TRUCKS MATTER! TRAFFIC AND LOGISTICS MANAGEMENT TO EXTEND THE LIFE OF ROAD ASSETS

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Abstract
Transport agencies in both developed and developing economies face problems with ageing infrastructure, budgetary constraints and competition for scarce public resources often inhibit or delay maintenance activities. Simultaneously, the demand for road freight transport continues to rise and become more complex. These trends are likely to continue, making proactive asset management ever more urgent. In this context, digitalization offers new opportunities.

The OECD-ITF working group *Policies to Extend the Life of Road Assets* (2017-18) brought together policy options for extending the life of road assets by mitigating deterioration caused by trucks. Beyond traditional engineering responses, they considered the role of trucks in road asset deterioration from a broader, demand-oriented perspective. This resulted in a new policy framework for maintaining and managing road assets in a cost-effective way and to meet road freight transport demand on a sustainable basis. The new policy framework contains three groups of policy measures: demand-responsive policies; policies that regulate demand; and policies that influence demand. In this paper we look in more detail at measures in the field of traffic and logistics management in order to extend the life of road assets.

The OECD-ITF working group included 27 renowned practitioners and academics from 17 countries with expertise in asset management, traffic management, vehicle dynamics, logistics and economics, truck operations, and transport regulation and compliance. For the HVTT16, under the name *Trucks matter!* the working group *Policies to Extend the Life of Road Assets* has elaborated the new demand-oriented policy framework in four papers, illustrated with current best practices and experiences.
Keywords: Heavy Vehicles, Asset Management, Digitalization, Enforcement, Regulatory Framework, Traffic Management, Logistics Management.

1. Introduction

Transport agencies in both developed and developing economies face problems with ageing infrastructure, yet budgetary constraints and competition for scarce public resources often inhibit or delay maintenance activities. Simultaneously, the demand for road freight transport continues to rise and become more complex. These trends are likely to continue, making proactive asset management ever more urgent. In this context, the proliferation of unconventional data sources and digitalization offer new opportunities to manage assets in response to road freight transport demand and to regulate and even influence this demand.

In 2017-2018, the OECD-ITF convened a working group to develop new policy options for extending the life of road assets by mitigating deterioration caused by trucks. The working group included 27 renowned practitioners and academics from 17 countries with expertise in asset management, traffic management, vehicle dynamics, logistics and economics, truck operations, and transport regulation and compliance. Beyond traditional engineering responses, the group considered the role of trucks in road asset deterioration from a broader, demand-oriented perspective. This resulted in a new policy framework for maintaining and managing road assets in a cost-effective way and to meet road freight transport demand on a sustainable basis. The new policy framework contains three groups of policy measures: demand-responsive policies; policies that regulate demand; and policies that influence demand (ITF, 2018).

As a special contribution to the HVTT16, under the theme ‘trucks matter!’ members of the working group have elaborated the new demand-oriented policy framework through four papers. The four papers will examine: (1) the need for the new policy framework (this paper), (2) proactive maintenance and asset management, (3) supportive regulatory and compliance frameworks, and (4) traffic and logistics management. Each paper will illustrate policies using best practices and experiences from around the world.

This paper deals how traffic and logistics management can be changed in order to extend the life of road asset, first by reducing traffic to its necessary part (logistics management), then by allocating, statically or dynamically, a given traffic to roads, lanes of raods or timeslots.

2. Context of traffic and logistics management to extend the life of road assets

Transport agencies in both developed and developing economies acknowledge the problems they face with ageing infrastructure and understanding the mechanisms that cause deterioration. However, budgetary constraints and competition for scarce public resources often inhibit or delay maintenance activities. Simultaneously, the demand for road freight transport continues to rise and becomes more complex. These trends are likely to continue, making proactive asset management ever more urgent. In this context, digitalization offers new opportunities to prolong asset life through a better and close to real-time understanding of the structure of demand and the impact of truck traffic on pavements and bridges.

The OECD-ITF working group *Policies to Extend the Life of Road Assets* (2017-18) brought together policy options for extending the life of road assets by mitigating deterioration caused by trucks. Beyond traditional engineering responses, it considers the role of trucks in road asset deterioration from a broader, demand-oriented perspective. The work contributes to developing a new policy framework for maintaining and managing road assets in a cost-effective way and to meet road freight transport demand on a sustainable basis (OECD, 2018).

The insights and policy options presented build on the collective knowledge of the Working Group on *Policies to Extend the Life of Road Assets* convened by the International Transport Forum. The group included 27 renowned practitioners and academics from 17 countries with expertise in asset management, traffic management, vehicle dynamics, logistics and economics, truck operations, and transport regulation and compliance.

A new policy framework for maintaining and managing road assets in a cost-effective way and meeting road freight transport demand on a sustainable basis is needed. This framework should encompass policies of three types (see Figure 1):

- *Demand-responsive policies*: Prolonging road asset life requires better alignment of infrastructure maintenance and management actions with current and future road freight transport demand.
- *Policies that regulate demand*: The pursuit of regulatory compliance typically occurs outside the civil engineering domain and without a clear understanding of the complexities of asset management. The policies in this category aim to close this knowledge gap.
- *Policies that influence demand*: Policies in this category have seldom been considered as opportunities to extend the life of road assets. These policies aim to purposefully influence real-time and longer-term road freight transport decisions and behaviors. Their gradual and careful integration into asset management strategies increases the number of options the standard toolkit for road managers.

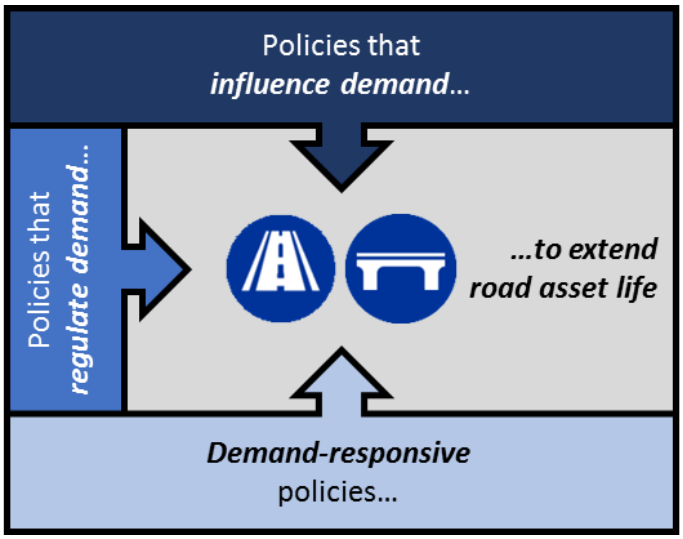

Figure 1: Policies that infleunce the life of road assets.

Regardless of the type of policy considered—responding, regulating or influencing—, a fuller understanding is necessary of current and future road freight transport demand, of the trucks that serve this demand, and of the mechanisms by which their utilization of transport infrastructure deteriorates road assets. Simply put: trucks matter for pavements and bridges.

3. Work methodology

The aim of truck traffic management is to avoid truck – infrastructure interactions that induce road wear that could be reduced, given the same traffic and the same road infrastructure. This mainly corresponds to trucks driving at the same time or at the same location, during critical conditions, as for example in adverse weather conditions.

Managing truck traffic proactively can help to extend the life of road assets : for that, information must be retrieved about usage, for example by installing and using in an efficient way monitoring sensors. Traffic management decisions can then be proposed by experts, and implemented through communication means.

The problem is that the expected benefits corresponding to the costs are not known precisely and quantitatively, and therefore the communication around the positive motivations of truck traffic management is scarce, or non-existent.

On the other side, demand for road freight transport is a consequence of economic activities related to the production and consumption of goods and services. Therefore, policymakers need to understand the dependencies between transport, logistics and the wider business environment.

In this paper, we do not treat the issue of High-Capacity Vehicles, which may be a (partial) solution to the issue of ever-increasing road freight traffic (ITF, 2019).

Policies that intervene in the use of trucks are usually motivated by objectives like the reduction of emissions or congestion. However, limiting the number of trucks, the number of kilometers driven by trucks and a more efficient use of trucks, can also contribute to a longer lifetime of road assets.

Assuming that the overall demand for freight transport is fixed, this paper focuses on two ways to minimize the impact of trucks on road assets : i) trip avoidance: this can be achieved by shifting freight to alternative freight transport modes; and ii) reductions of distance travelled by trucks: this focuses on interventions that can impact the structure of supply chains.4. Knowledge and practice

4. Results on Traffic management – New best practices

The first framework is road capacity management, which is widely applied nowadays: when lacking much data or information and often in presence of only expert knowledge, the principle is to reserve time slots or lanes for some given traffic (see Figure 2).

When more data is available, real-time, dynamic truck traffic management by monitoring of traffic and of road infrastructure, is possible. In this case, dynamic communication with the traffic is needed for example through dynamic communication panels. This solution is well known nowadays, but generally not applied completely on-site.

Finally, when “more” data is available and “more” communication is possible, real-time management through communication and collaboration between vehicles and infrastructure (V2I/I2V) or between vehicles (V2V) can be undertaken. In this case, to have this collaboration of traffic, adjustments for vehicles accepting to communicate may be proposed.

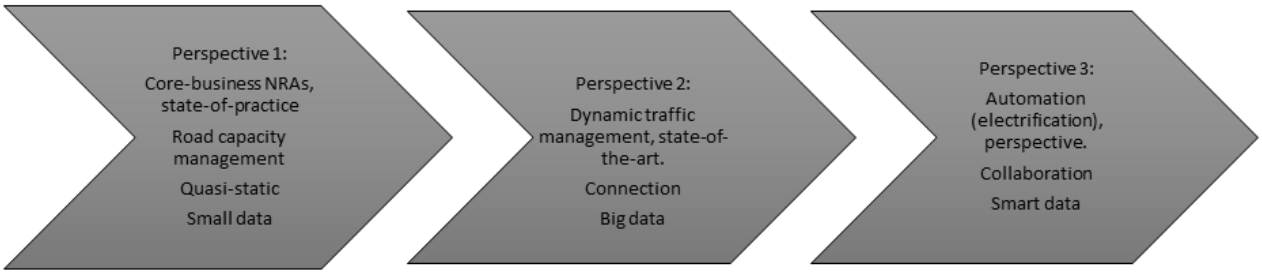

Figure 2: Three existing truck traffic management frameworks.

All this data makes it possible to associate with the physical infrastructure a digital one: this last one is the integration of the infrastructure-related data with the traffic data, for example by using a complete ICT communication between trucks and infrastructure.

The communication with the drivers and/or the public can be done through various means, as for example web applications or internet pages. Service can be offered accordingly.
Again, it should be highlighted that digitalization leads to automation. Standardization is needed, for the data formats, the models and the services.

This level of dynamic traffic management may be quite expensive and it may also be challenging to be enforced, especially in countries where this is not already the case (the majority of countries). Therefore, the use cases (the different ways of road utilization by different groups of road users on specific locations, for example long distance road freight transport on motorways) and the related business models have to be developed and agreed on: to do that, the global benefit in terms of environment, less congestion and reduced wear and damage to the infrastructure, have to be taken into account.

4.1 Best practices: Austrian national practice for according to time slots for different traffic users and dynamic traffic management

In Austria, time slots are used for abnormal loads or transports with bulky goods. These traffic users need a special permission to use the motorways and expressways and they are only allowed to travel off-peak time or at night-time with an escort vehicle. Also, some speed limits have been set, especially for travelling over bridges.
In urban areas, dynamic traffic signs are used to communicate with customers and influence the traffic in a positive way: speed harmonization to extend the capacity and reduce congestion, speed adjustment in case of dangerous weather situations, no overtaking for trucks, warning message in case of congestion, accidents …

4.2 Best practices: Different national truck traffic management procedures during freeze/thaw cycles

During low temperatures, the pavement can undergo freeze / thaw cycles which make the pavement more sensible to loadings. On the other side, if frozen, the substrate is more much compact and able to support much higher loadings. This leads to different policies, depending

on the countries: in several Scandinavian countries (Sweden, Finland, …), heavier loads are allowed during cold temperature periods: For example, in Sweden, trucks with CTI (Central Tire Inflation) during thawing season are allowed higher weights, compared to trucks without CTI. On the other side, in France, roads are closed to trucks during cold temperatures.

4.3 Best practices: Management of multiple passing of trucks on a bridge in Australia

In Australia telematics is being used to identify monitor the use and operation, through telematics applications such as the Intelligent Access Program (IAP). The IAP collects standardized data from each monitored vehicle, incorporating high-accuracy position, time and date records. At this time, the identification of multiple vehicles through the IAP is being used in Australia to calculate truck loading risks on vulnerable bridges and structures. Work is now underway in Australia, through the National Telematics Framework, to introduce real-time communication capabilities when more than one 'specified type of vehicle' (particular types of vehicles which represent risks to road infrastructure asset) is approaching a particular bridge, structure or other road infrastructure asset.

5. Results on Logistics management – New best practices

5.1 Best practices: Mode shift in Germany

In Germany, a package of financial and regulatory measures aimed at both rail and road has been deemed to have contributed to an increase of more than 30% in the volume of rail freight activity between 2000 and 2012 (Directorate General for Internal Policies, 2015). Measures have included financial support for the development or enhancement of transshipment facilities, certain regulatory exemptions for trucks involved in intermodal movements (e.g. increasing the maximum gross vehicle weight from 40 to 44 tons), and the introduction of truck tolls on motorways and major trunk roads. On 1st July 2018, the truck charging scheme was extended to cover all federal trunk roads.

5.2 Best practices: Modal shift from road to alternative modes of freight transport

In developed countries, there has been little change in modal split during the past decade: if anything, the main trend has been a shift from rail to road transport. Moreover, in the scenarios modelled by the ITF, road freight transport is expected to increase globally by 34-101% over the next 30 years. In many countries and regions, policies exist to encourage modal shift from road to alternative modes of transport. However, past experience suggests that a significant mode shift away from road is not likely to occur without significant investment in efficient rail and waterborne transport systems, including intermodal transshipment points and/or road charging, strong pricing incentives and an accompanying logistics reorganization by shippers.

5.3 Best practices: Reducing trip length

It has been estimated that, on average, freight transport costs per tonne-kilometre were 90% lower in 2004 than they were in 1890 (Glaeser and Kohlhase, 2004). Moreover, in Europe, the

average length of haul increased by 1.5-2.0% per annum from 1970 to 1996 and has been the main driver of the growth in road freight activity in Europe. Finally, in urban areas affordable depots from which to operate last-mile deliveries have becoming increasingly difficult to find due to rising land values. This has led to the suburbanization of warehousing and distribution facilities : In Paris, for example, the average distance from express parcel carriers' depots to the delivery area in the city increased from 6.3 km in 1974 to 18.1 km in 2010 (Andriankaja, 2014).

Unlike national and international patterns in increasing product supply chain length which policy makers have not attempted to reduce, there have been some recent efforts at the urban level to influence these trends, given their potentially negative traffic and environmental impacts. These efforts have included considerations of how best to use the urban land-use planning system to protect and safeguard logistics land, as is currently being considered in London (Mayor of London, 2017).

Consolidation centers are facilities typically situated towards the edge of urban areas, so that inbound deliveries can be made without having to penetrate busy inner and central urban areas. Goods from various suppliers are then consolidated for a joint delivery to the final destination in the city/town center.

5.4 Best practices: Urban consolidation centers (UCC)

The UCC concept has been tested in many different countries and commercial settings. Even though examples of successful implementations exist (e.g. Heathrow Airport consolidation center), most schemes fail when the initial financial support is withdrawn. Hence, public policy support is vital to the success of UCCs. For instance, the Monaco Consolidation Centre (MCC) was set up in 1989 when the local government decided to rationalize freight vehicle movements in Monaco. The MCC has resulted in significant environmental benefits, and reductions in truck traffic translating into a 38% decrease in traffic congestion as well as a 42% reduction in space used by vehicles for delivery.

5.5 Best practices: Advice, best practice and stakeholder engagement

Many road freight operators, particularly from the Small and Medium Enterprise (SME) sector, do not have the knowledge and/or resources to improve their road freight transport operations in a way that minimizes the amount of required truck movements, maximizes vehicle utilization and reduces the negative impact of trucks on the environment and transport infrastructure. Therefore, availability of reliable guidelines, advice and best practice is vital to support improvements in their operations.
Research also shows that increasing stakeholder engagement in the policy-making process may promote greater acceptance and ownership of proposed solutions and thus their successful implementation.

6. Conclusions

- Develop use cases and business models for the digital infrastructure of truck traffic management : an integrated approach to policy making is needed. Measures designed to improve the environmental performance of road freight transport can often contribute to a longer life span of road assets. Where this is not the case, a multi-modal, cross-function and multi-stakeholder approach enables a reasoned social trade-off assessment to be made.
- Create incentives for the logistics sector to implement truck traffic management.
- Improve awareness of the mutual impact that policies have on the environmental performance of road freight transport and extending the lifespan of road assets.
- Focus on creating a comprehensive regulatory environment rather than on individual measures : Policy aimed at extending the life of road assets is best supported by bundles of appropriate measures including cross-modal infrastructure investments, performance-based standards and coherent pricing structures for infrastructure use that encourage shippers, forwarders and carriers to reduce the number of trucks and the number of kilometers driven by them.

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