Challenges in management of road assets

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The overall aim of asset management is to optimise the service level delivered by infrastructure over its life-cycle. The focus of management should be on value to users or customers and not solely, nor even primarily, on cost or asset-replacement cost perceived by the infrastructure provider.

Asset Management for Sustainable Road Funding, ITF, 2013

A systematic approach to meeting the strategic need for the management and maintenance of highway infrastructure assets through long term planning and optimal allocation of resources in order to manage risk and meet the performance requirements of the authority in the most efficient and sustainable manner.

Highway Infrastructure Asset Management. UK Roads Liaison Group, 2013
Figure 4. **Dynamic interactions between service level targets and asset management objectives and strategies**

**Identify current levels of service provision**

**Ongoing review and management of performance**

**Assess affordability and make service level decision**

**Review demand for level of service change**

**Evaluate options to manage level of service gap**
- Create new assets
- Change operational and maintenance strategies
- Contingency planning in case of failure
- Dispose of assets
- Demand management
- Do nothing

**Potential drivers for reviewing levels of service**
- Customer feedback
- Changes to legislation and industry standards
- Internal levels of service reviews
- Strategic objectives changed or not being achieved
- Affordability
- Risk management identification of unacceptable risks

*Source: UK Audit Commission (2000).*
The trend is moving away from a purely infrastructure condition-based approach towards a service-based approach for managing road networks.

But,… for this presentation the scope will be reduced to consideration of the issue of maintenance of the road assets as asset condition is a key parameter of performance.
An all times issue... or how to do with no or little money

Royal corvee (*Corvée royale*) generalized in 1738 and suppressed in 1776
Introduction in 1764, by Trézaguet of the system of « cantons » for road maintenance
Sur la Route de Louviers (Chanson de Route)

Sur la Route de Louviers, (bis)
Y avait z’un cantonnier! (bis)
Et qui cassait .... (bis)
Des tas d’cailloux... (bis)
Et qui cassait des tas d’cailloux...
Pour metir’ su’ l’passag’ des roues.
Backlog in road maintenance, a world issue
Así de grande es el problema de baches en la Ciudad de México

Si se unieran todos los baches de la ciudad serían el equivalente a 45 Zócalos de la Ciudad de México; así de grande es el problema

A broke Highway Trust Fund means job losses equal to Denver’s population. President Obama warns 1 July

Survey reveals potholes in Finnish road maintenance

Carreteras llenas de troncos por falta de inversión
Placing Transport back on the agenda
Where are we now?
Making the case for maintenance
Acting for preservation of the assets
Funding certainty does matter
Questionning the form of organization for operation and maintenance of the national road network
Placing Transport back on the agenda
- Where are we now?
- Making the case for maintenance
- Acting for preservation of the assets
- Funding certainty does matter
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UN Millenium Development Goals (2000)

No reference to transport in the UN declaration except one single mention of the word “transport” in relation to land-locked developing countries.
A change in mind-set

“We note that transportation and mobility are central to sustainable development. Sustainable transportation can enhance economic growth and improve accessibility. Sustainable transport achieves better integration of the economy while respecting the environment.”

_The Future We Want_ UN Report (Rio +20) - 2012
Sustainable Transport essential to achieving the SDGs

Good roads contribute to the SDGs

- Sustainable economic growth
- Combat Climate Change
- Build resilient infrastructure
- Build effective institutions
- Make cities resilient
- Access to education
- Access to Health
- Placing Transport back on the agenda
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- Concluding remarks
Where are we now?

- Large investments made in high income countries from the 60ies (and going on now in emerging countries and countries in transition) to develop a modern road transport system (highways and up-grade to new standards of existing main roads).

- Pavements are built for a service life of 20 to 40 years, and need for major maintenance work appear only after 7 to 12 years or more.
The road network, generally the first public assets (in value).

**France**

- Total road network (1 million km):
  
  \[ \$2,250 \text{ billion} = 0.9 \times \text{France GDP} \]

- National road network (20,000 km):
  
  \[ \$250 \text{ billion}, \text{i.d. 2/3 of the State tangible assets} \]
A large and neglected ageing stock, ...

No anticipation as no immediate resource was necessary for some time.

Resources for maintenance have not been increased in relation to the growth of the assets and ageing of the stock.

U.S.

- 4 million miles of roads, and 65% of major roads rated in less than good condition
- 600,000 bridges and 1 in 4 need significant repair

*White House. An economic analysis of Transportation Investment. July 2014*
A lack of anticipation

Public road maintenance share of total road expenditure
(Euros, current prices, current exchange rates)

Source: International Transport Forum at OECD
Evolution of Road Infrastructure Investments and Road Maintenance Investments in a selection of Western European Countries*

* Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Sweden and United Kingdom

Source: European Road Federation
We need a more precise picture of capital expenditure (CAPEX)

CAPEX should differentiate between expenditure for expending the capacity of the road network (new roads, additional lanes…) and expenditure for rehabilitation, large repairs.
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A large public asset to maintain, but...

Still few local politicians hear the importance of preservation of the road assets

OK there are some more cracks but you can still ride on the road let’s see later.
The cut the ribbon and run problem
The cut the ribbon and run problem

“Deferring maintenance is a handy expedient for public officials faced with problems in balancing their budgets (…) there are significant fiscal and political incentives for public officials to defer maintenance—in good times as well as bad. These benefits lead them to overlook basic common sense and responsible management.”

Continuing the drive for change of the mind-set,

Speak to the public, address social expectations to influence politicians…
Make it a socio-economic case!

“Why roads matter

Our road network supports all our daily lives, and everyone in the UK has benefited from the investment made since the 1950s.

- Roads get us to work.
- Roads give us access to the goods and services we need.
- Roads connect us with family and friends.

Our road network is also the life-blood of the economy,

- Roads provide critical connections
- Roads support job creation and unlock new development.
- Roads help the UK compete internationally.
- Roads support business travel. “
From a functionality perspective

Deferral of maintenance works leads to:

- Less availability of the transport system resulting from reduced capacity, a more fragile and less resilient network

  *increased congestion, delays, less travel-time reliability, degradation of road safety…*
In 2010, it was estimated that deficiencies in America’s surface transportation systems cost households and businesses nearly **$130 billion**:
- approximately **$97 billion** in vehicle operating costs,
- **$32 billion** in travel time delays,
- **$1.2 billion** in safety costs, and
- **$590 million** in environmental costs.

If present trends continue, by 2020 the annual costs imposed on the U.S. economy from deteriorating surface transportation infrastructure will increase to **$210 billion**, and by 2040 to **$520 billion**.

By comparison, in 2015, US State and local governments spent **$168 billions** on highways and roads (45% of which went to operational costs).
England and Wales:

Poor condition local roads are costing Small and Medium-sized Enterprises (SMEs) approximately £5bn each year through operational inefficiencies, production delays, raw material and end product delivery delays, and vehicle repair costs (YouGov survey)

Scotland:

For a 40% maintenance reduction scenario, every £1 of reduction led to £1.50 in quantifiable costs to society (Transport Scotland)
From an asset preservation perspective

Deferral of maintenance works results in:

- An increasing backlog between the available resources and the actual needs.
- Higher costs of rehabilitation (degradations accelerate further degradations).
- Least efficiency of use of public funds as decisions about road works become largely determined by emergency situations and reconstruction costs often perversely taking up funds slated for maintenance.
Lack of maintenance results in dramatically increasing cost of investments. Ex. of Spain

Source A.E.C.
We must act in a responsible way

Deferred maintenance is a disinvestment

Inadequate maintenance affects not only the present generation but places undue financial burden on future generations.
Advocating for adequate resources can’t be successful without building trust between the road managers and the elected politicians.

Building trust requires:

- **Transparency**
  Fair and complete information on the impacts of the choices
  Definition of a set of measurable objectives of the road network condition over the coming years

- **Creating ownership**
  Make these objectives those of the governing body

- **Accountability**
  Report every year of the actual condition versus the objectives to assess the efficiency of the pavement preservation strategy implemented.
- Placing Transport back on the agenda
- Where are we?
- Making the case for maintenance
- **Acting for Assets Preservation**
- Funding certainty does matter
- Questioning the form of organization for operation and maintenance of the national road network
- Concluding remarks
Inventory and condition of the road assets

Data on condition of the elements of the road assets and their evolution

*methodologies and tools exist to provide quality information (pavements, bridges, tunnels, signage, road-side equipment),*

*difficulties remain for embankments, retaining walls, drainage…*

- Aggregation of individual data into condition indicators,

- Challenge: converting into monetary terms

*In France the rating system of pavement condition (Image qualité du réseau national (IQRN) – Quality Image of the national network) is directly linked to the cost of the repair work to restore good condition*
Valuation of the road infrastructure assets using accumulated condition based depreciation

“most useful indicator which has many uses and is the best summary descriptor of the long term performance of the road network”

OECD, Performance Indicators for the Road Sector, 1997.

Among various benefits:
- Facilitates communication
- Helps promoting accountability
Valuation of the road infrastructure assets

Pioneer work made by Australia and New Zealand in the 90s.

Still not generalized but there is a trend for expanding the use of valuation.

Canada (2008) All municipal governments to record and include all tangible capital assets in financial statements under the care and control of the municipality.
Current recommendation

adopt the **depreciated replacement cost** (DRC): current cost of replacing an asset with its modern equivalent asset (*), minus deductions for all physical deterioration and impairment.

(*) Gross replacement cost (GRC)
VALUATION OF ROAD ASSETS

Annual depreciation is calculated by identifying all the capital treatments needed to maintain assets or key components over their lifecycles and then spreading the total cost evenly over the number of years in the lifecycle.

Calculated in this way, annual depreciation not only represents the annual consumption of service benefits, but also provides a measure of what, on average, needs to be spent year to year to maintain the assets in a steady state.

*PIARC Road Asset Management Manual*
The approach to calculating the depreciation of the asset value must be repeatable and consistent:

- in order to consolidate the inputs at network level;
- for meaningful comparisons from year to year.

This implies in particular data collection on condition of the road assets must be repeatable and consistent.
A multi-annual vision and approach of road assets management

The starting point, a trivial statement: *The backlog can’t be reduced in one year.*

A multi-annual vision, strategy and action plan is necessary for all:

- For **road owners** to recover control on the evolution of the condition of the network, to rationalize interventions program, to make more efficient use of public money;

- For the **road industry**, so that they can plan investment in equipment, invest in training of qualified staff; this can’t be done without a few years vision.
Pre-requisite to a multi-annual strategy:

- Set objectives to the service condition of the roads (with different service levels according to the socio-economic interest of the roads) *(still not generalized)*

Risk identification and assessment should be integrated in the approach *(Which assets are critical to the functioning of the network? What could affect the delivery of the required performance? What is the acceptable level of risk? What are the options to mitigate those risks deemed unacceptable…)*
Pre-requisite to a multi-annual strategy:

- Build pavement deterioration models to determine the evolution of performance with time and the effect of repair works
  - usually based on historical data using Markov chains approach,
  - easier for standard flexible pavements, still challenging for thick asphalt, semi-rigid and rigid pavements
Developing a financial plan for the medium and long term

The business case should provide clear indications on the impacts of the choice between different options for the financial plan:
• on users benefits (traffic disruption, users costs, socioeconomic and environmental effects),
• on asset performance, evaluated in terms of the likely drop in performance values for condition and safety,
• on depreciation of the road assets.
Selecting the “optimum”

The optimisation problem involves trading off road agency costs against road user costs over time.

At the optimum the marginal benefit cost ratio (MBCR), that is present value of the benefit to users from spending an additional present value of a dollar on maintenance equals 1.

But!! … the relation of users costs to the condition of the road is very difficult to establish with modern pavements (when cracking is the dominant failure mode).
Selecting the “optimum”

The alternative approach is to minimize the present value of road agency costs subject to minimum standards constraints (what would be acceptable to users).

Usually with available funds the same standards can’t be achieved on the whole network, which implies to categorize sub-sets of the network each with different standards of condition.
**Scenario A**
2017 budget (265 M€) kept constant over 20 years

Rate of renewal 5.4% per year

**Scenario B**
360 M€ for 10 years then 307 M€

45% preventative, 55% curatif
Rate of renewal 7.1% per year

2018 Audit of French non-conceded national road network
Placing Transport back on the agenda
Where are we?
Making the case for maintenance
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The horizon of annual budget is a severe limitation and prevent adoption of an actual multi-annual strategy. “Why should I care of multiannual planning if the current resources I get are used to face emergency situations.”

Short-term fluctuations in funding
- introduces costly stop-go
- puts focus on finishing the « next project » without considering long-term vision
- degrades accountability of road management agencies
Funding certainty for at least 5 years in capital budget makes it possible to make a sensitive provision for the development of a pipeline of future work, ensuring continuity in investment.

Providing certainty enables industry to invest in training of staff, equipment.

*Action for roads. UK Department for Transport, 2013*
Placing Transport back on the agenda
Where are we?
Making the case for maintenance
Acting for Assets Preservation
Funding certainty does matter
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Operating, maintaining and enhancing this network effectively is crucial to countries’ economic performance.

With large public deficits, governments tend to reduce budget allocation for roads, to set efficiency targets, reduce the number of staff…

Running the road network by the civil service with the uncertainties of annual budget doesn’t provide the adequate framework for implementation of long-term strategy in the interest of the users and tax payers.

The State should maintain responsibility over the strategic part of the road network to ensure 24/7 availability and service, but the organisation structure for operations and management should change from standard form.
The example of Highways England (established in 2015)

A legally separate government-owned company, with the Secretary of State for Transport as the sole shareholder

with the legal powers and duties to operate, manage, maintain and enhance the network,
with a system of governance giving the road operator the daily independence and flexibility needed to act effectively,

HE is is fully accountable to the Department of Transport, the Parliament and road users

Establishment by the Department for Transport of A ‘Road Investment Strategy’, with a long-term funding guarantee, a defined funding and investment plan and performance requirements and delivery expectations to be met by HE.

Introduction of a system of external scrutiny to represent the interests of all those who use and rely upon the strategic road network, and to monitor the efficiency and performance of HE.
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Where are we?
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Continuing the drive for change

- Make the case of road preservation as a social issue and encourage citizens to make their voice heard and put pressure on politicians for long term decisions ensuring sustainability for the sake of our children.

- Reinforce communication to all stakeholders about the condition and the value of the road infrastructure, the economic impact of delayed maintenance and preservation of the roads.

- Pursue implementation of Road Asset Management (RAM) to improve decision making, provide transparency and promote accountability, advocate for appropriate funding.
Concluding remarks

- Pursue research on the development of degradation models pertinent to local national conditions.
- Integrate risk management (including consideration of climate change impacts) in road asset management.
- Develop specific approaches to deal with management of the bridge stock as part of the whole road assets management strategy and plan.
Concluding remarks

- A need for innovation in contracting maintenance
  Multi-annual performance-based maintenance contracts
  Yes, but…. necessity for more cooperation between public and private sector to develop balanced contracts

- Examine the potential of an evolution of the State organization in charge of maintenance and operation of the strategic road network towards a public operator with mid-term funding guarantee, an agile structure fully accountable to the government and the stake-holders.
WELCOME TO THE PIARC ASSET MANAGEMENT MANUAL

Road infrastructure asset is the most valuable asset owned by the public sector in most countries and it supports a nation's economy. Traditional management methods will no longer be sufficient to meet 21st century business and political demands.

Asset management is a well-established discipline successfully implemented in several countries, for management of highways as well as other physical asset, addressing demands of a nation's citizens and industry for greater accountability and transparency, more efficient use of funds, greater focus on customer expectations and more sustainable solutions.

It is recognized that all road organizations manage their assets, but they do not necessarily all apply an asset management framework in order to achieve their desired outcomes from the delivery of their service to the traveling public and other stakeholders.

This manual has been developed by the World Road Association (PIARC) and it provides advice: on how asset management principles may be used to support a more efficient approach to maintain road infrastructure assets - road organizations' most valuable assets, and on the implementation and continuous development of road infrastructure asset management.

The manual builds on the progress made with asset management, as matter of fact manuals from several countries, documents, websites and materials are referenced. The manual also contains case studies of successful practices to document the lesson learned and experience gained in implementing asset management.

https://road-asset.piarc.org/en
Thank you for your attention

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