INFRASTRUCTURE AND TRANSPORT MINISTERS

Australian Transport Assessment and Planning Guidelines

O7 Cost Benefit Analysis of Transport Regulatory Initiatives

October 2020

atap

ISBN 978-1-925843-62-0
October 2020

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Cost-Benefit Analysis of Transport Regulatory Initiatives

At a glance

- This guidance discusses the use of cost-benefit analysis (CBA) in assessing transport regulatory initiatives. It complements ATAP Part T2 Cost – Benefit Analysis. The principles for estimating costs and benefits set out in ATAP T2 are equally relevant here to transport regulatory initiatives.
- Governments in all jurisdictions regulate aspects of transport activity, for example private and commercial vehicle standards, vehicle emissions, when and where vehicles may operate, driving hours for truck and train drivers, safety management systems in the rail sector, and requirements that cyclists and motorcyclists wear helmets.
- Regulations are imposed to manage safety, environmental and asset protection risks.
- Regulatory Impact Statements (RIS) typically require CBA in which the costs and benefits of proposed regulatory initiatives are as far as practical, quantified and compared.
- Regulatory initiatives are an example of a non-infrastructure option. Relative to infrastructure appraisals, regulatory initiatives are less likely to have high investment costs either for regulatory agencies or for individuals and organisations who are regulated. Investment costs may be both upfront (for example investment in a new Information technology (IT) system) or spread over a number of years for example as vehicle fleets are progressively renewed).
- Both regulatory agencies and those who are regulated are likely to incur ongoing (recurrent) costs as a consequence of a regulatory change. For agencies, recurrent costs include administrative and enforcement costs. Individuals and organisations with regulatory duties could incur a wide range of potential costs including recording and retention of information, training and management of staff, maintenance of equipment and changes in fuel consumption.
- The benefits of regulatory initiatives are wide-ranging and specific to each initiative.
- Tables 1 and 2 provide a summary of investment costs, recurrent costs and benefits associated with a wide range of regulatory initiatives in transport.
- An important feature of regulatory appraisals is that the level of compliance with regulatory requirements will influence the costs and benefits of proposed regulatory changes. The higher the level of compliance, the larger are likely to be the costs and the benefits (and disbenefits) of a proposed regulatory change, assuming the proposed regulatory change is appropriately targeted at the regulatory problem.
- Regulation may give rise to what are referred to as displacement effects that may erode the benefits of a regulatory proposal. Displacement effects occur because the feeling of greater safety leads people to take greater risks, for example safety initiatives such as air bags in vehicles or the requirement for cyclists to wear helmets.

1. Introduction

This part of the Guidelines considers the assessment of regulatory initiatives in transport.

Its primary purpose is to highlight how CBA can be used in the assessment of regulatory initiatives. CBA is an important factor in policy makers' consideration of proposed regulatory initiatives.

This guidance complements ATAP Part T2 Cost–Benefit Analysis. Regulatory initiatives are also closely related to the ATAP guidance on options (Part F3) and non-infrastructure options
(Part O5) in particular. Users should therefore read this guidance alongside T2, F3 and O5.

Chapter 2 discusses the broad context and the types and characteristics of transport regulatory instruments.

Chapter 3 briefly restates the ATAP assessment model and discusses key aspects of the application of CBA to transport regulatory initiatives.

Chapter 4 provides an overview of the costs and benefits arising from transport regulatory initiatives.

Terminology

In this document, 'agencies' refers to public sector agencies that formulate and enforce
transport-related regulations.

Organisations and individuals who would have obligations under a proposed regulatory change are referred to in this guidance as 'duty holders'.

Further reading

Practitioners who want to read more broadly about the assessment of regulation will find that a range of materials are readily available. Guidance on a broad range of regulatory issues, including preparation of RIS and similar documents, is contained in the following:
Commissioner for Better Regulation 2016a, 2016b;
Department of the Prime Minister and Cabinet 2014, Queensland Treasury 2016;
SA Government 2011.

2. Context and Outline

2.1 Regulation rationale and principles

Rationale

The rationale for regulation and regulatory design principles are addressed in the various jurisdictional regulation guidelines, (e.g. Office of Best Practice Regulation 2016; SA Government 2011). In summary the key points are:

- The unregulated activities and behaviour of businesses, organisations and individuals can sometimes lead to undesirable economic, safety, social and environmental outcomes. This creates an in-principle case for government intervention, with regulation being one form of intervention. In economics, these cases are referred to as 'market failures'
- Sometimes regulation already exists but may not be functioning effectively. Economics refers to this as 'regulatory failure'
- Regulation may also be considered necessary if an unacceptable hazard or risk exists, or if social/equity issues exist.

As with all proposals, regulatory initiatives are introduced with the objective of addressing an identified priority problem(s), for example, efficiency, safety, environmental, or equity. It is important that the objectives of potential and proposed regulatory actions are well understood at the commencement of any assessment, and that any proposed regulatory actions are consistent with those objectives.

Trade-offs

It is important to recognise that whilst regulations are introduced to correct a market failure and regulatory failure, including for risk, social or equity reasons, their introduction usually involves trade-offs. For example, applying certain safety regulations may lead to lower productivity or efficient outcomes. Trade-offs are monetised (where feasible) and aggregated through the CBA (see Chapters 3 and 4).

Principles

Principles play an important role in guiding practitioners. In 2007, COAG (2007) agreed that all governments will ensure that regulatory processes in their jurisdiction are consistent with the following principles:

1. Establishing a case for action before addressing a problem;
2. A range of feasible policy options must be considered, including self-regulatory, co-regulatory and non-regulatory approaches, and their benefits and costs assessed;
3. Adopting the option that generates the greatest net benefit for the community;
4. In accordance with the Competition Principles Agreement, legislation should not restrict competition unless it can be demonstrated that:
   a. The benefits of the restrictions to the community as a whole outweigh the costs, and
   b. The objectives of the regulation can only be achieved by restricting competition;
5. Providing effective guidance to relevant regulators and regulated parties in order to ensure that the policy intent and expected compliance requirements of the regulation are clear;
6. Ensuring that regulation remains relevant and effective over time;

7. Consulting effectively with affected key stakeholders at all stages of the regulatory cycle; and
8. Government action should be effective and proportional to the issue being addressed.

2.2 Types of regulatory instruments

Regulatory options can take a wide variety of forms, including:

- Behavioural controls — for example wearing of bicycle and motorcycle helmets, hours of work.
- Process controls — for example requiring accreditation of management systems or of individual workers, staff training, incident reporting.
- Physical controls — for example vehicle standards, ticketing and metering for public transport and taxi services, emissions controls, mass limits and related axle spacings.
- Access controls — confining some vehicle types to specified roads or types of road.

Governments regulate a wide range of activities and behaviours in transport, for example:

- Vehicle standards for private and commercial vehicles covering, for example, braking and lighting systems, suspension systems, vehicle dimensions and vehicle emissions
- Operation of heavy road freight vehicles, for example vehicle mass, vehicle access (delineating which roads or types of road that heavy vehicles are allowed to use), hours of work for drivers, load restraint systems and operation of trailers
- Safety management systems in the rail sector, for example hours of work for train crew; putting speed restrictions to avoid derailment/safety or noise issue impacting on neighbourhoods closed to rail lines during night operations
- Requirements for cyclists and motorcyclists to wear helmets while riding.

Regulatory measures are implemented through a wide range of forms and instruments, including:

- Principal legislation (acts of parliament) and subordinate legislation which can include regulations
- Codes of practice
- Other forms of statutory guidance.

The choice of regulatory instrument would typically not influence the CBA methodology in the RIS. However as noted in section 2.4 some types of regulatory instruments will be more difficult to appraise than others.

In broad terms, this guidance can be applied to the appraisal of all these forms of regulatory instruments.

Regulatory instruments may be:

- **Principles or general duties-based** — with these, only very general rules and objectives are stated, for example that operators should provide transport services that are safe and provide reasonable levels of consumer protection. This form of instrument will present the most acute difficulties for estimation of costs and benefits because the regulations leave interpretation of requirements such as ‘safe’, ‘reasonable’ and ‘consumer protection’ to be defined by duty holders unless and until clarification is provided by the courts.

- **Performance-based regulations** — with these, outcomes are stated in regulations but not the means for achieving the outcomes. A performance regulation might state, for example, that a vehicle of a given gross mass must be able to accelerate at some predetermined rate. Because they specify desired outcomes in more detail, performance-based regulations present somewhat less of a challenge than principles or general duties-based regulations but the essence of this form of regulation is that duty holders determine individually how best to comply. Hence, estimation of costs and benefits will still be challenging.
- **Prescriptive regulations** — These define the obligations of duty holders in detail, for example requirements relating to vehicle mass and axle spacing, driver hours of work, frequency of maintenance inspections, requirements and specifications for vehicle monitoring equipment. This form of regulation is the most amenable to estimation of costs and benefits because individual requirements are set out in detail allowing the implications of the regulations to be identified elementally. For example, the benefits of a regulation changing maximum road speeds will have safety benefits that can be postulated from the literature about the effect of speed on crash rates (with allowances for compliance) as well as benefits in terms of travel time and operating costs that can be estimated using methods set out in ATAP Parts M2 and PV2.

2.3 Relationship to appraisal of large capital investments

ATAP Part O6 provides guidance on 'alternative options' to large capital investments. Regulatory initiatives are part of the broad category of alternative options, but their appraisal can entail subtleties in cause, effect and data quality that are less likely to be present in appraisal of other types of alternative options. Accordingly, separate but complementary guidance is provided here on regulatory initiatives.

In principle, there is no difference between a CBA for a large capital investment option and a CBA for an alternative option such as a regulatory change. In each case, the CBA is endeavouring to estimate the effects of a proposed change in resource use on the community's economic welfare. The differences between these two applications of CBA lie in the nature of the changes being appraised.

The typical transport CBA explores the relationship between the costs of large, relatively long-lived assets and the user response to the provision or upgrading of those assets. In contrast, in a regulatory appraisal, investment costs are likely to be smaller (for individual agencies and duty holders). In addition, investment costs may in some instances be distributed across very large numbers of individual duty holders. Benefits relate to how vehicles (cars, motorcycles, bicycles, buses, trucks and trains/trams and their drivers/crews) operate and interact, and the changes in safety, asset and environmental risk that regulatory change might produce. Regulatory changes might also increase the productivity of transport systems by allowing vehicles to operate with greater payload or on roads they were previously prevented from using.

2.4 Characteristics of regulatory changes

Outcome relationships

Regulatory change in the transport sector may be related to:

- Productivity — for example regulation that affects the number of passengers or the amount of freight that vehicles can carry
- Crash safety — for example the design and operation of vehicles and transport systems; speed limits

- Personal safety and consumer protection — for example operator and driver/instructor, accreditation, ticketing and metering, in-vehicle monitoring, vehicle standards covering, for example, buses, taxis, ride share vehicles and driver instruction vehicles.
- Environmental protection — for example emissions controls
- Asset protection — for example heavy road freight vehicle regulation to control bridge and pavement loads.

Physical and behavioural changes

Whereas infrastructure appraisals will address the effects of large capital projects, regulatory changes can be characterised by a mixture of physical change (such as requiring the installation of airbags in cars) and behavioural changes (such as requiring accredited quality systems to manage in-service safety risks; specifying hours of work for truck and train drivers).

Investments may be made by regulatory agencies (for example development of regulatory proposals, enforcement officer training) or by duty holders (for example. development of safety management systems in rail operations, installation of on-board weighing machines on trucks).

Investments by duty holders may occur progressively over time as vehicle fleets are renewed and businesses take on new workers. Consequently, appraisals may need to be supported by robust fleet age profile data so that the timing of investment can be determined. The older the vehicle fleet, the earlier investment will be required to meet the requirements of the regulatory change. Information may need to be sought about staff turnover because new staff may need to be briefed on their compliance responsibilities.

Compliance

The level of compliance with regulatory changes is an important determinant of costs and benefits. The higher the level of compliance, the greater the costs and the benefits (and/or disbenefits) of the regulatory change (provided the proposed regulatory change is appropriately targeted at the identified transport problem). For regulatory changes that will be mandatory, enforcement records maintained by regulatory agencies will allow ranges of compliance to be gauged.

Mandatory vs voluntary (concessional) regulatory arrangements

A subset of the compliance issue is the distinction between regulatory changes that are mandatory and those that are voluntary or concessional.

Mandatory changes will be pursued by government when the objective being pursued is regarded as being critical to the community welfare, for example the wearing of seat belts (to address a safety risk), vehicle emissions control (to reduce environmental and human health risks) or mass limits for heavy road vehicles (to minimise risk of damage to infrastructure assets and safety risk).

Voluntary or concessional schemes are employed where there is a scope for a regulatory outcome that is beneficial to both regulatory agencies and those who have regulatory obligations (duty holders). These arrangements take the form of a regulatory bargain in which those with duties under a specific body of legislation are granted concessions in return for additional compliance measures to provide assurance to regulatory agencies that the regulatory concessions will not be abused.

For example, in the roads sector, various concessional schemes allow higher vehicle mass or more permissive driver work hours provided vehicle operators agree to additional regulatory obligations (such as implementing management schemes to control and monitor mass). This fosters greater utilisation of fixed infrastructure (pavements and bridges) at relatively low cost. As a result, agencies benefit because the concessions allow more effective infrastructure utilisation without significant upfront capital cost, and duty holders benefit because they can better utilise their assets and workforce for the cost of an additional compliance effort.

Schemes initiated under the agenda of the National Transport Commission and the National Heavy Vehicle Regulator (such as the Performance Based Standards) scheme may provide guidance on the take-up of these arrangements and the reaction of duty holders to the perceived costs of these arrangements relative to their perceived benefits.

Quantifying the take-up of these voluntary or concessional arrangements will present greater challenges than estimating compliance with mandatory regulatory change because the voluntary concessional change will only be taken up by those businesses that see an advantage in doing so. Comparisons with earlier schemes combined with stakeholder consultations are suggested approaches to estimating take-up of concessional arrangements.

Non-regulatory options

Jurisdictional guidelines may require that at least one option be non-regulatory, reflecting a policy intention to reduce the 'burden' of regulation where possible (see for example OBPR (2016)).

Non-regulatory options in the road transport context could include:

- Education campaigns at the industry, motorist or general community level.
- Voluntary industry codes of conduct.
- Market-solutions such as tradeable permits.
- Do nothing[1].

Levels of compliance with the requirements of a regulatory proposal and the benefits (and any disbenefits) and costs will be more difficult to estimate for non-regulatory solutions than for regulatory solutions. However, guidance about the impacts of non-regulatory measures, such as education campaigns, may be available from analogous policy initiatives relating, for example, to smoking, drink driving and speeding.

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[1] Doing nothing may be a feasible option when duty holders have strong commercial incentives — including market and insurance incentives - for managing a risk that is the target of a proposed regulatory change.

3. Application of cost–benefit analysis

Within that broad context of Chapter 2, this chapter discusses the application of CBA to transport regulatory initiatives. Section 3.1 briefly restates the ATAP assessment model. The subsequent sections then discuss key aspects of the application of CBA to transport regulatory initiatives.

Note that, in some circumstances, it may be difficult to monetise the primary benefit of the regulatory initiative, making it difficult to undertake a CBA. In such cases, a cost-effectiveness analysis (CEA) will play an important role (see discussion in Appendix E of ATAP Part F3).

3.1 The ATAP assessment model

The ATAP assessment model outlined in Section 3.3 in ATAP Part F3 provides the basis for assessing all initiatives, including regulatory initiatives. The model consists of:

- Clarification of relevant jurisdictional goals, transport system objectives and targets — It is important to be clear about which of these relate to proposed regulatory initiatives early in an assessment.
- Consideration of strategic merit/alignment — the degree of strategic alignment of introducing regulatory initiatives should be assessed.
- Use of CBA (see ATAP Part T2) and the Appraisal Summary Table (AST). The AST provides the mechanism for presenting all the appraisal results—monetised and non-monetised—in a single location.
- The ATAP appraisal methodology recognises that all benefits and costs—monetised and non-monetised—are relevant to the appraisal of initiatives. It facilitates this through use of the AST, in which monetised and non-monetised benefits and costs are presented side-by-side (see Part F3 Chapter 3).
- Bringing together all aspects of the assessment into a Business Case (see ATAP Part F4).

Within this context, the remaining discussion in this chapter is on the application of CBA to regulatory initiatives, in line with ATAP T2. T2 provides guidance on how to undertake CBA of transport initiatives. The principles and methodology outlined there apply equally here.

3.2 Questions for identifying benefits and costs

In identifying benefits and costs, appraisers will be assisted by asking the following questions:

- What is the intention of the regulatory proposal (what is the regulatory problem being addressed)?
- How will the proposed options contribute to the intention of the regulatory proposal?
- How many duty holders will be required to comply with the proposed regulatory change and what will the regulatory proposal require them to do?
- Will the proposed regulation change investment and recurrent costs for duty holders?
- What benefits will the regulatory proposal generate?
- Will the options differ in their costs and benefits — if so, how and by how much?
- Will regulatory agencies incur costs in formulating the proposed options, drafting legislation, training staff?

- Will regulatory agencies incur additional costs in monitoring and enforcing the proposed regulatory change?

3.3 Identification of the base case

In regulatory proposals the base case is not always the pattern of activity and resource use that would pertain in the absence of the regulatory proposal.

For new regulations

The base case is defined as for infrastructure initiatives.

For regulations that expand an existing regulatory regime (excluding 'sunsetting' provisions)

The base case is defined as for infrastructure initiatives.

For 'sunsetting' regulations

In at least some jurisdictions, subordinate legislation including regulations ceases to have legislative force at the end of a designated 'sunset period', usually ten years, unless the regulations are re-made within that time.

In some jurisdictions, regulatory CBAs are required to adopt a 'no regulation' or 'zero base' base case. For regulations that have a long history — examples being seat belt wearing or taxi service quality — this requirement presents significant analytical difficulties for analysts. Analysts should consider consulting the regulatory oversight agency in the relevant jurisdiction before proceeding to define the base case.

3.4 Appraisal period

Regulatory changes might not have long lives. If enacted via subordinate legislation (including regulations), regulatory changes may be subject to a 'sunset' period. Because a subsequent government might not remake the legislation, the life of the regulatory change should be taken to be the period before sunsetting. To account for this, residual values might need to be calculated for some capital purchases associated with the regulatory change. Vehicles may have lives longer than ten years[2] but some electronic equipment and related software might only have a five year life and could thereafter be assumed to have zero value at the end of the analysis period. Estimation of residual value is discussed in section 3.3 of T2.

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[2] Typically, when regulatory changes are made, existing vehicles are 'grandfathered' and may operate as under the preceding regulations until de-registered. Consequently vehicles less than ten years old at the end of the analysis period can be assumed to have a residual value.

For regulatory changes that affect the cost of new vehicles, estimation of the costs of compliance for vehicle owners and operators will need to take account of fleet age and the rate at which owners — including light vehicle owners — turn over their fleets. Appraisers will need to use information from industry participants or associations or from the Australian Bureau of Statistics (ABS) to estimate the age distribution of the fleet. If 5% of the fleet is ten years old and 6% is nine years old and owners tend to replace their vehicles at ten years, 5% of vehicles would be assumed to be subject to the regulatory change in the first year plus any additional vehicles from industry growth and 6% in the second year[3].

DIT (2016) used an alternative simpler approach for a CBA of changes in vehicle emissions standards. In that approach, the upfront vehicle-related compliance costs were annuitised over the life of vehicles at the discount rate and only annualised cost for years in the analysis period were included in the CBA. Similarly, annual benefits were only included up to the end of the analysis period. This simpler approach avoided the complications of calculating residual value for a multi-age vehicle fleet, but it was able to be adopted because the improvement in vehicle emissions was expected to remain constant over the life of vehicles fitted with the new emissions equipment. In other circumstances, it might not be possible to use this simplified method of accounting for benefits that occur when the lives of some assets (those replacements of assets that occur in the latter part of the analysis period) go past the end of the analysis period.

3.5 Estimating investment costs

Unlike infrastructure initiatives, regulatory initiatives are less likely to generate very large investment costs for individual agencies and duty holders. Total investment costs across all agencies and duty holders may, however, sometimes be large. Investment costs could include:

- For agencies: data management and processing systems, Information Technology (IT) monitoring technology, formulation of legislation and staff training
- For duty holders: new vehicles and equipment, data management and processing systems, development of management systems and staff training.

Some costs may be upfront for example investment in a new IT system.

Some costs may include a bring-forward element as assets are replaced earlier to take advantage of a regulatory change. Some investment costs may be incurred progressively as vehicles or equipment are replaced and some costs may be re-incurred at regular intervals such as electronic equipment.

The bases for investment costs will be, for example, the numbers of vehicles, numbers of vehicle operators or track operators, or numbers of vehicle owners. When estimating investment schemes for concessional regulatory arrangements, an important consideration will be the proportion of organisations/individuals who choose to 'take up' the concessional arrangement (discussed in section 2.4).

3.6 Making demand forecasts

In regulatory appraisals, demand translates to levels of compliance and take-up among the target population of duty holders for the proposed regulatory change, as well as size of the target population.

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[3] Assuming that the regulatory change was to be made soon after the RIS was prepared.

3.6.1 Compliance with mandatory proposals

For mandatory regulatory proposals, benefits will be generated from the target population (for example number of vehicles, number of drivers, number of owners moderated by the expected level of compliance). Assuming that the regulatory proposal is well designed and appropriately targeted to the identified regulatory problem, benefits will increase with the level of compliance.

Compliance directly affects the costs and benefits of those proposed regulatory changes that are intended to be mandatory. However, even the most carefully designed and enforced regulations are unlikely to produce full compliance, and compliance may differ between regulatory options. Agency input and secondary research may be needed in estimating levels of compliance. If there is significant uncertainty about compliance, sensitivity testing of alternative compliance levels would be desirable.

Differences between compliance levels among options for a regulatory change should be reflected in the estimation of costs and benefits. It might also be appropriate to sensitivity test the results of the CBA for alternative compliance assumptions.

3.6.2 Take-up of voluntary/concessional schemes

For voluntary/concessional regulatory schemes, compliance is replaced by take-up — that is, the proportion of the target population that will take up the regulatory concession to gain the net benefits that it offers.

Take-up will be inherently more difficult to estimate because concessional schemes lack the element of compulsion and penalty for failure to comply. Individuals and businesses will only take up concessional schemes if they perceive that the benefits for them exceed the costs they will incur in participating, that is they obtain a net benefit. Accordingly, the higher the take-up, the higher the net benefits of a regulatory proposal[4].

Take-up could be estimated using:

- Ex ante surveys of operators or drivers — a costly method in which care would be needed to control for strategic bias[5].
- The results of other regulatory initiatives — a less costly method that relies on actual experience ('revealed preference'). Careful selection of analogous regulatory initiatives is needed for this method to be effective.
- Consultation with stakeholders.

3.7 Estimating operating costs

In the regulatory context, operating costs (ongoing or recurrent costs) include:

- For regulatory agencies: enforcement and monitoring costs.
- For duty holders: operation of management systems, equipment maintenance and monitoring, operation of accredited management systems.

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[4] Some operators might take up a regulatory concession even though the direct benefits for them do not exceed their costs. Other factors such as reputation ('social licence'), the requirements of major customers or a desire to reduce directors' risks might also be relevant.

[5] Strategic bias being a tendency on the part of some survey respondents to provide self-interested answers to survey questions.

3.8 Estimating benefits

Benefits are driven by the expected effect of the proposed regulatory change on the transport problem being regulated, the cost of the problem and the level of compliance or take-up.

The base and project cases should take account of long-term changes that could affect the viability of a proposed regulatory change. Examples include developments in European and US vehicle design standards, the increasing adoption of electronic vehicle monitoring technology, progressive improvement in the standard of the road network, development of autonomous vehicles, emergence of internet-based bicycle/scooter hire systems.

The more diffuse the range of duty holders and the more challenging it is to detect breaches, the more difficult it will be to assess the impacts of a proposed regulatory change. For example, the impacts of a requirement that all private-use motor vehicles be fitted with vehicle stability control are relatively easy to cost: firstly, because the number of motor vehicle manufacturers is relatively small and, secondly, because compliance is easily determined at points of import or sale.[6.]

Similarly, rail safety regulation imposes burdens on a small number of track owners and train operators.

On the other hand, the heavy vehicle road freight sector is characterised by very large numbers of small operators dispersed throughout the country. While freight vehicle operators and private light vehicle owners have no choice but to abide by new vehicle regulations if they want to purchase a new vehicle, the same is not the case for non-vehicle related regulatory changes. With large numbers of small operators operating a combined large fleet, non-compliance can be difficult to detect. So long as non-compliance is difficult to detect, there will be increased scope for some operators to ignore their regulatory obligations. Compliance and costs and benefits may be difficult to determine in these circumstances.

Primary and sometimes secondary research as well as industry consultation is required in estimating benefits. Sometimes a regulatory proposal will be supported by specific primary research but in other instances, industry knowledge or experience of other regulatory proposals will need to be referenced.

In identifying and assessing impacts and benefits, appraisers need to be aware of the phenomenon of regulatory displacement in which a regulatory requirement — for example, more sophisticated braking systems — encourages drivers to take more risk than they might otherwise (see Baldwin et al 2012)). Addressing the possibility of regulatory displacement will call for at least secondary research if there is a concern that the phenomenon will be relevant to a specific proposal.

3.9 Estimating cross-modal and network effects

Some regulatory initiatives could cause modal shifts, for example:

- From public transport and taxis to ride share services.
- From walking to bike share or scooter share services.
- Freight from rail to road — due to, say, changes in high productivity road access.

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[6] Notwithstanding the recent vehicle emissions scandal in the US and Europe.

T2 discusses the treatment of cross-modal effects in benefit estimation.

3.10 Discount benefits and costs, calculating summary results

Chapter 10 of T2 discusses discounting. As noted there, practitioners are expected to use the discount rate nominated by the funding jurisdiction.

A proposed regulatory change is economically efficient if its net present value (NPV) is greater than zero. If mutually exclusive options for a regulatory proposal are being compared, the option with the highest NPV is preferred because it offers the largest increase in the community's economic welfare. If appraisers are required to report benefit–cost ratio (BCR) results, they should be aware that the BCR1 measure will be appropriate if the options have zero upfront costs. Costs in the BCR1 will include on-going management and enforcement cost for agencies and compliance costs for individuals and organisations. If the BCR2 measure is being used, these costs are included in the numerator of the BCR (see ATAP T2 for an explanation of the BCR1 and BCR2 measures).

The CBA report should present the benefits and costs of each option broken down in a meaningful categorisation (for example, according to stakeholder type and/or type of benefit and cost). Sensitivity tests and their meaning should also be reported and the implications of any unquantified costs and benefits discussed. Sensitivity testing of assumed levels of compliance and take-up might be particularly important for some regulatory proposals (see section 3.6).

4. Costs and Benefits

In regulatory assessments, investment costs are incurred in the implementation phase and may be re-incurred at intervals post-implementation, for example training of staff in regulatory agencies and duty holders, periodic replacement of equipment, and equipment testing.

Recurrent or ongoing costs are incurred by agencies and duty holders in managing, monitoring, enforcement and compliance.

Regulatory change may bring benefits (and some disbenefits), for example changes in emissions, productivity, safety and infrastructure wear and tear.

The type of costs and benefits included and estimated in a regulatory CBA will generally not be affected by whether the proposed regulatory change is intended to be mandatory or concessional.

4.1 Costs

4.1.1 Investment costs

Investment costs include the upfront costs required to implement the regulatory change that is being assessed. Investment costs could comprise:

- For agencies: Drafting of legislation, staff training, development of new monitoring/enforcement processes, purchase/installation of monitoring equipment, development of databases.
- For duty holders: Vehicle modification or bringing forward of vehicle replacement, equipment purchase/installation, development of compliance processes including accreditation, staff training.

Costs may be spread across a range of parties:

- Regulatory agencies (such as the Office of National Rail Safety Regulator and police)
- Vehicle designers and manufacturers
- Vehicle operators (such as private motorists and cyclists)
- Vehicle owners and operators
- Infrastructure owners and operators (the latter particularly in the rail sector).

Depending on the nature of the regulatory proposal being assessed, data to support cost estimation might need to be sought from:

- Vehicle, rolling stock and equipment manufacturers
- Vehicle and service operators
- Industry representative bodies
- Environment protection agencies and health departments
- Government agencies
- Police.

Costs for the various parties affected by regulatory change fall into the following broad groupings:

- Vehicle designers/manufacturers — costs of new vehicle /new equipment design and testing[7]
- Vehicle operators/owners — costs of purchasing and installing new equipment or the costs of bringing forward vehicle or equipment replacement,[8] costs of preparing new operating procedures and training staff, costs of bringing forward vehicle purchasers for participation in concessional regulatory arrangements
- Regulatory agencies including police where relevant — the costs of regulatory design and legislative drafting, implementation of compliance monitoring and enforcement systems (including in-road weighing systems, cameras, camera gantries) and the costs of training staff.

Information needed to estimate investment costs could include:

- Number of agencies affected
- Number of infrastructure owners/operators affected
- Number of vehicle owners/operators affected (including road vehicle, train and tram fleet owners)
- Number of vehicles affected in the relevant class or across all classes
- Number of drivers affected
- Number of agency compliance officers or police officers affected
- Number of vehicle manufacturers/ vehicle modifiers affected
- Number of engineering or accreditation certifiers affected

Unit investment costs would be needed for each of these cost sources.

As in CBAs of infrastructure initiatives, appraisers will need to estimate not only the total costs for the affected parties but also the time distribution of those costs. Unlike infrastructure initiatives with their relatively high upfront capital costs, costs associated with regulatory changes are likely to be incurred over longer periods as new vehicles are purchased and as new drivers, cyclists, motorcyclists and industry personnel enter the transport sector.

4.1.2 Recurrent/ongoing costs

Agencies and duty holders may incur recurrent/ongoing costs (or accrue cost savings) in managing, monitoring, enforcement and compliance activities. Agency costs or cost savings could relate to inspectorate work forces, data collection and management, operation of monitoring equipment (cameras and weighing equipment) and GPS tracking systems.

For duty holders, ongoing costs could include compliance equipment maintenance, operation of accreditation systems and monitoring of operations and staff training.

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[7] These costs are relevant if designers/manufacturers are to be required to submit new vehicle or equipment designs to agencies for approval. If these costs are calculated, they should be excluded from any new vehicle/new equipment costs imposed on owners/operators by the proposed regulatory change.

[8] If the vehicle/equipment purchase is to be brought forward from year 7 to year 5 for example, the bring-forward cost equals the present value of purchasing in year 5, less the present value of purchasing in year 7.

Data requirements will be similar to those for investment costs except that unit costs (per vehicle, per owner, per operator) will relate to recurrent costs (for example in-vehicle camera maintenance costs per vehicle, accreditation costs per vehicle or inspectorate labour costs per duty holder).

4.2 Benefits

Regulatory initiatives can result in both benefits and disbenefits and will typically fall into the following categories:

- Changes in vehicle productivity
- Changes in operating costs for duty holders (such as changes in fuel consumption and vehicle/ equipment maintenance costs and crew time costs)
- Changes in infrastructure and other asset damage
- Changes in crash safety risk
- Changes in personal safety risk
- Changes in emissions.

The incidence of benefits could be as follows:

- Vehicle operators — enhanced vehicle productivity, reduced occupational health and safety costs
- Infrastructure owners/operators — changes in infrastructure and other asset wear and tear
- Other transport system/ community more broadly — changes in road safety, personal safety and environmental risk.

Information needed to estimate benefits could include:

- Number of regulatory and police agencies affected
- Number of vehicles affected
- Number of vehicle owners/operators, fleet owners/operators, drivers, cyclists and motorcyclists affected
- Base case crash and environmental risk relevant to the proposed regulatory change[9] and the risk reduction effect of the proposed regulatory change (drawing from Australian and overseas research)
- Changes in vehicle productivity (payload tonnes, payload cubic metres, sitting and standing passengers/vehicle)
- Changes in crash risk
- Changes in personal safety risk
- Compliance or take-up rates for the base case and for each regulatory option
- Changes in infrastructure/asset wear and tear attributable to the regulatory proposal

Information supporting benefit estimation might need to be sought from affected parties including:

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[9] For example, fatigue-related crashes are targeted by hours of work regulations for truck and train drivers. Vehicle stability control systems for road vehicles are introduced to reduce the risk that a sudden swerving manoeuvre will cause run-off-road or head-on crashes. Regulations that require cyclists to ride on bicycle paths when provided adjacent to roads target reductions in crash risk and possibly crashes.

- Vehicle and service operators
- Industry representative bodies
- Users and consumer groups
- Environment protection agencies and health departments
- Agencies
- Police.

4.3 Typology of costs and benefits

A typology of benefits and costs is set out in the following Tables.

Table 1: Typology of benefits and costs — agencies and the community

Type of Change	Investment Costs	Recurrent Costs	Benefits / Disbenefits Changes in:
Truck driver hours of work	Drafting of legislation, implementation of compliance monitoring systems, staff training	Compliance monitoring and enforcement costs	Road trauma; damage to road assets; user delay costs due to incidents
Vehicle mass	Drafting of legislation, implementation of compliance monitoring systems, staff training, in-road weighing systems	Compliance monitoring and enforcement costs	Pavement damage; crash risk
Load restraint	Drafting of legislation, implementation of compliance monitoring systems, staff training	Compliance monitoring and enforcement costs	Damage to road infrastructure for example bridges, overhead lights and signs); road crash risk from poorly loaded vehicles
Vehicle dimensions	Assessment of alternative vehicle designs, infrastructure upgrades, staff training, implementation of monitoring systems	Compliance monitoring and enforcement costs	Road asset damage; crash risks (for example better designed vehicles; more productive vehicles means few truck trips to achieve the same freight task)
Electronic vehicle monitoring	Scheme design and set up, equipment testing, staff training, monitoring systems (Note 2)	Compliance monitoring and enforcement costs	Crash risk; damage to road infrastructure (for example pavements, bridges)

Type of Change	Investment Costs	Recurrent Costs	Benefits / Disbenefits Changes in:
Autonomous vehicles	Development of safety management systems	Staff training, monitoring and enforcement; periodic review of safety management systems	Reduced road crash risk, improved road space utilisation
Vehicle emissions (rail or road)	Formulation of standards, verification of compliance	Compliance monitoring and enforcement costs	Emissions, related changes in incidence of disease, environmental and building damage caused by emissions
Service quality, driving instructors	Drafting of legislation, implementation of compliance monitoring systems, staff training	Compliance monitoring and enforcement costs	Safety and training outcomes for trainees; road crash risk; personal safety outcomes for driver trainees
Cameras in ride share vehicles	Drafting of legislation, implementation of compliance monitoring systems, staff training	Compliance monitoring and enforcement costs	Passenger personal safety risk, police investigations, court proceedings
Bicycle and motorcycle helmet use	Enforcement activity for agencies	Compliance monitoring and enforcement costs	Health system costs

Table 2: Typology of benefits and costs — duty holders

Type of change	Investment costs	Recurrent costs	Benefits / Disbenefit Changes in:
Truck driver hours of work	Electronic monitoring equipment; staff training; rescheduling of operations, set up of accreditation systems	Monitoring, recording, staff refresher training, accreditation auditing (if relevant)	Crash-related costs (for example driver death or injury; vehicle and contents damage, reputational improvement), reduced vehicle productivity, better driver health and wellbeing

Type of change	Investment costs	Recurrent costs	Benefits / Disbenefit Changes in:
Vehicle mass	Electronic monitoring equipment including on-board weighing scales, accreditation system set up, staff training, installation of upgraded suspension or bring forward cost of vehicle replacement	Monitoring, recording, equipment repair and maintenance, staff refresher training, accreditation auditing (if relevant)	Vehicle productivity — for example lower/higher driver time and vehicle operating costs
Load restraint	Vehicle modification or bring forward of vehicle replacement, preparation of systems documentation, staff training	Monitoring, recording, equipment repair and maintenance, staff refresher training	Vehicle productivity (for example loading procedures may be more or less time consuming, vehicles can carry less), crash risk (collisions caused by lost loads)
Vehicle dimensions (Note 1)	Vehicle design costs, vehicle modification costs; bring forward cost of vehicle replacement, staff training		Vehicle productivity
Electronic vehicle monitoring	Purchase and monitoring of in-vehicle equipment, Accreditation set up costs. Staff training	Maintenance of monitoring equipment, staff refresher training, equipment repair and maintenance	Vehicle productivity, better driver health and wellbeing, vehicle operating costs
Autonomous vehicles	Establishment of compliance systems	Maintenance of compliance systems, staff training	'Social licence to operate', savings in labour and crash costs
Vehicle emissions (rail or road)	Engine and emissions systems design and, testing, re-tooling of manufacturing processes	Repairs and maintenance of emissions equipment	Fuel consumption and vehicle maintenance costs

Type of change	Investment costs	Recurrent costs	Benefits / Disbenefit Changes in:
Service quality, driving instructors	Vehicle equipment/installation (ie instructor over-ride controls; training/accreditation	Staff training and monitoring, maintenance of accreditation status if relevant	Complaints, better service standards, savings in crash costs
Cameras in ride share vehicles	Camera purchase, installation	Equipment maintenance	Driver personal safety risk
Bicycle and motorcycle helmet use	Helmet purchase for cyclists and motorcyclists	Helmet replacement as appropriate	Morbidity and mortality associated with trauma to the head from bicycle and motorcycle crashes

*Note 1: See footnote **Error! Bookmark not defined.** about avoiding duplication of manufacturers' costs that are passed on in the prices of new vehicles or equipment.*
Note 2: In mandatory and voluntary/concessional vehicle monitoring schemes, road agencies are likely to receive non-compliance reports from vehicle operators directly or from operators' monitoring service providers. Agencies need technology and systems to receive and process non-compliance reports.
Note 3: Recurrent costs and negative benefits would be included in the numerator for BCR2 as defined in ATAP Part T2.

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