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**HIGH CAPACITY TRANSPORTS (HCT) IN SWEDEN AND AUSTRALIA –  
EXPERIENCES AND ROAD MAP TO THE FUTURE**

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**Abstract**

The freight transport task is growing rapidly and it is not possible to extend the infrastructure to meet that demand, particularly in scarcely and unevenly populated countries with large raw material sectors. Simultaneously there is an increasing pressure to lower the CO<sub>2</sub> emissions and to improve road safety. This calls for much more intelligent utilisation of both infrastructure and vehicles, based on the advancement of information, communication and satellite based position technology.

This paper is about a platform for collaboration between Sweden and Australia for joint R&D and technology transfer from Australia to deploy longer and heavier vehicles on parts of the Swedish road network. Special attention is given to regulatory reforms, PBS (Performance Based Standard), the IAP (Intelligent Access Program) for managing access, monitoring compliance, acceptance by public, politicians and industry, and a call for accelerating international standard setting and deployment.

**Key words:** Heavy Vehicles, Freight Transport, CO<sub>2</sub> reduction, Productivity, Safety, Performance Based Standard, Intelligent Transport Systems, Intelligent Access Program, Compliance Monitoring, Transport Policy.

## **1. Introduction**

The freight transport task is growing rapidly in most regions and it is seldom possible to extend the infrastructure to meet that demand. This is particularly true in scarcely and unevenly populated countries with large raw material sectors as Australia, New Zealand, Sweden, Finland, Canada and Brazil. Simultaneously, there is an increasing pressure to lower the Green House Gas emissions from the transport sector and to further improve safety, not least from road transport. This calls for much more efficient utilisation and management of both infrastructure and vehicles for of all modes of transport. Fortunately, the rapid advancement of ICT (Information and Communication Technologies) and satellite based position technology offers great and untapped opportunities. IVUs (In Vehicle Units) and transponders have since long been used in air, train and sea transport for access, safety and traffic management while until now to a very limited extent in road transport.

The Swedish Government follows the 4-stage principle (Swedish Road Administration 2004), which means that the following 4 stages are thoroughly investigated for each proposed infrastructure investment; 1. Re-think if it is possible to manage demand instead; 2. Optimize capacity utilization; 3. Re-construct existing infrastructure; 4. Build new infrastructure. In this paper, the focus is on 2, but both 1 and 3 will be enhanced with the new information and incentives introduced by the HCT programme.

Further the Government (Regeringen 2009) has set the goal to reduce CO<sub>2</sub> emissions by 40 per cent by 2020 and 80 per cent by 2050 compared to the 1990 level, and part of that is that the vehicle fleet should be independent of fossil fuel by 2030. In the Swedish Transport Administration's capacity investigation from April 2012,(Trafikverket 2012), it is foreseen that freight transport is going to double from 2006 to 2050. It does not seem possible to invest in the new infrastructure needed, therefore the focus has to be to increase the efficiency of the present transport system considerably, to meet the future demands. The report suggests a number of possible measures, for example: Trimming measures in the road system; by increasing the capacity in the existing network and hereby maximizing efficiency; and increasing road carrying capacity. The package of measures regarding freight includes technical development of vehicles in order to increase the load volume per vehicle and lower the energy consumption per transported tonne-km.

Despite their geographic differences, Australia and Sweden have some commonalities in the road transport sector. Both Australia and Sweden have large mining and forest industries with low value goods and operations and plants far away from their markets and have therefore special need for efficient freight transport with high productivity and low cost for all modes involved. Therefore both countries allow comparatively longer and heavier truck combinations for general access – now around 25 meters and 60 tonnes, while the rest of Europe in general only allow 18.75 meters and 40 tonnes. However, Australia has in recent years implemented several regulatory reforms in order to step by step accept truck combinations with even higher capacity, under three conditions:

1. they are only allowed on certain routes where pavements, bridges and road designs can handle the increased weight,

2. the move beyond traditional vehicle combinations, which has been promoted through the introduction of Performance Based Standards (PBS<sup>[1]</sup>) – advancing higher productivity, safety and environmental outcomes together,
3. the management of access and compliance for certain applications of 1 and 2 (above) is monitored through the Intelligent Access Program (IAP), which consists of a certified satellite positioning system utilising private telematics providers, reporting any non-compliance to the road authorities for their consideration and corrective action.

In order to open up part of the road network to such high capacity vehicles Sweden has to reform its road transport regulations in a similar way as Australia has already started to do. However, the situation in Sweden and Australia differs in many respects that make it impossible just to copy the Australian reforms. Hence, a Research and Innovation programme has been launched in Sweden, to which Australia is affiliated in order to prepare for the implementation of High Capacity Transports (HCT), enabled with the IAP and PBS in Sweden. Within the EU, Sweden has most advantages of opening up part of its road network to HCT and will therefore probably be a forerunner to the rest of EU.

## **2. Background – work until now**

In the late 1990s, Australia began allowing Higher Mass Limits (HML) vehicles fitted with 'road-friendly' suspensions access to certain parts of the road network. In 2005, Transport Certification Australia (TCA) was established to develop and implement the IAP to provide a means of accurately monitoring vehicle compliance, providing a new set of opportunities for road authorities and the road transport industry to optimise heavy vehicle operations in terms of safety, efficiency and productivity.

In 2007 Australia introduced the Performance Based Standards (PBS) framework. The scheme offers the heavy vehicle industry the potential to achieve higher productivity and safety through innovative truck and bus design. Trucks and buses are tested against 16 stringent safety standards and four infrastructure standards to ensure that they can stop, turn and travel safely.

In Sweden the Forest Research Agency in 2006 initiated a project to reduce the number of timber transports and associated diesel consumption and emissions by advancement of technology and logistics, as well as longer vehicles with higher gross weights. Experiences of High Capacity Transport in both the scientific and the more practically oriented literature were reviewed, which indicated that no negative effects regarding road wear and road safety had been observed when shifting to HCT vehicles, see af Wåhlberg (2008).

Explorative interviews with most of the stakeholders and persons involved in the HCT reforms in Australia were performed in 2010 by Sten Wandel from Lund University, and in 2011 a small group of representatives from the most important stakeholders in Sweden was formed that identified detailed research questions. These were communicated with the agencies in Australia responsible for their HCT reforms and two representatives from TCA attended workshops in Denmark and Sweden with major stakeholders in July 2011. A

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<sup>[1]</sup>PBS ensures that the vehicle is safe on the road from a technical perspective. A certified PBS vehicle needs to be PBS compliant, which includes fulfilling a number of different technical issues.

Research and Innovation programme to prepare the introduction of HCT in Sweden was initiated by the Swedish Transport Administration in 2011. It will be operated by CLOSER, the new Swedish arena for transport efficiency, focusing on research, development and innovation at an international level. CLOSER is part of the creative environment at Lindholmen Science Park, Gothenburg. Within this mobilization in logistics and transport; academia, business and society will work together to strengthen the whole innovation chain from research and demonstration to the deployment of commercially viable products and services. In November-December 2011 a delegation of seven persons from Sweden visited Australia and met key stakeholders involved in the IAP and PBS, in order to get a balanced view and to look for the possibilities to transfer technology to Sweden and Europe.

### **3. Previous Research Results and Experiences regarding High Capacity Road Vehicles**

#### **3.1 The OECD study: Moving Freight with Better Trucks**

The purpose of the report Moving Freight with Better Trucks, Research Report, Summary Document (OECD/ITF 2010) is to identify potential improvements in terms of more effective safety and environmental regulation for trucks, backed by better systems of enforcement, and to identify opportunities for greater efficiency and higher productivity. The report offers proposals on how regulatory frameworks can be modified to promote innovation that can improve safety and environmental outcomes, protect infrastructure assets and drive efficiency. This includes the use of higher capacity vehicles in appropriate circumstances, but involves better regulation for all vehicles. The report does not propose specific interventions, but offers a series of options for governments to respond to the challenge of rapidly increasing demand for road freight. The key messages of the study were:

1. The freight transport task is growing rapidly in most regions and requires effective utilisation of all modes of transport
2. The safety and environmental impacts of road haulage require regulatory intervention for optimal outcomes
3. Compliance can be improved greatly through legislation that assigns responsibility
4. Compliance regimes can be enhanced by exploiting technological innovations
5. A performance based approach to regulation offers the potential to meet community objectives for road freight transport more fully
6. Many higher capacity vehicles have equivalent or even better intrinsic safety characteristics in some respects than most common workhorse trucks
7. Truck crash energies mean safety regulation must pay particular attention to managing truck speeds and driver alertness and impairment
8. Further research is needed into other safety aspects of trucks
9. Higher capacity vehicles have potential to improve fuel efficiency and reduce emissions
10. Higher capacity vehicles can result in fewer vehicle-kilometres travelled
11. The lower unit costs offered by higher productivity trucks could result in increased overall demand for road freight transport and a transfer of freight from other modes
12. Road pricing systems can be developed to manage use of the transport network more efficiently
13. The capacity of the road network is not uniform
14. Road infrastructure and trucks need to be developed in concert
15. Further research and data is needed for solid, evidence-based decision making

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16. Significant opportunities for improvement of the regulation of heavy trucks have been identified

### **3.2 Vehicles**

The following potential driving forces and positive effects by shifting to HCT road vehicles were identified during the literature study and the interviews:

- classify the different parts of the road network according to their capabilities to carry vehicles of different lengths and weight and offer differentiated access accordingly
- higher productivity that makes it possible to maintain a competitive base industry even if CO<sub>2</sub> taxes increase,
- less energy usage and greenhouse gas emissions,
- less traffic and congestion since fewer vehicles are needed,
- less congestion since peak hour could be avoided and fewer vehicles,
- less need for investment in new infrastructure since less traffic growth
- less cost for maintenance due to less wear on the roads for the same transport work (tonne-km) with properly designed vehicle combinations,
- less accidents due to fewer vehicles and equally safe or safer vehicles than the commonly used “work horses” around the world
- incentives to vehicle manufacturers, operators and cargo owners to match the vehicles to their tasks

During the last three years, three different HCT trucks for transport of timber have been tested. Löfroth (2012). The project is called ETT-one pile more- a modular system for forest transport. The ETT vehicle is a 30 m Truck–Dolly–B-semitrailer–Semitrailer combination with a maximum gross combination weight of 90 tonnes of which maximum load of 66.1 tonnes. Costs and CO<sub>2</sub> emissions were reduced by 20 per cent compared to a conventional Swedish 60 tonne truck used in forestry. No negative impact on road safety was observed and road wear was not increased as the weight was distributed over more axles. The distance covered by the vehicle was 900,000 km and the transported volume measured 160,000 m<sup>3</sup>. The studied vehicle was run on a 170-km route from a terminal in the north down to one of SCA<sup>1</sup>'s large sawmills in Piteå.

The other two are within the limit of 25.25 m but 74 tonnes compared to the 60 tonnes allowed for general access, which was made possible by using 9 axels compared to 7 for the common timber truck. For these the cost and emissions were reduced by about 10 per cent.

The tests will continue with more vehicles in several different regions in Sweden with different traffic and driving conditions and also products. In particular traffic safety will be studied, in addition to the thorough studies already being made on overtaking.

In March 2012 a fourth HCT test vehicle, called DUO2 started its 3 year testing period. It is a vehicle combination with a tractor, one dolly and two semitrailers, which are 13.6 m each,

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<sup>1</sup> SCA is one of the world's largest companies in personal care products, the world's third-largest supplier of tissue, Europe's second-largest packaging company and one of Europe's most profitable producers of forest products. [www.sca.com](http://www.sca.com)

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resulting in a 32.5 meter/11 axels/80 tonnes gross/32 tonnes net/200 m<sup>3</sup>. It transports general cargo on the motorway between the two major cities Gothenburg and Malmö only at night (7pm and 6am.). The first test results indicate that CO<sub>2</sub> was reduced 27 per cent and the load capacity increased with 100 per cent compared to traditional EU-vehicles consisting of tractor and one semitrailer. Compared to a standard Swedish long haul truck the DUO2 vehicle combination carries 33 per cent more load, results in 16 per cent fuel and CO<sub>2</sub>-reduction. At the rail or sea terminal the two trailers can be transferred to a train or a ship for transport to their international destinations.

### **3.3 Performance Based Standard (PBS)**

PBS ensures that the vehicle is safe on the road from a technical and performance perspective. A certified PBS vehicle needs to be PBS compliant, which includes fulfilling a number of different technical issues.

The following potential driving forces and positive effects by introducing PBS were identified during the literature study and the interviews:

- better matching of individual vehicles to the differing capabilities of the road network
- allows road authorities and local governments to grant tailored access arrangements
- give transport operators flexible access to the road network to suit their specific needs
- less cost for maintenance due to less wear on the roads for the same transport work (tonne-km)
- less accidents, according to OECD research (OECD/ITF 2010), HCT vehicles are safer than the commonly used “work horses” around the world and
- incentives to vehicle manufacturers, operators and cargo owners to be more innovative

### **3.4 Regulatory reforms**

The European legislation as regards road vehicles is based on the Directive 96/53<sup>2</sup>, which has been undergoing discussions of amendments throughout a number of years. The most recent interpretation regards the authorisation of the European Modular System (EMS) for cross-border transports between 2 countries on mutual agreement under certain circumstances. Amendments to the regulation as regards improvement of cabin design and aerodynamics of the truck are foreseen proposed by the EC at the end of 2012 (European Commission 2012).

Sweden and Finland have had 24 m and 25.25 m vehicles for many years, and followed the legislation as regards EMS since their entry to the EU in 1996. A few other countries have trials for EMS. Denmark has had a trial since November 2008 and this has been extended to 2016. The first years have shown positive effects of the trial, (The Danish Road Directorate 2011), which mainly includes the motorway network and adjacent roads. From the evaluation the following findings have been made:

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<sup>2</sup> COUNCIL DIRECTIVE 96/53/EC of 25 July 1996 laying down for certain road vehicles circulating within the Community the maximum authorized dimensions in national and international traffic and the maximum authorized weights in international traffic, (OJ L 235, 17.9.1996, p. 59)

- At the end of 2010, 408 EMS vehicles were registered in Denmark, and primarily the Type 3, link trailers is used (267 registered).
- In 2010 the EMS vehicles carried out about 26 million km of traffic performance, equivalent to 1.2 per cent of the total traffic performance by trucks in Denmark.
- The EMS transport performance was 0.4 billion tonne-km, equivalent to 3.6 per cent of the national transport performance in 2010.
- EMS-vehicles are mainly used for transporting general cargo, which accounts for about 2/3 of the transported freight volume. For ordinary trucks, general cargo only constitutes some 10 per cent of the goods in 2010.
- During the 2-year evaluation period, only 4 accidents involving EMS-vehicles were registered. If EMS vehicles had the same traffic accident frequency as ordinary trucks, 16 accidents would have taken place, compared to the 4 actual ones.
- The introduction of EMS vehicles does not affect the road wear considerably.

In the Netherlands, an EMS trial has been on-going since 2000, (Åkerman, I., Jonsson R. (2007), also with success. The following areas have been closely monitored by the Dutch authorities; traffic safety effects, economic and environmental consequences. Results from the trials indicated that, based on the preconditions used in the trials, 8,000, corresponding to 7 per cent of all regular heavy freight vehicles could be replaced by 6,000 LHV's. This would have the following effects, annually:

- 1.8 per cent reduced transports costs, corresponding to 216 million Euros.
- 4 fewer fatalities and 13 fewer injuries, corresponding to 9 million Euros.
- Positive effects on the environment, corresponding to 24 million Euros.
- 0.7 per cent less congestion, corresponding to 10 million Euros.
- 0.05 per cent increased road freight traffic, corresponding to 266,000 tonnes, and similar
- decrease of inland waterway by 0.2 per cent and rail transports by 1.4 per cent

Following the successful 10 years of EMS trial, the Dutch Minister decided to make the EMS permanent in The Netherlands.

Existing rules allow 25, 25 m and 60 tonnes vehicles in Sweden, based on Swedish legislation and the EU directive 96/53EC. This directive makes it also possible to set up trials with even longer and heavier vehicles.

The fulfilled and on-going pilots, and the new HCT-programme aim to investigate whether it is possible to allow longer and heavier vehicles within the existing regulatory framework or not. A number of issues and questions have to be considered: limitation in the accessibility to the road network including bridges, safety and the acceptance among people in common.

For Sweden and EU the Australian model to establish a regulatory framework based on PBS and telematics opens up quite new possibilities.

It is important for a successful introduction of the HCT concept that authorities and industry in Sweden have a common vision. It is also important to establish alliances with stakeholders in other countries within EU.

### **3.5 Telematics and the IAP**

By implementing IAP the following the following potential driving forces and positive effects were identified: Partly based on (Baring, J. & Koniditsiotis, C. 2010),

- supports an increased range of access concessions to heavy transport operators
- provide road authorities and local governments with greater confidence that HCT vehicles comply with agreed road access conditions
- improves public perceptions concerning the management of heavy vehicle activities
- safer vehicle operations since compliance of PBS and speed regulations are checked 100 per cent of the time
- reducing compliance cost, including on-road enforcement activities
- enabling the development and deployment of other applications of the IAP compliance infrastructure, such as fatigue regulation; increased safety through speed and driving behaviour compliance; real time vehicle mass, including advice to the driver and automatic stop; road charges differentiated for place, time, emissions and mass;
- promotes the development of applications, software and hardware for even more advanced telematics and ITS for both the private and the public sectors.

### **3.6 The Australian experience – advancing regulatory and technical reforms together**

TCA was established by Australian governments to administer the IAP, a national transport reform, which deploys the use of government-endorsed, evidentiary-quality Global Navigational Satellite System (GNSS) to manage the access and compliance of higher capacity heavy vehicles on the road network.

The IAP is a twenty first century technical and regulatory framework, which is being used throughout Australia to enable freight productivity reforms by managing infrastructure management risks, providing governments with the highest levels of assurance that the right truck is on the right road.

While the growing use of GNSS-based systems within the road transport sector is noteworthy for business purposes, it is not sufficient alone to use GNSS-enabled systems without an agreed set of technical, functional and integrity standards being established, or without a sufficient level of quality assurance to provide confidence to regulators and other road users.

It is for this reason that Australian governments established TCA in 2005, to administer a national telematics framework for road transport regulation, which is underpinned by a rigorous certification and auditing programme of in-vehicle and information systems to provide governments with the ability to manage risks through the use of technology confidently.

This combination of public and private benefits is a core feature of the IAP operating model. This is further highlighted through the emergence of a competitive market of certified IAP Service Providers (there are currently five IAP Service Providers available), which provides the road transport sector with a choice of differentiated products and services.

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Despite the differentiation available, all IAP Service Providers offer equivalent levels of evidentiary-quality GNSS to manage access and compliance of heavy vehicles on the road network.

An overview of the key building blocks of the IAP operating model below provides an insight into the defining features that separates the programme from other GNSS-enabled systems:

- the distinct separation of roles and responsibilities between policy makers (regulators) and TCA (as policy taker) ensures that the national telematics platform on which the IAP operates meets regulatory requirements;
- an open, performance-based functional and technical specification that specifies the minimum operating requirements of government;
- strong and transparent privacy protection safeguards, coupled with strong mechanisms to manage the transfer of information;
- automatic reporting of non-compliant events to regulators, including ‘alarms’ that signal possible tampering of in-vehicle systems;
- a national ‘road map’ recognised by governments; and
- national model law that underpins the IAP operating model, and specifies the roles and functions of TCA as the national administrator and outlines the duties and obligations of the parties involved.

These building blocks enable the IAP to be used as a regulatory system, and the information derived from the IAP to be considered evidentiary-quality for compliance management purposes.

Furthermore, in recognising the evidentiary nature of data collected under the IAP, regulators are able to optimise road freight policy outcomes and the adoption of risk-based on-road enforcement programmes, which can reduce the impact of traditional compliance and enforcement activities on the road transport sector, and provide improved dividends to government.

### **3.7 The IAP enables reform to road transport**

The IAP has led to road managers and regulators introducing longer and heavier vehicles onto the Australian road network. This has occurred because of the strong assurances that the IAP provides in ensuring the ‘the right truck is on the right road’.

The headline access reforms, introduced by Australian governments through the use of the IAP, include:

- Higher Mass Limits (HML) – which permits an increase in the payload capacity of up to 13 per cent on existing vehicle types
- Performance Based Standards (PBS) vehicles
- Road Train Modernisation Program – which introduces new types of multi-trailer combinations into Australia
- In addition to Higher Productivity Vehicles, the IAP is being used to manage the access and compliance of mobile cranes in three jurisdictions within Australia.

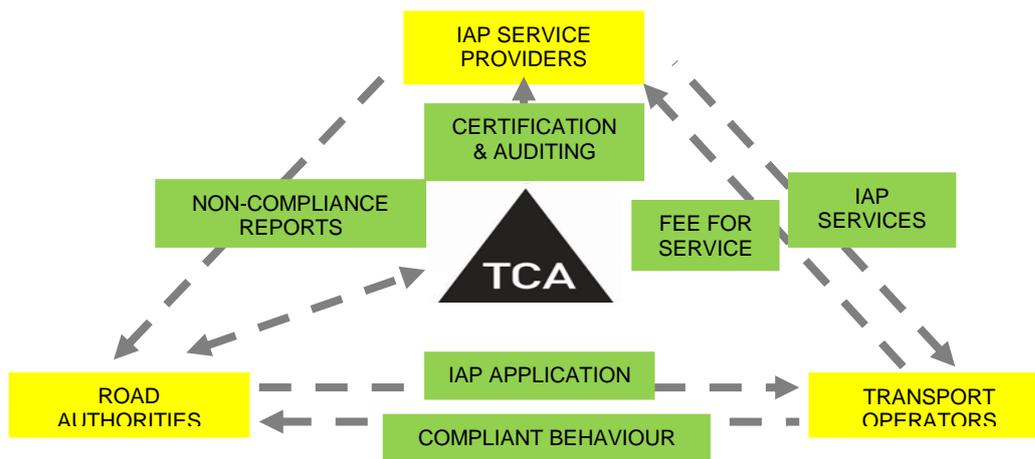


Figure 1: IAP environment

A growing number of transport operators and road owners are benefitting from the increased productivity and assurance provided through the IAP. The IAP environment is described in the figure above. For some of the real-world examples that demonstrate the productivity, efficiency and environmental benefits of IAP, please consult the annex.

#### 4. Tentative Road map for further development of HCT in Australia

##### 4.1 A focus on the economics of corridors

Governments in Australia are now focussing their efforts on the economic benefits of establishing supply-chain based network arrangements. This represents a shift from the broad, network-based approach to higher productivity route approvals, to sub-networks that can support specific industry sectors. Such a focus on ‘the economics of corridors’ provides an opportunity to prioritise future infrastructure upgrades to enable the growth of specific industries, to reflect the broader positioning of government. An industry-based approach to access is contributing to increased demand for the IAP in Australia.

##### 4.2 On-Board Mass

Certified On Board Mass (OBM) systems, integrated with the IAP, promote improved risk management practices by asset managers, and to liberate access arrangements for higher productivity/higher risk vehicles. The availability of integrated OBM systems provides an opportunity to further drive the utilisation of the IAP in Australia.

The use of OBM systems by the Queensland Department of Transport and Main Roads provides a prelude into how asset and access and asset managers can apply differentiated risk management models, which is a direct attribution of the increased assurances over route and mass compliance.

The availability of certified OBM systems provides a renewed opportunity to contribute further to increased productivity, asset management and safety outcomes – beyond what the IAP can deliver alone.

### **4.3 Entry Options Initiative for transport operators**

The Government in New South Wales, Australia, has recently announced plans to work with TCA to assess In Vehicle Units (IVUs) already in use in vehicles by transport operators against the national IAP standard.

The assessment of IVUs will look at:

- Performance and reliability
- Accuracy
- Robustness
- Security and alarms (tamper evidence)
- Data security
- Data compatibility

This provides an opportunity to evaluate the systems already being used by the transport sector against the established, national IAP standards for managing access to regulatory requirements – providing a new ‘entry option’ into the IAP for transport operators who may otherwise be unwilling to replace their IVUs.

The road transport industry continues to be at the forefront of innovation, as well as being early adopters of new technologies. TCA and Australian Governments are committed to working together to deliver positive outcomes for transport operators, road managers and regulators.

### **4.4 Intelligent Speed Compliance (ISC)**

TCA recently introduced a 21st century way of managing heavy vehicle speeding. The new regulatory service, known as *Intelligent Speed Compliance (ISC)*, is now available for use by TCA’s Members, supporting the objectives of the *National Road Safety Strategy 2011 – 2020*. In short, ISC provides a continuous measure of speed, reported on a rolling 30 second average (similar to a continuous point-to-point average), and responds to requests from Governments for this service.

ISC is being provided as part of the National Telematics Framework, which has been adopted by Members to deliver the IAP. For Members with the IAP already in operation, there are no operational or technical development costs associated with ‘turning-on’ ISC. Recent media coverage in Australia surrounding systemic breaches of speed limiting devices in heavy vehicles has again exposed the need to combat speeding and speed limiter tampering in heavy vehicles.

Utilising GNSS to independently measure the speed of vehicles, ISC has the potential to be used as a stand-alone service, or as a secondary line of defence to detect speed limiter malfunctions or tampering. TCA is currently working with Australian Governments on this safety initiative.

### **4.5 Achieving compliance assurance through the IAP**

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The operation and function of the IAP as an evidentiary-quality system is explicitly recognised in national model law in Australia.

This national model law, which forms part of the broader suite of road transport laws for heavy vehicles in Australia, is the first time an Intelligent Transport System (ITS) has been explicitly recognised in law.

The suite of laws under which the IAP legislation is contained introduces Chain of Responsibility (CoR) concept, which means that all parties in the logistics chain – not just the driver and transport operator, but extending to the the consignor, consignee, packer, loader and receiver, as well as the driver and operator – can be held responsible for breaches of road laws and may be legally liable.

These parties must take all reasonable steps to prevent their conduct from causing or contributing to a breach. The concept of CoR was approved unanimously by Australian transport ministers in November 2003, later incorporating the IAP and measures relating to heavy vehicle speed and driver fatigue. Under these suite of laws, there are a range of enforcement powers (or regulatory interventions) that regulators have at their disposal to drive behavioural changes. This extends from providing information and education to assist in the management of compliance, through to administrative sanctions and penalties, through to court imposed sanctions and penalties.

In Australia, it has been observed that consigners and receivers along the supply chain are electing to use transport operator monitored under the IAP as a way for them to show their own commitment to meeting chain of responsibility obligations.

#### **4.6 The emergence of an ‘information rich’ environment**

Data collected by in-vehicle systems generates a new source of information for governments. What the IAP has demonstrated is that a national telematics framework – administered by TCA on behalf of governments – provides regulators with access to components of this information, and/or information at an aggregated level. This has the potential to positively shape the way road managers can deploy its resources in an operational capacity.

This provides a strategic opportunity for national regulators to approach the business of regulation (compliance and enforcement) in a different way – a way that is data rich, and evidence-based, to provide improved levels of transparency that can enable a stronger demonstration of public benefit outcomes.

Aggregated information also provides a new source of information for infrastructure planners and network managers. The potential contribution of information derived from a national telematics platform to broaden the evidence-base that underpins strategic infrastructure investment decisions is already being realised by road authorities.

#### **4.7 The strategic view of telematics in Australia**

Australian Governments continue to respond positively to take advantage technology-based regulatory reforms using in-vehicle technologies to derive improved public outcomes in respect of road transport productivity and efficiency, and improving road safety, including:

- Council of Australian Governments (COAG) Road Reform Plan (which examined alternative pricing mechanisms for road use)
- National Railway Level Crossing Safety Strategy 2010-2020
- National Road Safety Strategy 2011-2020
- National Framework for Intelligent Transport Systems – endorsed by the Standing Council on Transport and Infrastructure (SCOTI) in November 2011

Each of these initiatives has highlighted the importance of making greater use of technological aids to address these challenges. It is critical, however, that this takes place in a coordinated and consistent fashion.

This was also demonstrated in SCOTI's recent paper on 'Policy Framework for Intelligent Transport Systems in Australia', where they looked at the multiple uses and benefits of telematics and ITS, including monitoring speed, location and on-board mass, stating that:

*'Telematics is finding increasing commercial uses, leading to more efficient private commercial freight operations. It can also be used as a regulatory tool, for purposes such as road charging and compliance and enforcement.'*

## **5. Tentative Road map for deploying HCT in Sweden**

Since Sweden's economy and thereby also the freight transport task are growing, rail and water transport are not available everywhere, and the road network has much less capacity bottlenecks compared to rail, strategies for a more rational use the existing road infrastructure is sought for. The implementation of HCT seems promising based on both the international experiences and the results from Swedish tests. It would mean less need for investments in new infrastructure, increased productivity, better competitiveness for vehicle, transport and producing industries, and also less use of energy and therefore lower emissions of CO<sub>2</sub> and other substances. However, before changing the regulations to allow HCT vehicles on certain parts of the road network, more knowledge is needed. So far the following research questions have been identified, (Berndtsson, A. 2012):

- A. Which parts of the road network are HCT suitable? (need to reinforce bridges, roundabouts, maintenance)
- B. Which market niches? (type of goods, feeder to rail and sea, transport service network)
- C. How will the competition between road, railway and waterway transports develop?
- D. Potential for reducing investments, energy use and CO<sub>2</sub> emissions.
- E. Development of regulations for HCT
  - Which parts of laws and regulations in Sweden and EU need to be changed?
  - Permissions to use PBS and for road access
  - Compliance monitoring
  - Process and timeline for these reforms
- F. Acceptance by road users, politicians, industrial and other stakeholders
  - Current perceptions of pros and cons of HCT
  - Who have these perceptions, how do they act, on which arenas?
  - Communications strategies to close the gap between facts and perception
  - Strategies to manage stakeholders

- G. Traffic safety
  - Analyse experiences from other countries
  - Continue studies of incidents, accidents and effects linked to the demonstrations in Sweden
  - Adaption of the vehicles
  - Requirements on the infrastructure
  - Requirements on the driver
- H. Further development of the HCT-vehicles
  - Stability, sweep and hidden angles
  - Steering and braking
  - Vehicle combinations, modularity
  - Aerodynamic
  - Adaption to type of goods, easy to load/unload
- I. Development of logistics concepts within different industrial sectors and types of goods
  - Optimal use of the higher load capacity, fill rate
  - Load units and loading/unloading systems
- J. Establishing demonstrators where A-I can be studies.

In March 2012 the following pre-studies started:

1. Need and benefits of HCT in different industry sectors and types of goods.
2. Use of existing modules in the European module system (EMS) – possibilities and limitations within HCT.
3. Possibilities, benefits and risks by using the IAP within HCT. Was extended to develop a demonstration pilot of IAP.
4. Calculations and measuring the stability of various vehicle combinations. Using same tools as PBS in Australia, in order to develop a process that is acceptable for all parties to be part of the forthcoming reform.

In June 2012 the Swedish Forum for innovation in the transport sector commissioned CLOSER to develop a roadmap for introduction of HCT in Sweden.

### **5.1 IAP demonstration pilot**

It is believed that the acceptance of HCT vehicles and thereby the possibility of a successful and rapid introduction will be enhanced if IAP is deployed simultaneously. IAP might even be a necessary prerequisite for general political acceptance and for last mile access using roads controlled by local governments. Therefore an IAP demonstration pilot will be set up in the fall of 2012. It will monitor the HCT test vehicles for up to 4 years. For deploying IAP in Sweden a multistep approach is suggested where evaluation and revisions are made after each step. A scenario of potential steps is:

1. All processes are done in Australia. The IAP boxes in the Swedish test vehicles send data via mobile Internet to the Australian IAP service provider's server that provides Non Compliance Reports (NCRs) to a simulated Swedish jurisdiction (road authority) server at TCA in Australia.
2. The IAP service provider processes involved are moved to Sweden and the NCRs are transmitted to the simulated Swedish jurisdiction in Australia.

3. Also the jurisdiction processes are moved to Sweden. The purpose is to demonstrate IAP for all types of stakeholders, and to learn how to operate a jurisdiction by cloning the Australian processes. At a later stage the HCT programme will investigate what has to be changed to adapt to Sweden and in the future Sweden and Australia could jointly develop the process and software to store, analyse and screen the NCRs.
4. Introduce automatic declaration of vehicle configuration, electronic on board mass reporting in real time, and possibly also driver support.
5. Simulate the other process at TCA, such as certification and auditing of service providers and IVU manufacturers, installers and maintainers.
6. Close down the demonstration pilot. Let telematics providers in Sweden take over the regulatory compliance monitoring. Move the jurisdiction process server to the proper governmental organisation. Move the other simulated TCA processes to TCS (Transport Compliance Sweden), a possible new Swedish certification authority. By now we have a fully operational IAP system in Sweden under the governance of Transport Compliance Sweden.
7. If and when other nations want to introduce IAP they may proceed in a similar way. At this point in time we have more than 15 years of knowhow from Australia and some years from Sweden, which should speed up the introduction and deployment process in the next nation. Perhaps a European TCE (Transport Compliance Europe) could be set up to become the Certification Authority for all EU nations (jurisdictions) including Sweden to monitor the compliance of specific regulations of nations or even regions.

Please note that the text above is a scenario, not something yet decided upon.

## **6. Mutual platform for collaboration**

As described earlier Australia, a continent with extremely long distances and Sweden, a "long" country from north to south, have much in common: the need for efficient road freight transport and efficient usage of both infrastructure and vehicles.

In Australia a deliberate development towards a more sophisticated and dynamic strategy for usage of very long and heavy vehicles based on HML, IAP and PBS since the late 1990s.

In Sweden we have 25.25 m vehicles as a standard for longer vehicles and also part of the regulations, especially since entering the EU in 1996, where Finland and Sweden were exempted from the EU-regulations for these types of vehicles. During the last few years the forest industry has been looking for possibilities to use even longer and heavier vehicles and the ETT project is an excellent and successful example of this.

The new RDI-programme for High Capacity Transport was initiated in the middle of 2011 based on the good results from the pilots and in order to also look into the existing and possible future regulations in the area.

The contacts between Australia and Sweden during the last year, and the field study trip in Australia in November/December 2011 made by a Swedish expert group, have now resulted in an established platform for collaboration.

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A Memorandum of Understanding will be signed between Transport Certification Australia (TCA) and The Swedish Transport Administration (STA).

In this MoU it is stated that “Collaboration between TCA and STA regarding ‘High Capacity Transports’ (HCT), Intelligent Access Program (IAP) and Performance Based Standards (PBS) will improve possibilities to introduce High Capacity Transports in a systematic way for the benefit of environment and transport efficiency”.

The collaboration platform builds on knowledge exchange, technology transfer and exchanges on experiences in different areas.

TCA and STA have identified a number of issues where Australia and Sweden in collaboration can develop and implement new efficient solutions for the future. Therefore they foresee a strategic, long term partnership between the parties.

## **7. Open invitation for further development**

Australia and Sweden are looking forward to obtaining concrete results from the now established platform for collaboration. TCA and STA will endeavour to consult with each other regularly to identify opportunities for mutual cooperation.

But cooperation and collaboration with other countries and parties on international basis is also important, in order to take the advantages of results from innovation, research and best practice all over the world. We are still in the beginning of a very interesting development with a number of issues to tackle – technical, societal, legal etc. Therefore it is a good strategy to try to learn from each other and from others.

An idea is to propose OECD to set up a new expert group on PBS and the practical use of it and based on the earlier work carried out by the group of international experts representing 15 countries under the aegis of the Joint Transport Research Centre of the Organisation for Economic Co-operation and Development (OECD) and the International Transport Forum.

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ANNEX:

Table: <<>> Some of the real-world examples that demonstrate the productivity, efficiency and environmental benefits of IAP

State	Vehicle/Application	Key Industry Grouping	Organisation Name/s	Productivity benefits	Environmental benefits
New South Wales	<ul style="list-style-type: none"> <li>Quad-axle semi-trailer approved under HML to operate to 55 tonnes Gross Vehicle Mass.</li> </ul>	<ul style="list-style-type: none"> <li>Supply Chain</li> </ul>	<ul style="list-style-type: none"> <li>Fletcher International</li> <li>Exports (rural processor of sheep meat, skins, wool and by-products)</li> </ul>	<ul style="list-style-type: none"> <li>The gross allowable mass on a tri-axle trailer combination is less than the allowable mass on a quad axle combination</li> <li>Because of the density of sheep meat, hides and other by-products Fletchers was able to increase the payload in containers carried on a quad axle semi-trailer and to transport those containers from the rail head at Dubbo.</li> </ul>	<ul style="list-style-type: none"> <li>Payload increase resulting in transport of full 40 foot containers of around 25 per cent.</li> <li>Fewer truck trips for the same freight task</li> <li>Less transport noise</li> </ul>
New South Wales	<ul style="list-style-type: none"> <li>Higher Mass Limits approved to operate at up to 68 tonnes Gross Vehicle Mass</li> </ul>	<ul style="list-style-type: none"> <li>Transport Operator in resource sector</li> </ul>	<ul style="list-style-type: none"> <li>Scott Corporation Limited (SCL)</li> </ul>	<ul style="list-style-type: none"> <li>Payload increase of approximately 2.5 tonnes/12 per cent payload increase.</li> <li>‘Based on 14,000 loads per month, SCL achieve an additional payload of 420,000 tonnes per year. A saving of around 12,500 truck movements a year meaning they need 2-3 fewer trucks for their operation.’ <b>SCL</b></li> <li>‘An additional payload of 420,000 tonnes per year easily covers the cost of being in the IAP. Across our fleet of 40 vehicles, the cost of TCA Type-Approved IVUs was around \$100,000 with an annual operating cost of around \$70,000 for the fleet. Even if we were only earning \$1.00 per additional tonne</li> </ul>	<ul style="list-style-type: none"> <li>Approximately 12 per cent fewer truck trips for the same freight task</li> <li>Reduction in fuel consumption environmental emissions of approximately 12 per cent for the same freight task.</li> </ul>

				we would still be way ahead under the IAP' <b>SCL</b>	
New South Wales	<ul style="list-style-type: none"> <li>Higher Mass Limits approved to operate at up to 68 tonnes Gross Vehicle Mass</li> </ul>	<ul style="list-style-type: none"> <li>Local Government</li> </ul>	<ul style="list-style-type: none"> <li>Penrith City Council</li> </ul>	<ul style="list-style-type: none"> <li>'The IAP provides the Council with a level of compliance assurance that means we are confident that transport operators enrolled in the IAP will comply with conditions to access approved routes,' <b>Penrith City Council</b></li> <li>'As a result, Penrith City Council has approved requests for HML access on a total of twelve routes.' <b>Penrith City Council</b></li> <li>'Access along these routes was only made possible thanks to the IAP' Penrith City Council</li> <li>'IAP provides Council with a sufficient level of compliance assurance consistent with its responsibilities as a road asset manager.' <b>Penrith City Council</b></li> </ul>	<ul style="list-style-type: none"> <li>'Payload increases in the order of 10 per cent to 13 per cent are possible with HML vehicles. This means that significant reductions in fuel consumption, environmental emissions and number of truck trips are possible.' <b>Penrith City Council</b></li> </ul>
New South Wales	<ul style="list-style-type: none"> <li>Higher Mass Limits approved to operate at up to 68 tonnes Gross Vehicle Mass</li> </ul>	<ul style="list-style-type: none"> <li>Port Authority</li> </ul>	<ul style="list-style-type: none"> <li>Port Kembla Port Corporation</li> </ul>	<ul style="list-style-type: none"> <li>'The Intelligent Access Program (IAP) was an important consideration behind the Port Corporation's decision to grant HML access. The IAP provided the Port Corporation with the required level of assurance that transport operators would comply with conditions to access approved HML routes.' <b>Port Kembla Port Corporation</b></li> </ul>	<ul style="list-style-type: none"> <li>'Transport operators gaining HML access under IAP can increase their payload by up to 12 per cent. This is delivering benefits for all road users as well as the broader community because it means</li> </ul>

					fewer truck trips for the same freight task contributing to lower fuel consumption, less environmental emissions and greater productivity for the transport and logistics sectors.’ <b>Port Kembla Port Corporation</b>
Queen s-land	<ul style="list-style-type: none"> <li>• Performance Based Standards 2 B Vehicles (PBS-2B) up to 30m long and carrying up to 79 tonnes Gross Vehicle Mass along the Toowoomba to PoB corridor.</li> <li>• Transport task is typically movement of containerised grain from Toowoomba to the Port of Brisbane for export in two 40 foot containers.</li> </ul>	<ul style="list-style-type: none"> <li>• Transport Operator</li> <li>• Trailer Manufacturers</li> <li>• Port Authority</li> </ul>	<ul style="list-style-type: none"> <li>• Haulmark Trailers</li> <li>• O’Phee Trailers</li> <li>• South East Queensland Haulage</li> <li>• Woods Transport</li> <li>• Port of Brisbane</li> </ul>	<ul style="list-style-type: none"> <li>• Productivity gains of up to 100 per cent, reduction in truck trips by 50 per cent and a saving in fuel use of up to 40 per cent.</li> <li>• Early modelling showed that a transport operator would have needed to make 4,800 trips along the corridor to carry 120,000 tonnes per annum. With a PBS 2B vehicle those trips could be slashed in half.</li> </ul>	<ul style="list-style-type: none"> <li>• A round trip from Toowoomba to the Port of Brisbane is around 260 km, early modelling shows PBS 2B results in a reduction of up to 624,000 truck kilometers, an estimated saving of approximately 230,000 litres of fuel and reduction of greenhouse gas emissions by around 490 tonnes or 40 per cent.</li> <li>• Just 20 PBS 2B vehicles represent a net saving of 4,600,000 litres of</li> </ul>

					fuel and a reduction of 9,800 tonnes of greenhouse gas emissions per year.
Victoria	<ul style="list-style-type: none"> <li>• Higher Productivity Freight Vehicle (HPFV) Trial</li> <li>• The trial allows B-doubles up to 30 metres in length, carrying up to 77.5 tonnes Gross Vehicle Mass, that meet safety and performance standards to travel on certain roads in the Green Triangle region in south western Victoria and on key metropolitan freeways which link the Port of Melbourne with major industrial areas in the west and north of Melbourne</li> </ul>	<ul style="list-style-type: none"> <li>• Transport Operator (Woodchips)</li> </ul>	<ul style="list-style-type: none"> <li>• Noske</li> </ul>	<ul style="list-style-type: none"> <li>• ‘Our innovative HPFVs enable Noske Logistics to achieve a 44 per cent increase in productivity per vehicle when compared to the standard HML B-Double woodchip transport end tipping system. This arises from a 12 per cent increase in payload and faster turnaround times during pick-up and delivery.’ <b>Noske</b></li> <li>• ‘IAP gives our company and our customer greater levels of compliance assurance and has simplified vehicle scheduling.’ <b>Noske</b></li> <li>• ‘The bottom line is that the IAP has helped Noske Logistics to be a more efficient &amp; safer transport operator and better service provider.’ <b>Noske</b></li> </ul>	<ul style="list-style-type: none"> <li>• ‘The installation of the IAP has led to a 12 per cent reduction in truck trips as well as a significant reduction in emissions per tonne-kilometre and significantly higher productivity levels per vehicle and per employee.’ <b>Noske</b></li> </ul>