a weighing facility and on the national or other standards that such equipment must comply with.

Content:

- Types of weighing equipment and their use
 - Fixed weighbridges
 - Mobile weighbridges
 - Static weighing
 - Dynamic weighing
 - Axle scales
 - Axle unit scales
 - Multi-deck scales
- Maintenance and calibration requirements
 - Applicable national, regional or other standards
 - Routine verification checks
 - Routine maintenance
 - Verification requirements
 - Type approval requirements
 - Cleaning requirements
 - Operators certificates
- Portable enforcement weighing/screening equipment
 - Types of equipment
 - Limitations in the use of the equipment
 - Site selection
 - Setting-up of equipment
 - Verification of equipment
 - Weighing procedures
 - Maintenance of equipment
 - Regular verification of equipment

Duration: 2 Days

COURSE 6

<i>Title</i>	Data management and management reporting
<i>Target audience</i>	Administrative staff Management
<i>Objectives</i>	To train administrative staff in data management and producing management reports.
<i>Content</i>	<ul style="list-style-type: none">▪ Introduction to databases▪ Data collection▪ Data preservation and back-ups▪ Data verification<ul style="list-style-type: none">▫ Identification of invalid data▫ Treatment of invalid data▪ Data analysis▪ Data reporting <ul style="list-style-type: none">▪ Types of reports<ul style="list-style-type: none">▫ Operational reports▫ Manual reports▫ Daily reports▫ Weekly reports▫ Monthly reports▫ Annual reports▪ Producing reports▪ Interpretation of reports▪ Types of graphs▪ Interpretation of graphsProducing ad-hoc reports
<i>Duration</i>	5 Days

COURSE 7

<i>Title</i>	Generic training
<i>Target audience</i>	All staff (Specific training for specific levels of staff)
<i>Objectives</i>	To equip staff with general training relating to the management and operation of a weighing facility.
<i>Content</i>	<ul style="list-style-type: none">▪ Basic computer skills▪ General computer office applications, such as word processing, spreadsheets, databases and presentations▪ Staff management▪ Operations management▪ Maintenance management▪ Financial management▪ Safety▪ Dealing with hazardous cargoes▪ Fire fighting▪ First aid
<i>Duration</i>	2 Days

COURSE 8

<i>Title</i>	Health and Safety Issues
<i>Target audience</i>	Law enforcement staff Operational staff
<i>Objectives</i>	To sensitize law enforcement and operational staff to health and safety issues related to various aspects of transport
<i>Content</i>	<ul style="list-style-type: none">▪ Role of transport legislation for drivers and organizations involved in the transport of the following:<ul style="list-style-type: none">▫ Hazardous goods▫ Hazardous wet cargo▫ Livestock▫ Abnormal loads
<i>Duration</i>	1 Day

Development of training materials

6.5.2 The above training materials are currently not all available, although some countries, such as South Africa have developed useful guidelines (National Department of Transport, 2004, KwaZulu-Natal Road Traffic Inspectorate) which could be customized for regional use. In addition, other countries (e.g. Namibia, Tanzania and Zambia) have also developed training materials which could be customized for regional use. Thus, in terms of the way forward, there is a need to ascertain the availability of all such training materials as an input to the development of a regional syllabus to cover the range of subjects recommended above.

Certification and accreditation

6.5.3 It is important that there is a training certification and accreditation process in place to ensure that the outputs of any training centre are recognized within the Eastern and Southern African region and, moreover, that the graduates from the centre could be certified, as appropriate, for undertaking overload control operations.

6.6 References

Gicon A/S (Norway) and InfraAfrica (Botswana) (2003): *Overloading and Truck Taxation Survey – Final Report* prepared for Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ, Germany).

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.