

**Workshop on Planning, Pavement Design
and Overloading Prevention**



***Developments in Vehicle Overload
Control in Southern Africa***

Mike Pinard

InfraAfrica Consultants, Botswana





Objective of Presentation



-
- **To appraise workshop participants with developments that have taken place in vehicle overload control in Southern Africa.**
 - **To enable Cambodia to learn from the experiences in overload control in Southern Africa for improving practice in the country.**
-
-
-



Outline of Presentation



-
- **Introduction and Background**
 - **The Southern African Region**
 - **The Overloading Problem**
 - **Controlling Overloading**
 - **Sustainability of Overload Control**
 - **Summary**
-
-
-



Outline of Presentation

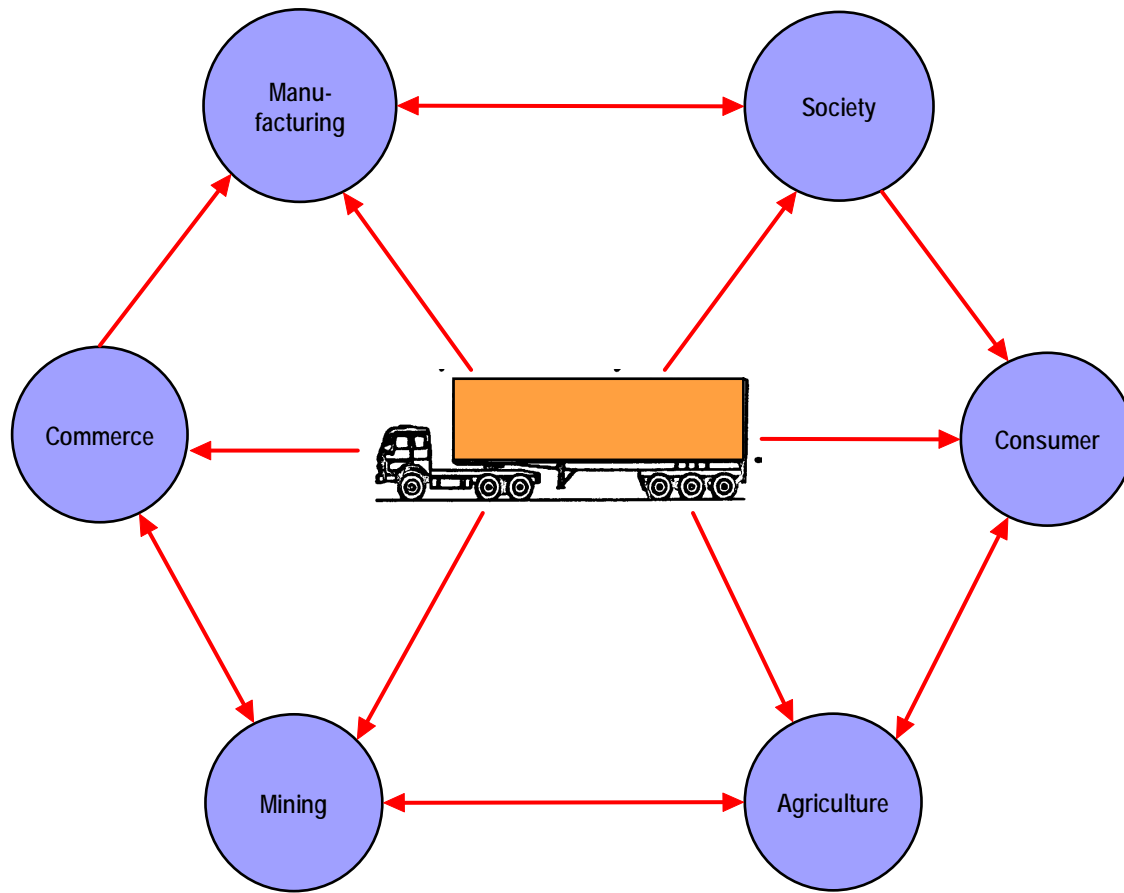


-
- **Introduction and Background**
 - The Southern African Region
 - The Overloading Problem
 - Controlling Overloading
 - Sustainability of Overload Control
 - Summary
-
-
-



Introduction and background

Importance of Road Transport



The Road Transport Web

- **Dominant mode of transport (>80%)**
- **Essential to the growth of economy**
- **Impact on road infrastructure**
- **Need to optimise operations**





Introduction and background

Good Roads – Essential to the economy





Outline of Presentation



-
- Introduction and Background
 - **The Southern African Region**
 - The Overloading Problem
 - Controlling Overloading
 - Sustainability of Overload Control
 - Summary





Southern African region

Geographic Setting

- 14 Countries
- 10 million sq. km
- 200 million pop
- Largely agrarian economy
- 80% pop in rural areas
- Rural roads critical to economic well being of all countries





Southern African region

Regional Road Network



Total length = 50,000 km

Main Roads	Road Condition (Weighted Average)		
	Good	Fair	Poor
Paved	49	36	15
Un-paved	38	31	31

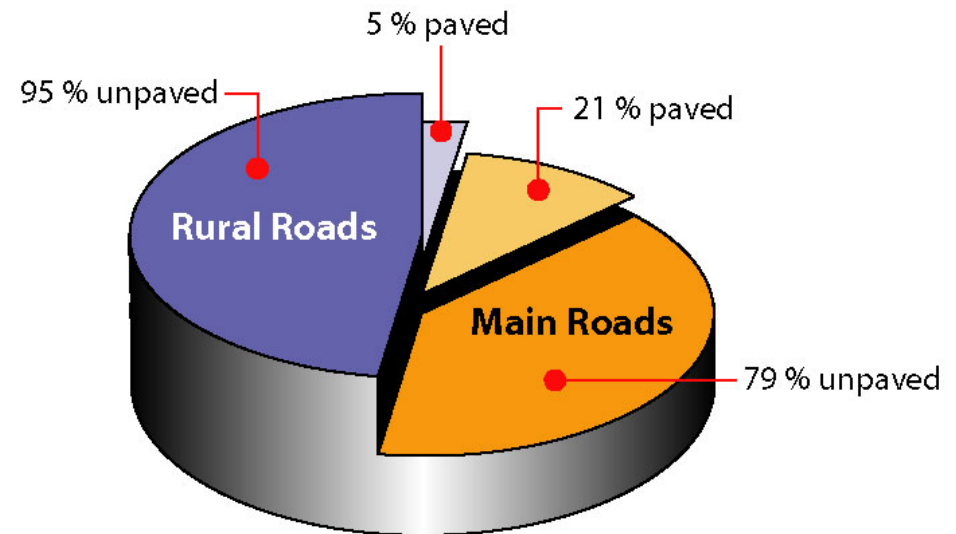




Southern African region

Road Network Details

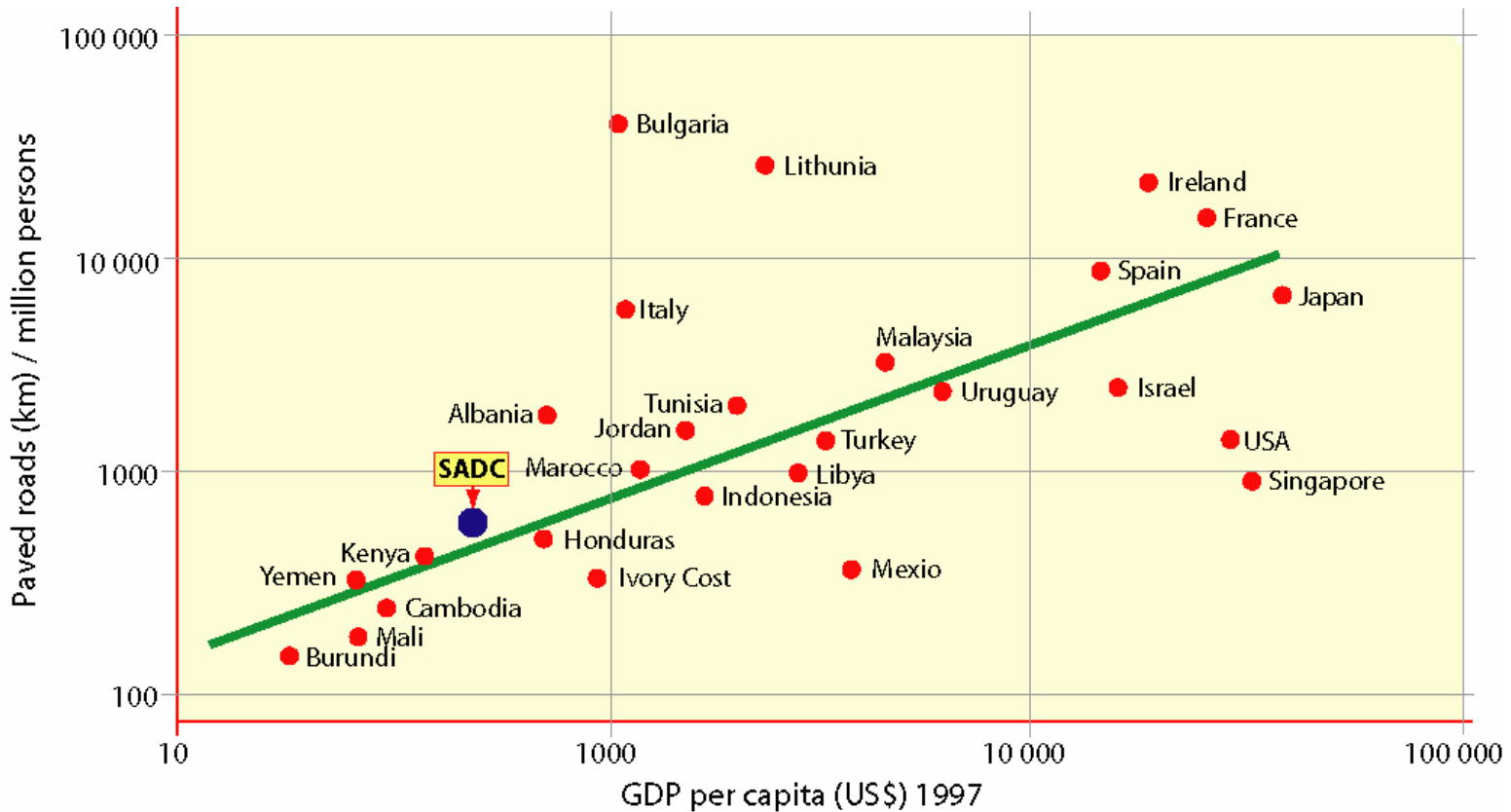
- Total road length of about 1 million km
- Approx 50% are “rural” roads
- More than 75% of both main and rural roads is unpaved
- Less than 50% paved main roads and 40% unpaved main roads in good condition
- Most rural (LVR) in poor condition - impact negatively on economy.





Southern African region

Roads and Economic Development



“You can always tell the state of a country’s economy by looking at the state of its roads”





Outline of Presentation



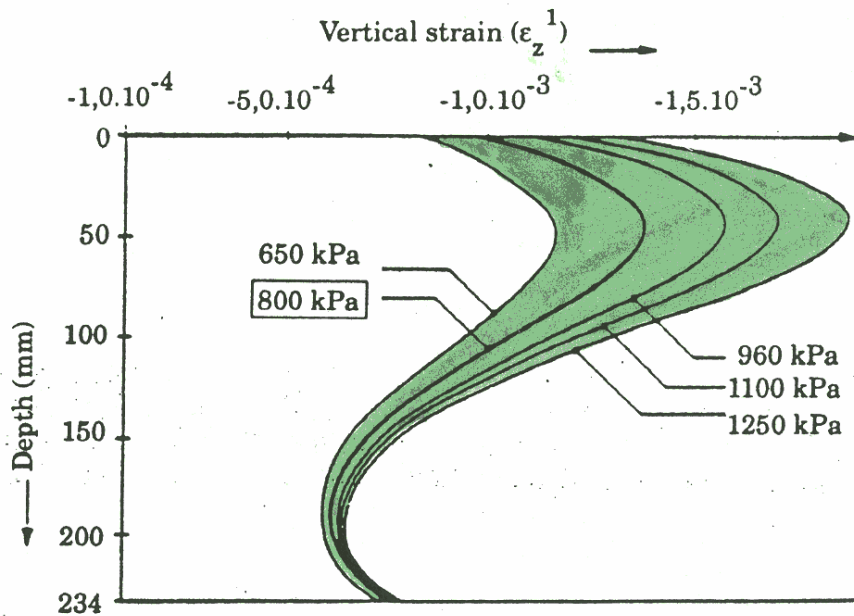
-
- Introduction and Background
 - The Southern African Region
 - **The Overloading Problem**
 - Controlling Overloading
 - Sustainability of Overload Control
 - Summary
-
-
-

The overloading problem

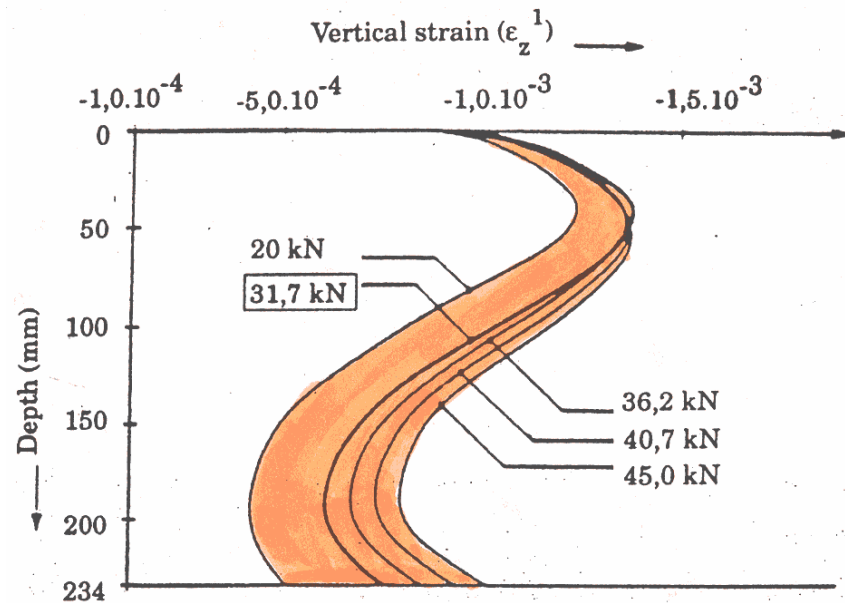


Axle Loads versus Tyre Pressure

Effects of tyre pressure and wheel load on vertical strain



Constant wheel load (31.7 kN)
Increasing tyre pressure



Constant tyre pressure (800 kPa)
Increasing wheel load



The overloading problem



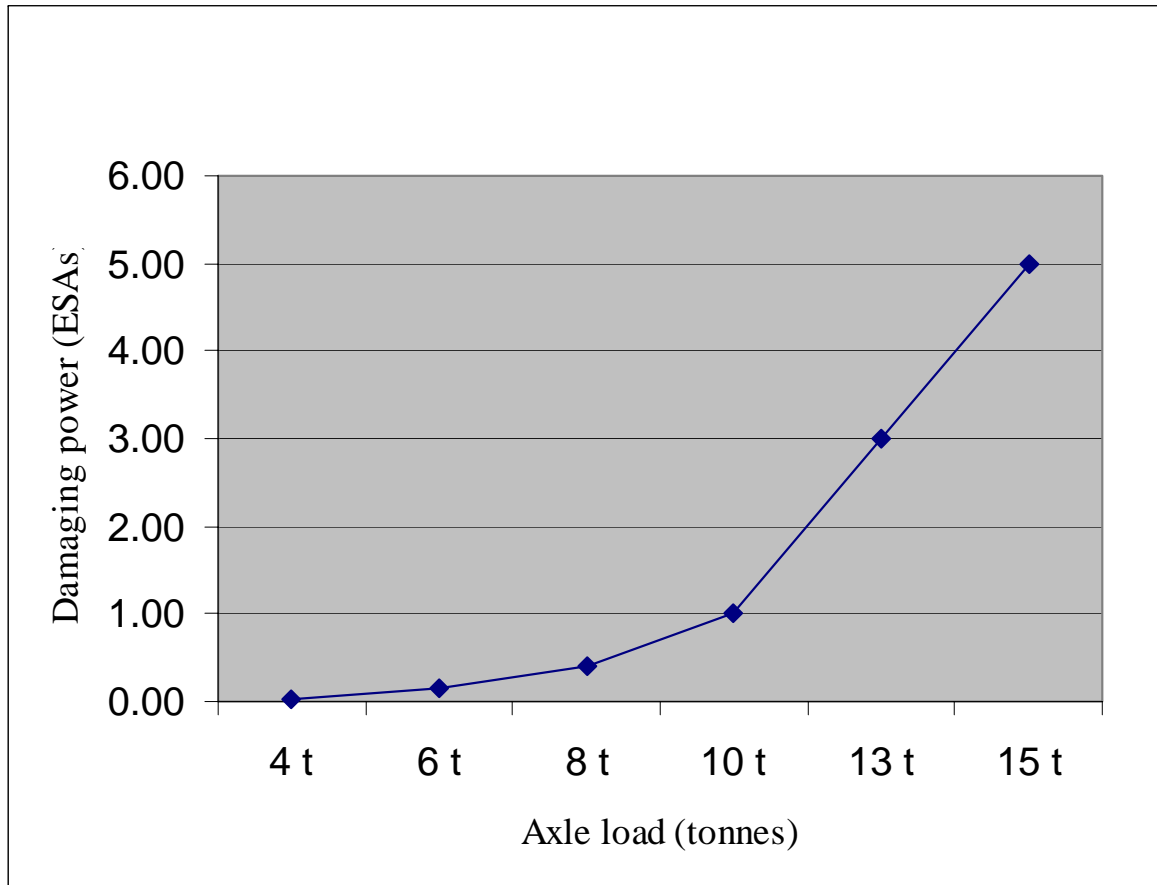
Why Control Overloading?

- **Reducing the destruction of the road network**
- **Improving road safety**
- **Reducing the amount of road maintenance required**
- **Ensuring level playing field between transporters**
- **Reducing the amount of fuel levy required**



The overloading problem

Damaging Effect



$$LEF = (P/W_s)^n$$

where LEF = load equivalence factor

P = axle load

W_s = standard axle (8.2 or 10 tonnes)

n = power law exponent (typically assumed to be 4.2)





The overloading problem

Axles of evil!



Axles of evil?



The overloading problem



Axles of evil!

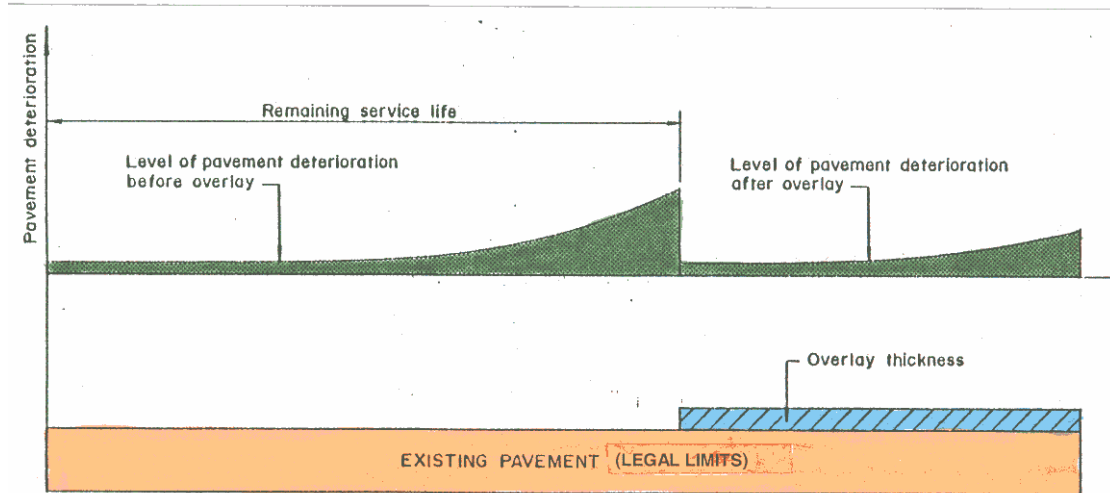


The overloading problem

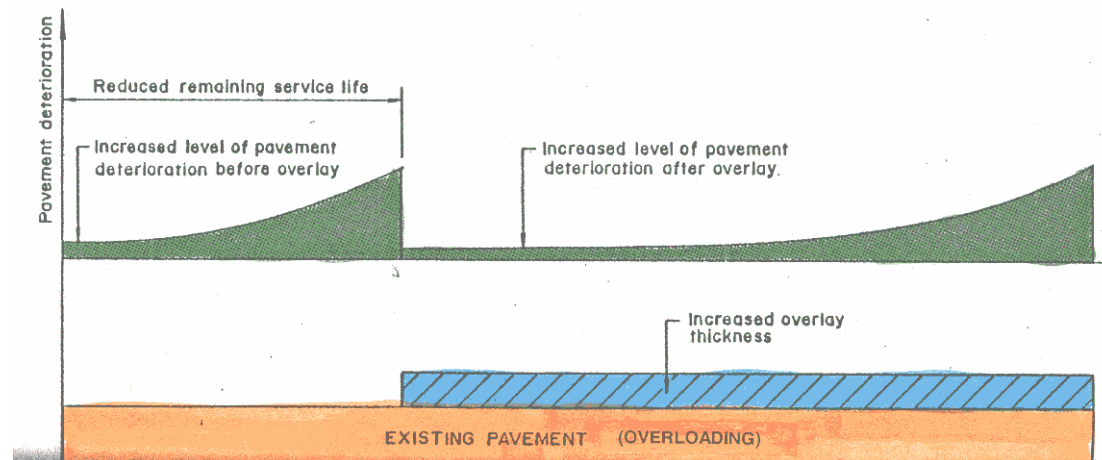


Impact on Pavements

Pavement performance under legal load limits



Pavement performance under overloading





The overloading problem

Accelerated pavement deterioration



The overloading problem



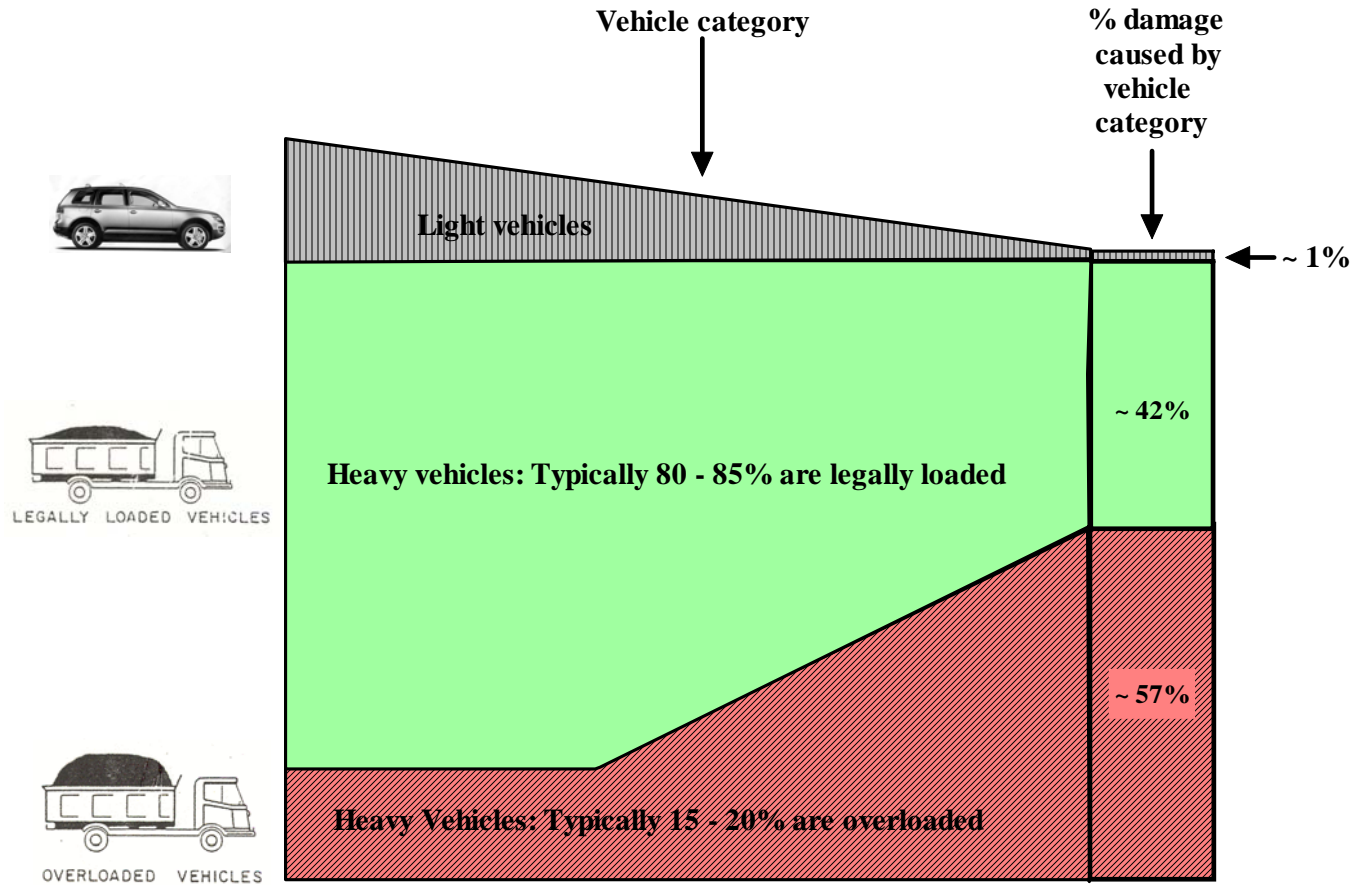
Axle Loads vs Pavement Life

Design Axle Load (Tonnes)	Carried Axle Load (Tonnes)	Equivalence Factor			Pavement Life (years) for Varying Power Exponent		
		n = 4.0	n = 4.5	n = 5.0	n = 4.0	n = 4.5	n = 5.0
10.0	10.0	1.0	1.0	1.0	20.0	20.0	20.0
10.0	11.0	1.5	1.5	1.6	13.7	12.9	12.4
10.0	12.0	2.1	2.3	2.5	9.7	8.8	8.0
10.0	13.0	2.9	3.3	3.7	7.0	6.1	5.4
10.0	15.0	5.1	6.2	7.6	3.9	3.2	2.6



Overview of SADC MoU on Ovreload Control

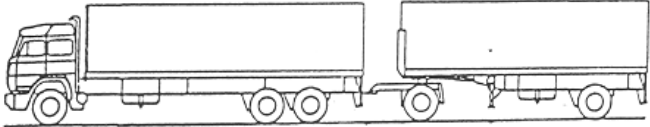
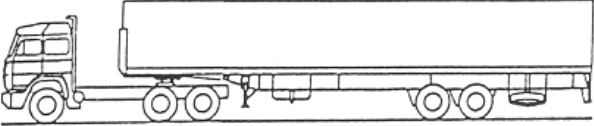
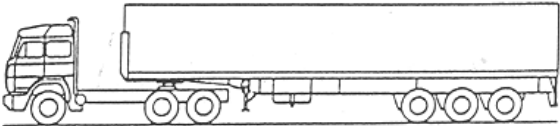
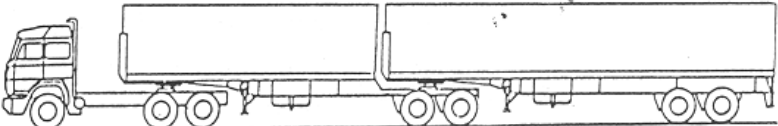
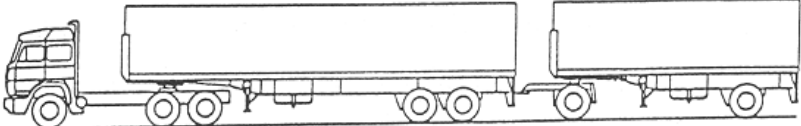
Source of Road Damage





The overloading problem

Source of Road Damage

	GVM (Tonne)	Payload (tonnes)	Relative damage ESAs/100t
	38.5	22.9	17.4
	38.5	21.2	18.8
	41.2	23.0	12.9
	46.6	22.2	13.0
	48.5	26.5	13.3





The overloading problem

A major road safety problem





The overloading problem

Increased accident rates



- Road accidents cost the SADC region some 1.5 – 2% GDP annually
- Accidents rates 30 – 50 times higher than Europe, USA!



The overloading problem



A scourge on the region





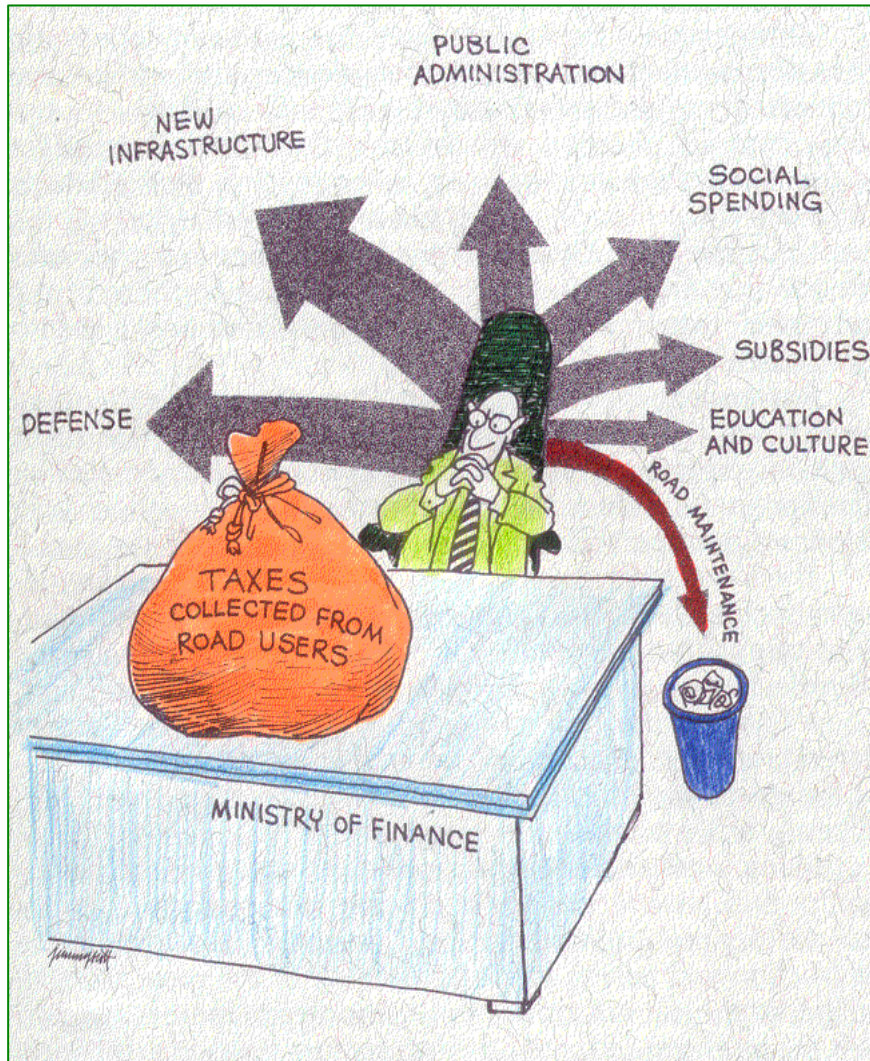
The overloading problem

Endangering vehicle and life safety

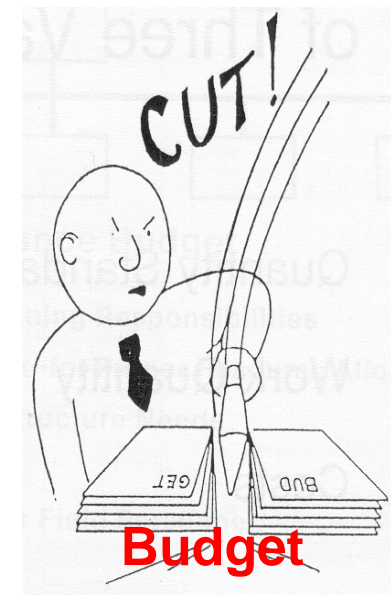


The overloading problem

Inadequate Maintenance Funding



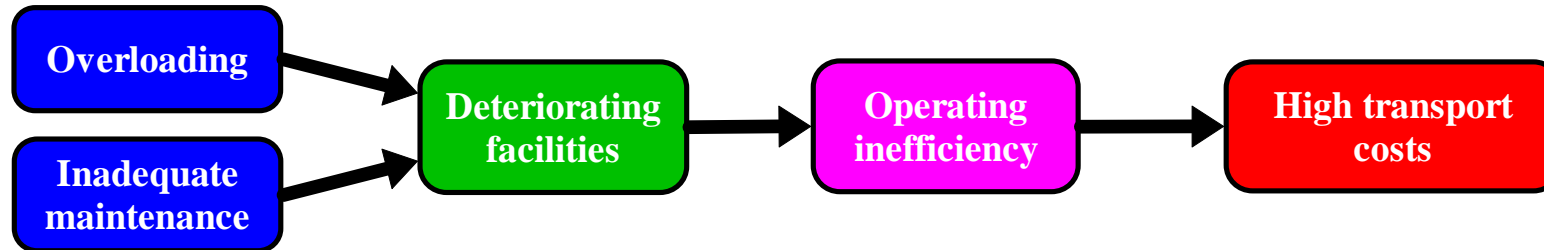
- Maintenance often over-looked in favour of capital projects and other political priorities
- Allocations typically less than half of optimal requirement





The overloading problem

High Transport Costs



- **Endemic overloading in region (typically 10-50%)**
 - **Lack of maintenance funding (typically less than half of requirement)**
 - **Accelerated deterioration of roads (design lives halved)**
 - **High transport costs (4 – 5 times greater than industrialised countries)**
 - **Global uncompetitiveness**
- ➔ **Need to set appropriate axle load limits and to enforce them**
- ➔ **Ensure a sustainable source of maintenance funding**
-
-
-

The overloading problem



Rationale for Axle Load Limits

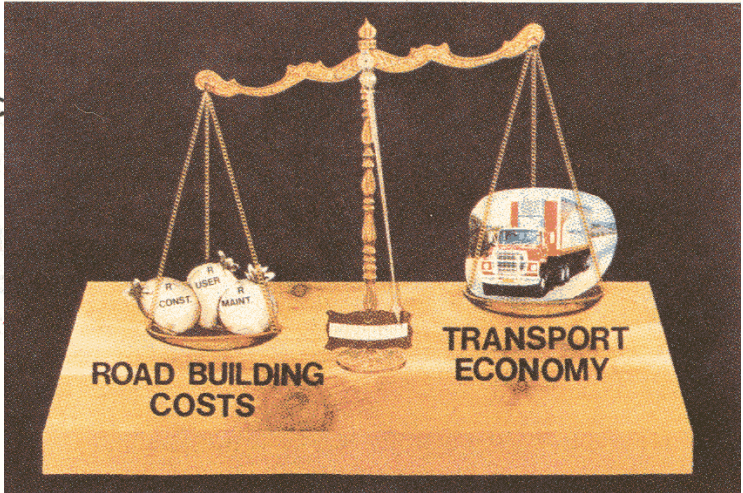
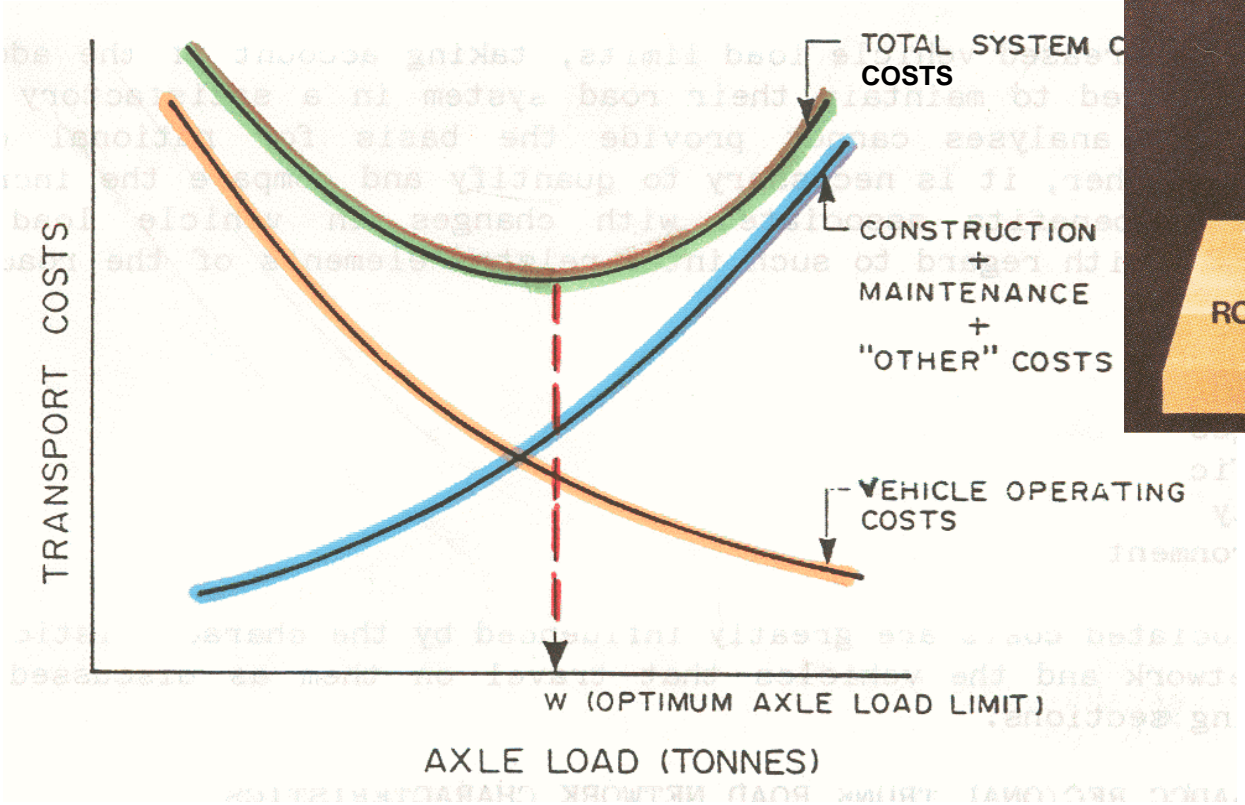
- Adoption of those "optimum axle loads" that minimise total transport costs consisting of:
 - **construction + maintenance costs**
 - **road user costs**
- Vehicle limits should ideally be standardised amongst countries that share common borders





The overloading problem

Concept of Optimum Axle Load Limits



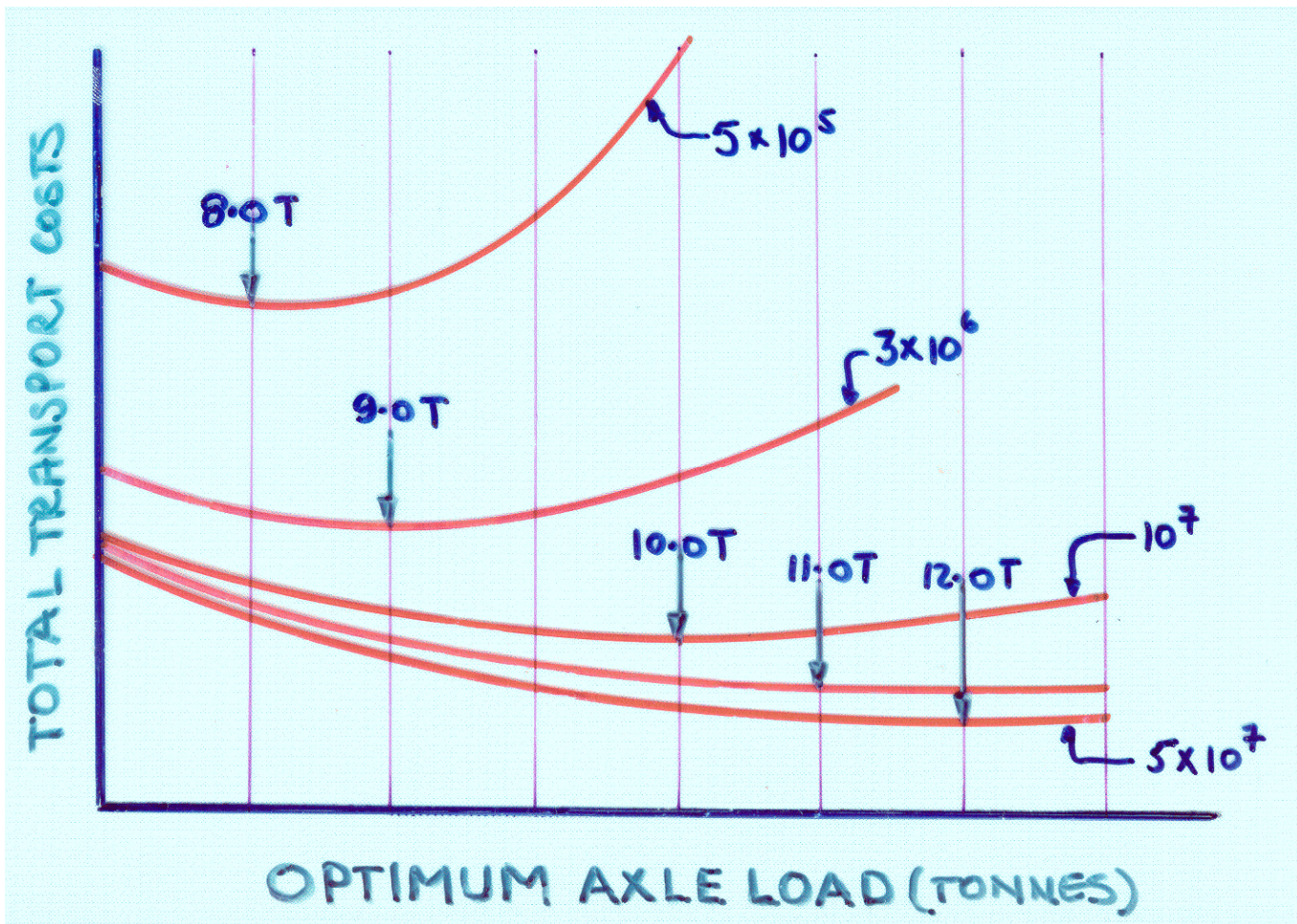
Balancing road-building costs and the transport economy





The overloading problem

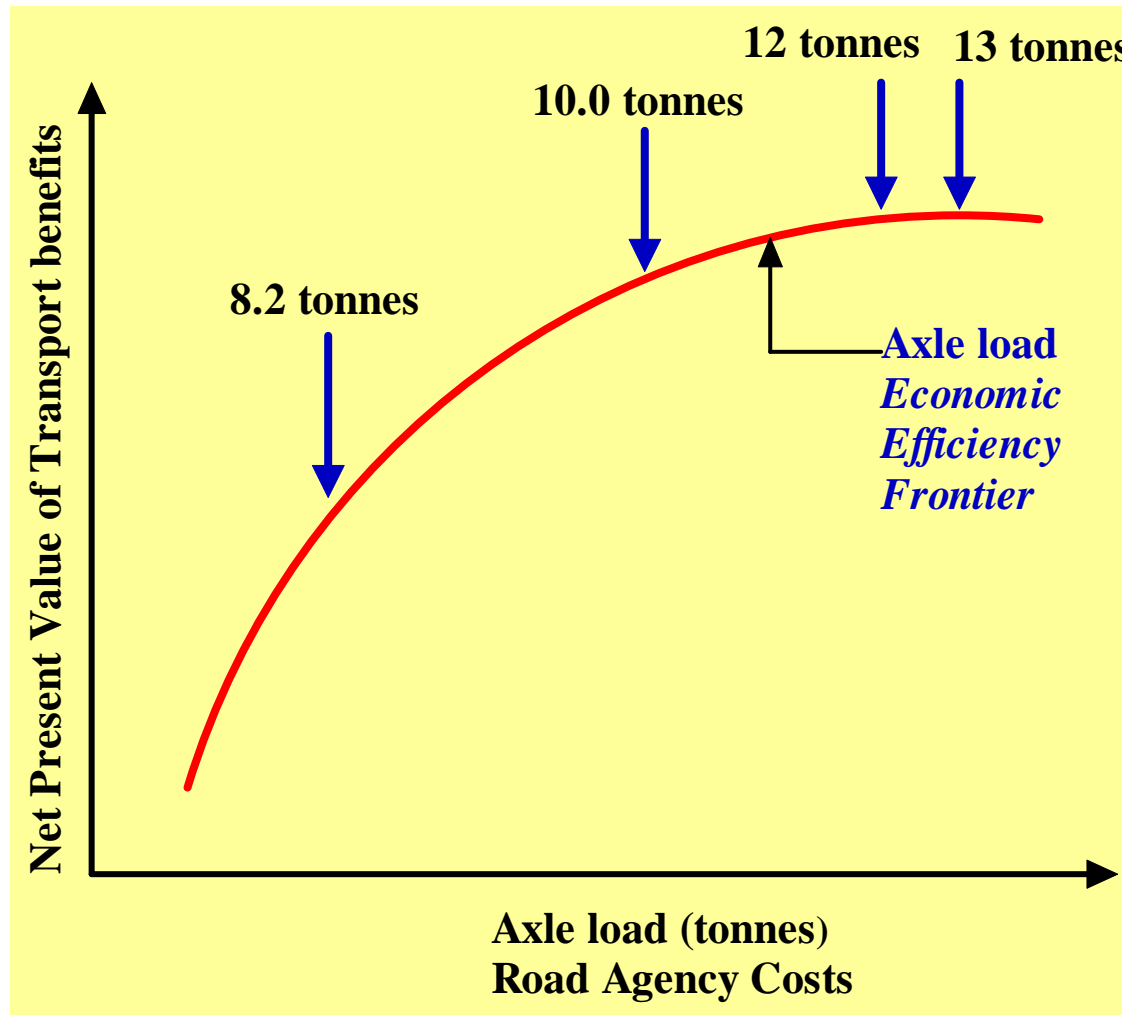
Determining Optimum Axle Load Limits



The overloading problem



Recommending Axle Load Limits



Increase in axle load limit		Benefit/ cost ratio
From	To	
8.2	10.0	10.1
10.0	12.0	3.6
12.0	13.0	1.7



The overloading problem

Optimum vs Actual Axle Load Limits

- On basis of regional study, following axle limits recommended:
 - Single (four tyres) = 10.0 tonnes
 - Tandem = 18.0 tonnes
 - Tridem = 24 tonnes
 - GVM = 56 tonnes
- In practice, following limits prevail:
 - Single = 8.2, 9.0 and 10 tonnes
 - Tandem = 16.4 and 18.0 tonnes
 - Tridem = 21.0 and 24.0 tonnes
 - GVM = 60 tonnes
- Lack of standardisation of axle load limits complicates enforcement process and disrupts efficient flow of vehicles in region.





The overloading problem

Cost of Overloading

- **Botswana – 1994: US \$1 million**
2004: US\$2.6 million
- **South Africa – 2002: US \$100 million**
- **Sub-Saharan Africa – 2004:**
US \$500 million





The overloading problem

Regional Consensus on Problem

The onerous and costly impact of vehicle loading in the SADC region has been a negative feature of the transport industry for the past few decades. Precious infrastructure, worth millions of dollars, has been lost through accelerated deterioration of roads and indifferent attention to maintenance. Unless urgent steps are taken to halt this unacceptable situation of overloading, the poor condition of roads will provide a formidable barrier to further economic development in the SADC region.

→ Need for new *Overload Control Management Initiative (OCMI)* – similar in scope to the **Road Management Initiative (RMI)**



Outline of Presentation



-
- Introduction and Background
 - The Southern African Region
 - The Overloading Problem
 - **Controlling Overloading**
 - Sustainability of Overload Control
 - Summary
-
-
-

Elements of Overload Control

- **Appropriate legislation**
 - **Appropriate regulations concerning axle load and GVM limits**
 - **Enforcement of regulations**
 - **Authorised control personnel**
 - **Control Procedures**
 - **Control sites**
 - **Weighing equipment**
 - **Personnel and training**
-
-
-



Controlling overloading

Features of status quo

- Current systems provide a **criminal response** to overloading
 - Low conviction rates due to legal technicalities
 - Courts bogged down with “non-serious” cases
 - Current approaches conducive to **bribery and corruption**
 - Criminal response does not provide any **institutional controls** or **financial links** between RA’s and actual road damage
 - No “**price**” for overloading. Fines non-economic
 - RA’s have **primary responsibility** for road preservation but **limited role** in regulation
-
-
-



Controlling overloading
Lessons Learned



***“If you do what you
have always done,
you will get what you
have always got.”***



Controlling overloading

Features of regional OCMI

- **Current approaches generally fail to achieve primary responsibility for preserving road infrastructure**
 - **OCMI based on SADC Protocol, including a **Vehicle Loading Control Strategy** which comprises:**
 - **MoU on Vehicle Loading**
 - **Model Legislative Provisions on Management of Vehicle Loading**
 - **Above documents constitute important reforms which address most glaring short-comings of traditional approaches – **Overload Control Management Initiative (OCMI)** – similar in concept to the Road Management Initiative (RMI)**
-
-
-



Controlling overloading

Features of regional OCMI

- Introduction of a **Regional Vehicle Overloading Control Association (REVOCA)** as well as a national **Vehicle Loading Advisory Committee (VLAC)** comprising public/private sector stakeholders
 - Introduction of a **regional strategy** on overload control which focuses on **regional corridors** to ensure a **coordinated approach** within SADC countries
 - Operation of a **self-regulatory system** which places the onus for overload control on transport operators and freight forwarders
 - Application of **administrative disincentives** to combat overloading practices
-
-
-



Controlling overloading

Features of regional OCMI

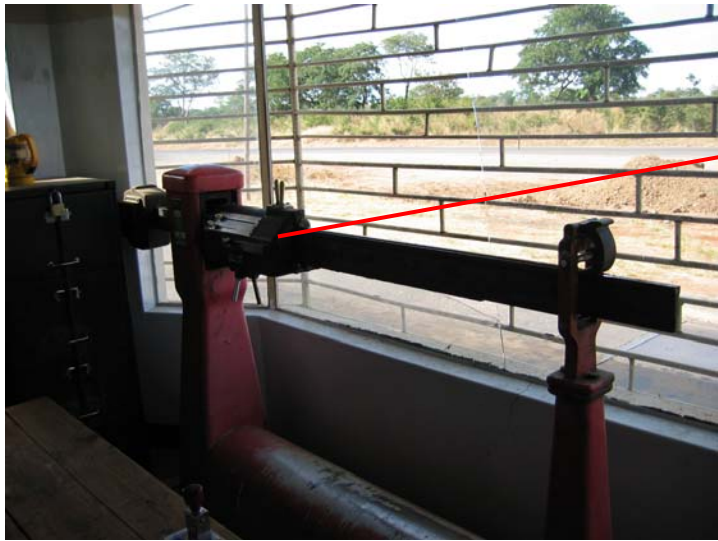
- **Decriminalisation** of offenses for overloading by handling them administratively and imposing a requirement on the overloader to pay an overloading fee
 - Linking level of imposed fees for overloading with actual cost of road damage, i.e. by imposing **economic fees**
 - **Outsourcing** weighbridge operations to the private sector on a concession basis, i.e. embarking on a commercialised public/private sector approach to overload control
-
-
-

Controlling overloading *Modern Weighbridge Equipment*





Controlling overloading
Outdated Weighbridge Equipment





Outline of Presentation

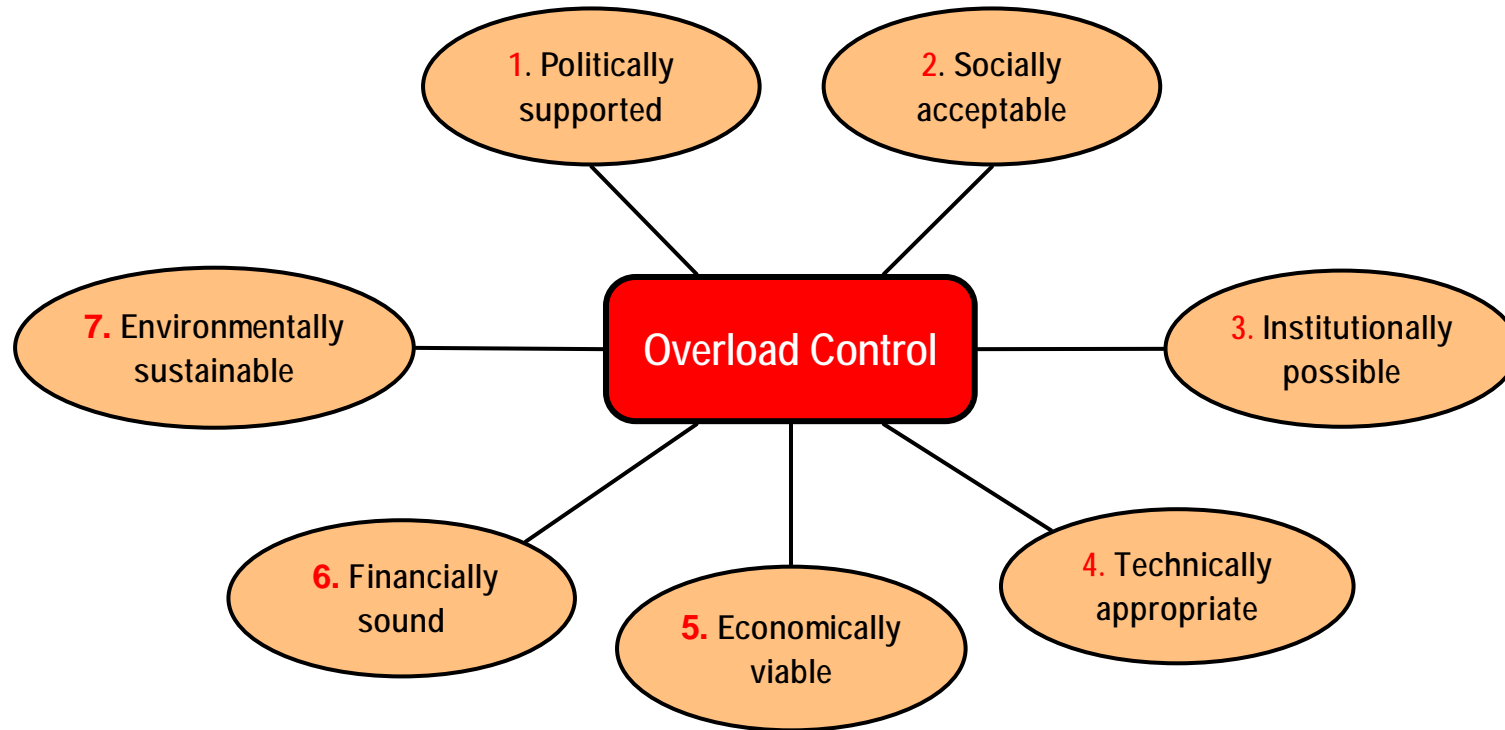
- Introduction and Background
- The Southern African Region
- The Overloading Problem
- Controlling Overloading
- **Sustainability of Overload Control**
- Summary





Sustainability of overload Control

Dimensions of Sustainability



The seven dimensions of sustainability in overload control



Dimensions of Sustainability

- **Political**
 - Need for strong policy and appropriate regulations
 - Need to quantify costs
 - Need for awareness pamphlet/campaigns
- **Social**
 - Involve community/transporters in policy/planning of overload control
- **Institutional**
 - Gradually outsource management, operation and maintenance of weighbridge operations.





Outline of Presentation

- Introduction and Background
- The Southern African Region
- The Overloading Problem
- Controlling Overloading
- Sustainability of Overload Control
- **Summary**





Summary

- **Provision of good road transport infrastructure essential to efficiency of transport system.**
- **Overloading coupled with inadequate maintenance has led to high operating costs and adverse impact on economy**
- **Traditional approaches to overload control unsuccessful**
- **New, more creative approaches to overload control required**
- **Sustainability of overload control should not be overlooked**
- **Benefits of overload control generally far exceed costs**





Reduce overloading otherwise...



- Increased transport costs
- Loss of asset value
- Higher costs of rehabilitation
- Brake on economic growth and poverty alleviation

Can any country afford this??

“My country was never so rich that it could afford poor roads” - William the Conqueror
1066 AD





Finally – Our Vision

“It is not wealth which makes good roads possible – but, rather, good roads which make wealth possible – Adam Smith



Need to reduce overloading to <5 % within 5 years.





Thank you

