

# OECD PROJECT: PERFORMANCE BASED STANDARDS FOR THE ROAD SECTOR

**Fiona Calvert and Peter Cleal**

National Transport Commission

Level 15, 628 Bourke Street, Melbourne, Victoria, 3000, Australia. Tel: +61 (0) 3 9236 5036.

E-mail: [calvertf@nrtc.gov.au](mailto:calvertf@nrtc.gov.au)

## ABSTRACT

This paper reviews the Organisation for Economic Co-operation and Development (OECD) IM4 Working Group's recently published report entitled "Performance Based Standards for the Road Sector". This report is concerned with moving towards a greater focus on outcomes or results in heavy vehicle regulatory systems around the world.

The paper examines:

- how heavy vehicles are currently regulated;
- regulatory principles;
- best practice directions from around the world;
- performance based measures and standards that have been developed in different countries;
- implementation issues; and
- potential outcomes.

It finds that there are a range of ways in which regulatory systems can shift to a greater outcomes focus, and that different approaches to regulatory systems will better suit different countries' needs. However, a results-oriented approach based on better understanding of the factors that influence performance outcomes, in whatever form it is implemented, has the potential to provide better outcomes for safety, environment protection, infrastructure protection and transport efficiency.

The paper also outlines the project methodology and concludes by briefly describing an international collaborative research effort proposed to further understanding of the issues raised in the report.

## INTRODUCTION

In 2002 the OECD Roads and Transport Research Programme established a Working Group to examine the use of performance-based standards in the regulation of heavy vehicles.

The expected outcomes of this work were:

- Development of more sustainable transport systems through improved road vehicle regulations controlling vehicle safety and infrastructure impacts, and better environment outcomes.
- More flexible road transport regulations that provide for increased innovation and more rapid adoption of new technologies.

The Terms of Reference explain that existing regulations of heavy vehicle use are generally rigid and only indirectly ensure that vehicles are able to operate in a safe manner and control the amount of road and bridge wear they cause. Increased flexibility in controls on heavy vehicles could help meet the demands of growing freight tasks where the potential for expansion of infrastructure investment is limited. Increased flexibility could do this by allowing better management of the use of existing infrastructure, while simultaneously improving safety and amenity outcomes of heavy vehicle use.

The IM4 Working Group has completed its deliberations and prepared a report for OECD publication. This paper summarises the findings of that report and examines the need for further international collaboration in relation to this topic.

## REGULATORY PRINCIPLES

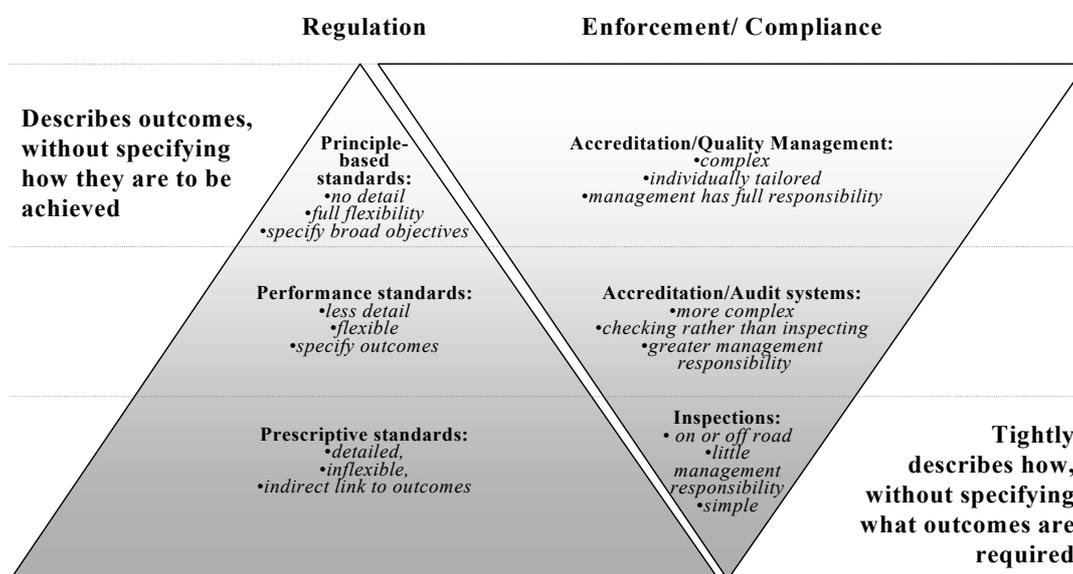
The use of heavy vehicles is regulated predominantly by prescriptive rules that evolved over a long period and which differ internationally. Both the OECD and regulatory reform agencies in individual countries have promulgated the need to review regulatory structures and processes across the gamut of regulatory activity to ensure they achieve the desired outcomes. Consideration of performance-based regulation is seen as a key factor in such reviews. While most regulations for heavy vehicles remain prescriptive, performance-based approaches to regulation have been the focus of regulation reforms internationally in recent years.

This has been to ensure:

- governments only intervene when there is a need for them to do so;
- the performance that needs to be regulated is transparent;
- regulations are subject to an ongoing process of evaluation;
- consistency is achieved across jurisdiction boundaries; and,
- innovation and take-up of new technologies and approaches is encouraged by regulations that do not create unnecessary inflexibilities for those who have to comply with them.

The OECD report notes that reforms to regulation of food standards and occupational health and safety are the prime examples of major sectors of activity that have moved from fixed prescriptive rules and regulations to performance based regulation. This regulatory approach started in the occupational health and safety arena in the United Kingdom and has since spread to a wide range of other areas and other countries.

The report explains that regulations can vary considerably in terms of how they specify what they are trying to achieve. There is a spectrum in the nature of regulations, from prescriptive regulations at one end to solely ‘principle-based regulations’ at the other. Figure 1 illustrates the range of approaches that can be taken, and the hierarchy of Performance Standards they make possible.



Source: NRTC 2001

Figure 1. Hierarchy of possible approaches to regulation.

- Principle-based regulations specify requirements very broadly in terms of general objectives and do not incorporate any quantified limits. They provide each organisation with the maximum possible flexibility to determine how best to achieve those objectives.

- At the other end of the spectrum are ‘prescriptive regulations’, which are defined in very specific terms. Heavy vehicle operators have little flexibility to determine how the objectives underlying these regulations are to be met. If an operator can find a safer vehicle design that leads to less congestion or less road wear, the design can only be used if it also meets the fixed prescriptive regulations.
- In between these two extremes are ‘performance standards’ and ‘performance-based prescriptive regulations’, both of which are examples of results-oriented forms of regulation. Performance standards are specified in a more precise and measurable manner than principle-based regulations, but provide greater flexibility in how to meet the requirements than prescriptive regulations.
- Performance-based prescriptive regulations are prescriptive regulations based on performance analyses. Under this approach, specific criteria for performance are developed, as they are for Performance Standards. Prescriptive regulations that deliver the same performance are then established. However, even when prescriptive regulations are based on performance standards, they may be sub-optimal because they do not allow for innovative designs and equipment that might allow a vehicle to stay within the same performance envelope even if the prescriptive limits were exceeded.

The introduction of better regulation is expected to:

- encourage innovation;
- provide a better match between vehicles and roads;
- increase regulatory transparency by providing a more consistent and more rational regulatory approach;
- improve performance (by providing better controls on safety and infrastructure wear); and
- improve compliance.

## **CURRENT REGULATORY APPROACHES**

Current approaches for regulating vehicle weights and dimensions to promote safety and infrastructure protection vary widely among OECD member countries. A survey was developed for the OECD report and sent to each member country to obtain specific information about current regulatory practices.

All responding countries rely primarily on prescriptive standards for regulations of vehicle weight, height, width, length, trailer length, axle spacings, axle loads, and other characteristics related to vehicle safety and infrastructure preservation. The purpose of these regulations is to ensure that motor carriers use equipment that is safe and does not cause unacceptable damage to the infrastructure or disruption to traffic operations. The four European countries seek EU-based consistency for most weight and dimension standards. However, it was clear from a number of the responses to the survey that in some countries the reasons for the prescriptive rules applied are not always broadly understood. Similarly, the outcomes they seek to achieve are not always known. This knowledge may exist among those most closely concerned with vehicle performance and its regulation, but may not be understood more widely.

### **Pavement and bridge protection**

The vehicle characteristics currently regulated to limit pavement and bridge loadings are gross vehicle mass, axle group mass, suspension performance, axle group mass based on suspension type, axle group mass based on axle spacing, tyre configuration, and tyre pressure. All countries regulate gross mass and axle group mass and many countries regulate most of the other characteristics affecting pavement and bridge loadings.

Considerable research has been conducted in recent years on vehicle-pavement interaction. This research has demonstrated the impacts of dynamic loads on both pavement and bridge performance – static measures of gross mass and axle mass do not capture these dynamic forces. Some countries are moving to reflect the importance of dynamic loads in their regulations, largely through prescriptive requirements that have a stronger performance basis.

### **Vehicle handling, stability, and control**

Another important purpose of regulating vehicle weights and dimensions is to assure that vehicles are stable and that they will handle safely on the highway. Vehicle characteristics included in the survey that are associated with vehicle handling, stability, and control include height, width, load distribution, and the type of trailer connection. All countries regulate vehicle height and length while two-thirds regulate load distribution. However, none of these characteristics is a direct measure of vehicle stability and control. There

are a limited number of examples of countries moving to use direct performance measurement to control these factors.

### **Compatibility with highway system**

The last group of vehicle characteristics that are regulated by some or all OECD countries are ones intended to assure that vehicles are compatible with the highways on which they will operate. Those characteristics include vehicle length, width, height, trailer length, rear overhang, turning circle, kingpin-to-rear axle distance, number of trailers, and gross mass based on engine horsepower. Most of these characteristics are regulated by a majority of OECD countries.

Most of these dimensional limits are intended to assure that a vehicle is able to safely negotiate curves and turns at interchanges/intersections without encroaching on shoulders or opposing travel lanes. The correlation between the vehicle characteristic being regulated and the desired outcome varies widely across these characteristics. Vehicle length would have a significant impact on this measure, but length is regulated for other purposes as well including allowing acceptable sight distances for passing on two-lane highways. Other vehicle characteristics may have an equally significant impact on a vehicle's ability to negotiate curves and intersection turns. Turning circle is a true performance measure and has the greatest correlation with a vehicle's ability to negotiate curves and intersection turns. Other performance measures that have been used by several countries in evaluating applications for special permits, and which were included in the survey, are low and high-speed offtracking.

### **Exemptions**

All responding countries grant exemptions from routine weight and dimension regulations, especially for indivisible loads. Practices for granting these exemptions vary from country to country and also depend on the weights and dimensions of the vehicle the carrier proposes to use. Australia, Canada, and New Zealand, the three countries that have gone furthest to date in implementing performance-based regulations, rely the most on vehicle performance attributes in making decisions concerning exemptions from general weight and dimension limits. Reviews in other countries also consider vehicle performance characteristics, some quite extensively, but generally in a less systematic way than Australia, Canada, and New Zealand.

### **Standards review**

Only the United States, Australia, and New Zealand have reviewed regulations on vehicle mass, dimension, and configuration within the last five years. Each country considered a broad range of potential policy issues including vehicle stability and control properties, the economics of changes in vehicle weights and dimensions, and potential infrastructure costs associated with changes in weights and dimensions.

Three nations, New Zealand, Australia, and Canada already have made some progress toward implementing performance standards. New Zealand has a static roll threshold (SRT) standard explicitly in its regulation and uses several other performance standards in setting prescriptive standards and in evaluating exemptions.

Australia also has done extensive research in these areas, much of it in cooperation with New Zealand. Although use of performance-based standards has been limited to date, Australia expects rely heavily on such standards in the near future. They expect this to improve safety performance, reduce wear and tear on pavements and bridges, increase vehicle productivity, provide more flexibility in vehicle design to comply with regulations, lead to the introduction of new vehicle designs and technologies that will further improve safety and productivity.

Canada has used a variety of performance measures<sup>1</sup>, but has not formally adopted such measures for general regulation of weights and dimensions. Canada, the United States, and Mexico have considered the feasibility of using vehicle performance criteria in connection with any efforts to harmonize weights and dimension regulations in North America under the North American Free Trade Agreement.

---

<sup>1</sup> Examples of the performance measures used in Canada in assessing exemptions from weights and dimensions limits include high speed, low speed and transient high-speed off-tracking, static roll threshold, load transfer ratio, braking efficiency, friction demand, rearward amplification, and swing-out.

## USES OF PERFORMANCE STANDARDS

### Alternative regulatory approaches

The OECD report lists four key uses of performance measures and standards, noting they can be used for a variety of purposes:

- comparing the performance of different vehicles;
- helping to ensure that new vehicle designs or concepts will perform appropriately;
- developing safety or infrastructure wear counter measures; or
- as regulatory requirements within a regulatory framework.

The use of performance standards for heavy vehicles in the latter manner forms the emphasis of the OECD report. The report identifies a range of options for how performance standards can be applied in a regulatory framework.

They are:

- using assessments of vehicle performance in comparison to the performance standards to develop and refine prescriptive regulations (underlying basis for prescriptive regulations);
- using assessments of vehicle performance in comparison to the performance standards as the criteria for considering applications for vehicles to operate under exemptions outside the normal regulatory requirements (exemptions approach);
- as the underpinning of a results-based system of performance regulation, replacing existing prescriptive rules (holistic approach);
- a combination of the first two approaches (hybrid approach); and
- as the basis for determining access requirements and network standards for different parts of the road network (road network approach).

The OECD report found that in determining the appropriate approach to regulation, different circumstances may warrant a different emphasis.

It suggests that a range of questions should be considered:

- Are current prescriptive limits on heavy vehicle mass and dimensions credible and sufficient for the future?
- Do they constrain innovation and productivity?
- Do current prescriptive rules provide adequate certainty that vehicles operate safely and do not cause undue wear to road infrastructure?
- Are the risks to road safety and to damage to infrastructure incorporated within the provisions for compliance and enforcement?
- Does the regulatory system facilitate the shift to 'smarter' compliance and enforcement systems that respond to risks and are more easily communicated?
- Is it practicable to determine a joint research effort?

Whether the solution is to introduce performance based regulation direct or to use it to improve prescriptive regulation, a more explicit specification of performance criteria, measures and thresholds (or standards) is fundamental to each alternative regulatory system. The OECD report suggests a set of criteria that can be applied to assist in determining whether the regulatory approach is appropriate or can be further improved. These criteria are outlined in the box below.

Whilst improvements to the regulatory system must be appropriate for the particular circumstances, in all cases these require the specification of performance measures and thresholds (standards) and a shift to 'smarter' compliance and enforcement systems.

**Performance Standards**

1. Performance standards for road safety, protection of infrastructure (pavements and bridges) can be specified and measured, and risks quantified (including computer simulation and field tests).

**Mutual Recognition**

2. Procedures and guidelines can be applied consistently to enable mutual recognition across multiple jurisdictions (eg guidelines for vehicle assessment, classification of roads, enforcement practices).

**Utility of Roads**

3. The freight transport task and vehicle performance can be related to variations in road and traffic conditions and parts of the network, including provisions for general access and regional or route access. Road safety risk and levels of service can be specified for each road classification.

**Effective Compliance**

4. A cost effective compliance and enforcement system is available, including compliance assurance and audit schemes, linked to the body of transport law, including chain of responsibility provisions and links between risk-based offences and sanctions and penalties.

**Accessible**

5. The regulation is accessible by the full range of vehicle and parts designers and manufacturers and large and small operators.

**International**

6. The regulatory regime accommodates international needs and opportunities, relating to the 'seamless' freight task, vehicle design and manufacture and research capacity.

**Communications**

7. The regulations are easily communicated and supported by education and training.

**Implementation**

8. Provision is made for existing non-complying vehicles.

**Net Community Benefits**

9. The regulatory alternative is supported by an evaluation of the net benefits to the community, demonstrating the economic, social and environmental benefits.

Source: OECD 2004.

**Compliance arrangements**

Regardless of which approach to regulation is adopted, improved results can be achieved by moving towards an outcomes-oriented, risk-based approach to compliance and enforcement. Under such a system, the compliance arrangements might be described as performance-based, as much as the regulations for which compliance is sought.

This might comprise<sup>2</sup>:

- completion of a risk assessment;
- intensive compliance effort (for example, constant electronic monitoring) required for high risk factors and less intensive (for example, road side detection) for low risk factors;
- shifting of responsibility for monitoring and demonstrating compliance to those responsible for outcomes;
- applying responsibility for compliance across the whole chain of decisions that leads to the compliance or non-compliance results. That is extending the chain of responsibility beyond the vehicle's driver to all others involved in deciding how it is operated. This might include packers, loaders, dispatchers, the vehicle owner, manufacturers, purchasers of freight services and so on. This approach can ensure that the burden of compliance and penalties for non-compliance falls where there is greatest potential to achieve the results sought;
- establishing a hierarchy of penalties and sanctions that enable the responses to non-compliance to match the offence. More serious offences should attract a higher penalty, and more deliberate or persistent non-compliant behaviour should attract more severe penalties and sanctions.

There is considerable concern about how compliance with performance standards can be achieved when it is not possible to measure performance against these standards in the field. The work being undertaken in Australia has identified approaches to overcome these difficulties, which rely on documenting in-field

---

<sup>2</sup> NRTC 2000a, Jaguar Consulting 2003.

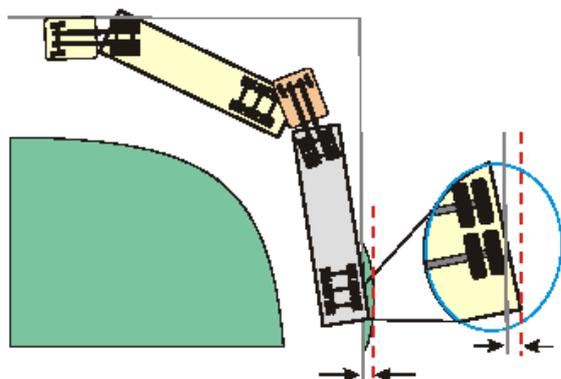
requirements that guarantee the standards are met and smarter communications between regulators, enforcement officers and regulatees.

## EXAMPLES OF PERFORMANCE STANDARDS

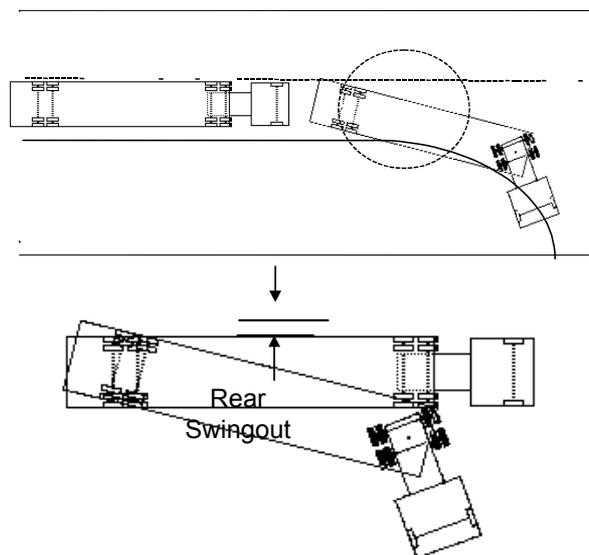
### For safety outcomes

Both Canada and Australia have developed a range of performance measures designed to address safety outcomes. Examples from these two countries are presented in the OECD report, illustrating how different countries have developed different ways of measuring the same aspect of performance. They have then applied the results in different ways: one as a means of directly specifying the performance required and the other as a means of ensuring the prescriptive rules are soundly based.

One example of the different approach adopted is rear swing. Both countries aim to ensure that the rear corner of a trailer does not swing out so far that it crosses the centre line into the adjacent lane of traffic as shown in Figure 2. A similar approach was considered in 1999 under the North American Free Trade Agreement.



Source: ARTSA 2003



Source: OECD 2004

Figure 2. Canadian and Australian approaches to controlling rear swing.

For typical Canadian highways used by trucks up to 2.6 metres wide, the maximum acceptable swing out would be about 0.46 m. To ensure that this limit is not exceeded for even the longest allowable trailer (16.2 m), the Canadian national standards restrict the effective rear overhang to no more than 35% of the wheelbase of the trailer. In Australia, a similar prescriptive control is being replaced by a performance standard that limits the amount of rear swing (as shown on the left side of Figure 2) to no more than 0.3m, 0.35m or 0.5m, depending on what type of road is used.

So, while both countries use the same measure of performance to assess what is appropriate behaviour, different thresholds are applied to determine what is safe for the local conditions. Different approaches to ensuring vehicles are able to meet these thresholds are then applied, one based directly on performance standards and the other on derived prescriptive rules. In this instance, the measure is defined similarly in both countries. In other instances, the same concept is measured in different ways. Details of how performance is calculated against the measure may also differ. As a result, it may not be possible to directly compare performance outcomes across countries, and testing undertaken in one place may not be accepted as proof of performance in another.

While it is appropriate for performance thresholds to vary depending on local conditions, and for different countries to take different approaches to applying performance measurement information, lack of consistency in performance measures used and methodologies for calculating performance against these measures are problematic.

- It is difficult for data on performance outcomes to be pooled across international borders and compared with crash records;
- Vehicle manufacturers may be required to repeat testing in order to match different measurement requirements, leading to additional costs and complexities in supplying heavy vehicles in a global manufacturing market; and
- Efforts to define performance measures and measurement methodologies are duplicated unnecessarily.

## CONCLUSIONS

Consideration of performance standards is consistent with international moves in other economic sectors, supported through the OECD processes, to introduce regulatory reforms. However, information on vehicle performance and its link to safety and infrastructure outcomes needs to be pooled internationally if significant progress is to be made. Additionally, heavy vehicles are produced in a global international market, and no single country is able to shift the principles of design used in vehicle production independently. Pressures for harmonisation are consequently high, and international collaboration and agreement on performance criteria, in particular how performance is measured and tested, would provide much greater opportunities than can be achieved by individual countries.

## REFERENCES

1. ARTSA (2003), PBS Explained: Performance Based Standards for Road Transport Vehicles, Issue 1 September 2003, Australian Road Transport Suppliers Association, Melbourne. [http://www.artsa.com.au/PBS\\_Explained\\_Sept\\_03.pdf](http://www.artsa.com.au/PBS_Explained_Sept_03.pdf)
2. Black J, (2001), 'Managing Discretion', proceedings of the Australian Law Reform Commission Conference, Penalties: Policy, Principles and Practice in Government Regulation, Dockside, Cockle Bay Darling Harbour, Sydney, June 7 2001.
3. Kulakowski B (2003), 'Performance Based Standards: The Time Has Come', Proceedings of Performance Based Standards International Seminar, NRTC, Melbourne, Feb 10-12, 2003, <http://www.ntc.gov.au/FileView.aspx?page=A02303405400250020> .
4. Borbely, C.L., Gilks, G. and Pearson, J. (2000). Challenges to using performance criteria as a basis for vehicle weight and dimension regulations. Proceedings of the 6<sup>th</sup> International Symposium on Heavy Vehicle Weights and Dimensions, Saskatoon, Canada, June 18-22, 2000.
5. Drahos P and Braithwaite J, (2000), Global Business Regulation, Cambridge, Cambridge University Press, pp 476-477.
6. Edgar, J. (1995). Regulating Heavy Vehicle Safety in New Zealand using Performance Based Standards, Road Transport Technology-4, UMTRI, Ann Arbor, MI, USA.
7. NRTC (2000b) Specification of Performance Based Standards and Performance of the Heavy Vehicle Fleet, Performance Based Standards-NRTC Austroads Project A3 and A4, Discussion Paper, prepared by ARRB Transport Research, Pearsons Transport Resource Centre, Phillips Fox, Economic Associates, Woodrooffe & Associates, Transport Engineering New Zealand, August.
8. NRTC (2001), Performance-Based Standards: Policy Framework for Heavy Vehicle Regulation Regulatory Impact Statement, NRTC, Melbourne.
9. NRTC (2002). Performance Characteristics Of The Australian Heavy Vehicle Fleet, Working Paper, Available at <http://www.nrtc.gov.au>
10. NRTC (2003), Performance-Based Standards: Regulatory and Compliance Processes Discussion Paper, NRTC, Melbourne.
11. NRTC (2003b), Performance-Based Standards: Phase A Standards and Measures Regulatory Impact Statement, prepared by Economic Associates P/L, Pearsons Transport Resource Centre P/L, RT Dynamics P/L, Project Managed by: ARRB Transport Research Ltd, NRTC, Melbourne.
12. OECD, (2004), Performance Standards and Heavy Vehicle Regulation, OECD, Paris, forthcoming.
13. OECD, (2000), Reducing the Risk of Policy Failure: Challenges for Regulatory Compliance, OECD, Paris.
14. OECD, (2004), Performance-Based Standards for the Road Sector, OECD IM4 Working Group Consultation Draft, OECD, Paris, forthcoming.
15. Parker C, (2000), 'Reinventing Regulation within the Corporation: Compliance-Oriented Regulatory Innovation', Administration and Society, 2000:32:5:529-565.