



Proceedings

11th Annual Conference Stockholm

Congestion Charging in Stockholm and Unexpected Events

29-30 June 2006

Welcome Address from the Vice Mayor of Stockholm - Teres LINDBERG

Teres LINDBERG opened the conference by welcoming everyone to the City of Stockholm and this 11th conference of IMPACTS.

She observed that in Stockholm there will be a General Election and a referendum on congestion charges in September following the vote of confidence the electorate gave 4 years ago to go ahead with a pilot scheme. Stockholm is a growing city (estimated to grow by 150,000 by 2030) and it wants to plan for that growth with a compact city that has a good public transport system. The goal is to create a more urbanised environment. In the last 4 years Stockholm has started construction of 20,000 new apartments. A further 20,000 apartments will be needed. Plans exist for a commuter train tunnel in central Stockholm, new LRT services and a bypass. Some aspects of globalisation had led to a short term approach. In Stockholm the politicians did not want to risk losing perspective. You need a clear vision which reflects people aspirations where lives can develop in a positive way and where there is a collective belief in the future.

It is a pleasure for Stockholm to host this conference where we can exchange experience and faith in the future. We need each other and the opportunity to test ideas with other planners from the world's major cities.

The Stockholm congestion charge was initially criticised, but now it is widely recognised that it not only works well technically, but also has growing support from citizens. Traffic cannot be allowed to continue to grow if we are to realise the dream of the good city.

Welcome Address from the President

Gunnar SÖDERHOLM as President and host city representative welcomed everyone to the 11th Annual conference. We have gathered here representatives from 16 countries from Europe and North America, including new representatives from the Baltic States and Eastern Europe. We are happy to expand Impacts in different ways and extend an invitation to cities to join the network.

Ian JOHNSON from IMPACTS Secretariat reminded delegates that the programme for the conference had been specifically designed not to overload sessions with speakers, but to provide opportunities for greater debate and exchange of experience. He invited delegates to take advantage of the extended breaks for networking.

Copies of all presentations are available for viewing and download from **www.impacts.org**
The following proceedings therefore only provide a brief context of the presentation and concentrate on the debate, question and answers.

Session 1 ***Congestion Charging - the Stockholm Experience***

Keith GARDNER – Chaired the session which included a presentation of the Stockholm Congestion Charging Scheme by:

Birger HÖÖK, Vägverket Swedish road administration on the planning of the congestion charging trial;

Gunnar JOHANSSON, IBM Road User Charging Manager on the technical implementation of the system; and

Gunnar SÖDERHOLM, City of Stockholm on the results so far.

Keith commented that Impacts is a “Family Affair”, an opportunity to network and share ideas. On behalf of everyone he gave a particular thank you to Gunnar and the Stockholm team for organising the conference. The first day is going to be focussed on the Stockholm experience with an opportunity for the congestion charging family to exchange experiences. Whether you are a politician or an administrator you should gain many insights into the benefits and pitfalls of congestion charging.

The presentations were given as a block followed by collective questions.

Birger HÖÖK There are only 3 places in Sweden where tolls are paid, so it is not something citizens are used to, which makes the Stockholm trial very interesting. Many bodies and agencies have been brought together to realize the trial. There is a lot of water around Stockholm so the main transport problems are at the crossing points. There are only 18 connections (entry points) to the central parts of Stockholm, so it has been easy to build a charging system compared to over 220 access points in London. Charges occur on entry and exit. An exception applies to residents of one island who can pass through the system freely within 30 minutes. Charges vary by time of day and are levied for each passage.

Gantries have cameras, lasers and tags. Photos are taken from front and rear of vehicles. About 50% identified by tags, 40% by OCR and 8-10 % by manual readings. The system has to be able to identify foreign plates as these vehicles are exempt. Number plates are also checked against the traffic registry each day to ensure the correct owner is billed. All tax accounts are finalized each day.

Quality assurance of traffic has shown quality is high. Down time is very small – close to zero.

Payment period has been extended from 5 to 14 days. For large fleets operator gets an email invoice each day. 95% paid within 5 days and only 1% had not paid in a month. Enforcement is not a problem with very small numbers to follow up. The call centre has therefore been reduced in size (now only about 1600 calls a day).

Effort was made to educate citizens about the system before it was opened. Media coverage was helpful and the opinion of the system has turned from skepticism to approval when it was immediately seen to be successful in reducing traffic. Vandalism has been minor.

All evaluation reports on the system are available in English from www.stockholmsforsoket.se

Gunnar JOHANSSON, described the IBM role in the Stockholm trial and the day-to-day operation. The system has to identify 350,000 vehicles a day and manage 850,000 photos. We had to distribute about 500,000 transponders and 100,000 payments per day. As a tax the system had to be very secure with high levels of redundancy in the system to manage risk.

All roadside equipment was delivered by Q-Free from Norway. The system is linked with a fiber network to a central server located in Copenhagen. All retail outlets are linked to the server through their own centralized system. A web platform is used to train retailers.

As a vehicle passes an entry point it is detected by lasers. When the front end reaches the second laser beam it will trigger the front end photo and as it moves on the rear end photo is taken. If the vehicle has a transponder this information is also collected. There is OCR software at the roadside. The package of information sent to the central system includes place and time. OCR performance has been especially developed to meet the service level agreement.

The charging process is managed at the end of the day – handling about 1 million accounts.

The whole system is constantly monitored to overcome any technical faults.

What can other cities learn about the costs of implementing such a system? Some kinds of exemption rules might be expensive others may be for free. High service levels will determine cost. Payment rules also affect costs, each type of payment has its own cost and the time period for payments has an affect. Prepayment could have reduced costs for payments. Transponders are most efficient mechanism for identification, but the OCR software is now performing to a high standard, so costs could be reduced.

Gunnar SÖDERHOLM outlined the background to the trial. After the 2002 General Elections it was decided there would be a trial. The trial consists of three parts: improvement in public transport, congestion charge from 3 January 2006 to 31 July 2006, then referendum in September 2006.

The main objective is to reduce congestion and create a better environment. A secondary objective is to reduce traffic on most used routes by 10-15% in peak hours and improve accessibility to city centre. National Government has paid for the trial costs. The main report on the trial is now available, other minor reports will follow in the coming months.

Traffic will be measured in August-October period to monitor both the before and after situations. Figures for the start of the charging trial show an immediate marked reduction in traffic. Seasonal variations in traffic follow the same pattern as in other years, but at much lower levels. The gap between 2005 and 2006 levels has been stable at about a 22% reduction in traffic. There has been a lower reduction in traffic leaving the city (but significant at midday and in the afternoon) than traffic entering. There has been a significant reduction in traffic out of the city in the morning.

More transport infrastructure (eg ring road) is planned. Some has been created, but not fully implemented yet as plans have changed to use tunnels.

The goals of the trial have been met: Traffic is down 20-25% (goal was 10-15%), queue times are down 30-50% in the inner city. The bypass traffic has only increased 3-5%. People have also experienced a better traffic environment in the city.

The effects of congestion charge in the inner city appears to have a beneficial impact far out from the city. Some areas are also seeing 10-20% reductions in traffic.

There is now a growing majority believing the congestion trial is a good thing. The opinion polls show that in 2005 there were 57% against and 32% for. In April 2006 this had changed to over 50% in favour of congestion charging.

The session concluded with questions on the following:

Robert Stüssi sought clarification on who is exempt from the charge and how many people pass the system several times in a day. In response **Birger** indicated that about 30% of those traveling were exempt (eg foreign vehicles, Motor cycles, Public vehicles and environmentally friendly vehicles).

Roland Rydin asked if help was given to the police with information from camera system. **Birger** pointed out they were only permitted to show photos to the owners of vehicles.

A delegate from the city of Riga asked what happens in winter when plates are covered in snow or mud. **Birger** admitted it might be difficult at times but normally at least one plate is fully readable on all days. The number of plates not identified is less than 1%.

Elliot Sander asked how would you contrast the experience between London and Stockholm? **Gunnar** noted that scope for IBM was different. In London they did not operate the system. However, in the London system there are no transponders, but otherwise there are many similarities. Main thing which drives cost is the difference in legislation (eg. Tax or Charge). **Keith Gardner** added that London is now also looking at tag and beacon to move the technology on.

Robert Stüssi sought more detail on how much lead time there was to prepare bid and how much did experiences of other congestion charging systems help? **Gunnar** noted that procurement started in spring 2003, contract signed in January 2004 – so it took about half a year to come up with a price to deliver the system. The appeal process then halted the development for a time. It then took about one year to develop the solution.

Keith Gardner asked if the referendum mandates the future for congestion charging? **Gunnar** responded there will be an additional political process. The referendum is only advisory.

Jean-Paul Wouters noted that congestion charges mean less cars and more collective transportation, but how do you take account of bicycle use and its seasonality. He went on to ask how socially acceptable was the tax where workers who can change their hours might avoid or reduce exposure to the congestion charge? On technical aspects he also sought information on the average cost of transponders? **Gunnar** commented that bicycle users have increased, but the specific report is not yet available. The tax system has not been seen as unfair to workers without flexible working time. **Birger** responded that prepayment is not allowed so every passage has to be monitored. Costs for transponders are probably close to 200 Swedish Krone.

Grace Crunican asked how the vendors were selected for the payment system. **Gunnar** commented this was done based on their existing centralised cash payment systems and their distribution throughout the city.

Julio Garcia noted the system has a variable price and asked for clarification on what was the criteria to decide the price at each time period? He went on to ask whether the effect of the system was a problem for retailers. Finally, he asked what was the period in which payments could be made. **Gunnar** responded that the payment period was 14 days since the first of June, it was 5 days prior to that. There is a suggestion it could move to monthly. In respect to retailers only 2% of all cars entering the city are doing this for shopping, so there is no perceived problem or change in business as a result of the charge. The price ranges were recommended following a consultancy study with the aim of achieving the target for the trial. The pricing model was also intended to be simple to explain to the public.

Stefano Riazzola asked what is meant by Green Vehicles and whether the technology for matching number plates require you to have physical separation of lanes where multiple lanes exist? **Gunnar** said there is no national definition of green cars. The charging system has defined it as the use of bio-gas as

an alternative fuel, electricity, or alcohol. **Birger** confirmed there is no need for lane segregation given the number of cameras.

Claude Dargent remarked that a congestion charging policy has 2 aims; to reduce congestion or to be a tool to transfer mobility from the car to other modes. What is the choice made in Stockholm? He went on to ask about the statistics, for the reduction in traffic in the centre do you have the social composition of those who do not use their cars, and for motorcycles has there been any shift to this mode? **Gunnar** pointed out that there is no major switch to motorcycles. The social component report is not yet available.

René Meijer saw 2 financial costs for the city: a decrease in parking revenue to the city, and greater costs to manage public transport. **Gunnar** pointed out that the tax paid to the national authorities comes back to the city. Improving public transport was an aim. Most of the reduction in traffic seems to be from a rationalisation of driving patterns, not a major switch to public transport.

A final question sought clarification on whether the CO₂ emissions were a real measurement or a calculation. In response **Gunnar** confirmed they were calculations.

Session 2

Congestion Charging - City Perspectives

Gunnar SÖDERHOLM Chaired the session.

Having gained an appreciation of the Stockholm experiment in congestion charging in the previous session the conference moved on to consider the views of other cities. These included contributions from:

John MASON, Head of Enforcement, Congestion Charging at TfL updating the experience in London;

René MEIJER, Deputy Director, Directorate of Infrastructure, Traffic and Transport Amsterdam on the cities continuing plans for road pricing; and

Henrik SYLVAN, Head of Transport Planning provided a perspective from Copenhagen their intention to implement a scheme.

John MASON set out to pick up on the key differences in the schemes and the impact of congestion charging. London needed congestion charging to remove the gridlock that was developing. There was general acceptance something had to be done even in the planning stages (unlike Stockholm). 6 million journeys are made on London busses with a large increase since the charge. Also bicycle use has risen to a third of a million users.

The London charging zone is only in a small central area. A low emission zone scheme would be applied to the whole of London. Although the charging zone is small there are over 220 entry points (18 in Stockholm). Also the zone contains no major through roads.

London has a flat fee of £8 per day (originally £5). From February 2007 the charging hours will be reduced to stimulate the economy in the evenings. The payments have to be made by midnight followed by civil enforcement. A new move is to permit payment the next day in the expectation this will reduce penalty charges by 20%. There are many exemptions similar to Stockholm taking in 30% of traffic in zone.

Five payment channels exist including text messaging. Retail has reduced with web increasing. Phone payments are static.

The Western extension to the charging zone in February 2007 will double the size of the zone and use a wireless network rather than fixed fibre. This will also replace existing networks and be coupled with roadside processing to reduce information transfer.

Automated number plate recognition is not 100%. It is backed up by manual checks. By checking against several camera sites it is generally possible to capture a usable image for most users.

Impacts are documented in the 4th Annual report. Overall congestion is down 26%. Bus use is significantly up. The scheme is generating considerable revenue that can be reinvested into network. Accidents involving motorcycles have not increased despite a rise in the use of this mode. There has been no significant impact on business. There has been a reduction in accidents and carbon emissions (about 13-15% down).

Most of people removed by congestion are still entering the zone, but by public transport. Another group who previously just passed through now go around the zone.

Appeals and penalties are continually reducing.

René MEIJER observed that Stockholm and Amsterdam are about the same size and that they wanted to join the family of congestion charging cities, but political changes over the years have influenced the planning process.

The presentation discussed 3 themes: Traditional instruments of traffic management in Amsterdam, the cities reasons for road pricing, and speeding up national implementation.

Parking policy: It is difficult to park in the city and parking and strict enforcement is applied. A web based information system has been created to help drivers find parking spaces. Revenues go 50-50 to city and district councils.

Dymanic traffic management is used to help guide drivers to parking spaces from the city ring and from motorways (eg for events at sports stadium). A network approach is used for traffic management coupled with agreements with adjacent road administrations. A priority is to avoid traffic jams on the ring road.

So why would you introduce road pricing? The following are the objectives of Amsterdam: Accessibility, economic attraction; Quality of life, reducing air pollution; Network measurments/ dynamic traffic control; and funding for new infrastructure either investments in road or public transport (eg infrastructure out to Almere).

Speeding up national implementation. Road pricing is part of an integrated plan. In Spring 2005 advice was given from a National platform on road pricing. The main principle for road pricing will be a fee paid only when you use the road. Initially, the idea is to start with the toll on new roads and bridges. The next stage will be to move towards a kilometre price by 2012 - abolishing road taxes – with differentiated charges including time, place and environmental characteristics. The programme for next 18 months involves preparing policy choices and monitoring costs of satellite-based system.

Henrik SYLVAN began by pointing out that Copenhagen is at the centre of the Øresund region with major international transport connections from Sweden to Denmark and the south. Copenhagen itself is a small municipality of 500,000 inhabitants, but the larger integrated Øresund region is 3.5 million inhabitants.

The Øresund bridge has 16% growth in traffic each year which has brought a large increase in traffic from Sweden. There is also a major urban development underway for retail and housing development. Road infrastructure is also being developed.

The challenge is to maintain mobility. However, average speeds in the network are falling and are now about 10-30km/hr. There is about 800 million euro per year economic loss accounted for by delays.

Many roads are near to critical conditions in respect to congestion. Car traffic is increasing (25%) and car ownership is up 45%. The result is lower mobility.

Traffic management cannot just be realised by cutting parking spaces. Car parking is a major problem with 50% of drivers searching 10-20 minutes for spaces. This adds to congestion.

The solutions include some form of road pricing and improved transport infrastructure. Copenhagen has already investigated a toll ring which seems to be desirable. This could reduce traffic congestion problems, and in principle is easy to establish, and provide revenue to accelerate transport infrastructure investments. Implementation is not a technical problem, it is more a case of influencing the government to go ahead.

Three models have been investigated: a little toll ring, a big toll ring, and a GPS solution. The main results of the studies suggest congestion charging improves mobility. That all models reduce congestion problems, reduce time wasted. There is an anticipated 15% traffic reduction and an extra 75,000 metro passengers. There will also be environmental benefits (eg CO2 and noise reductions).

The charging schemes could generate considerable revenue: €100 mill (Little Ring) €200 mill (Big Ring) €500 mill (GPS in the Region), but there is the problem of Danish Government's 'Tax Stop' policy.

In Copenhagen mode split is 33% car, 33% public Transport 33% bicycle. Although ownership is increasing car use is already declining. The question is could public transport do more.

In the short term Copenhagen would prefer to move forward with a transponder based system (GPS is a longer term option, but still has technical issues). Also 20-25% of cars have a transponder fitted already as they are used on the Øresund bridge.

Public opinion is in favour of congestion charging with 67% saying yes.

The timeline for congestion charging in Copenhagen is 2007 for planning, 2008 for implementation with a start date in 2009.

The subsequent debate addressed the following questions:

The **representative from Riga** asked how congestion affected revenue from public parking space? **John** replied there has been some reduction, but TfL do not have data on this.

Jean-Paul Wouters requested information on who was diverted between modes. In London nearly 60% diverted to Public transport, but in Stockholm it is only about 20%. Also if you keep extending the zone eventually everyone is inside the zone, so what is the equilibrium size. **John** responded that the zone would only be extended to an area that needed this solution. There are no further extensions planned. The difference in mode switch could be related to the size of the charge, but there is no data to answer this question.

Gwen Perlman sought more information about the telecoms change. **John** responded that this is wireless broadband. Data is constantly filtered at the roadside to reduce the data flow back to the central servers.

Grace Crunican wanted to know if there was any shift in freight lorry movement patterns. **John** responded that there seemed to be no noticeable difference. In London some existing restrictions constrain lorry traffic so congestion charging has not added to this.

A representative from New York asked whether any polling had been done in Amsterdam to gauge public reaction to the platform recommended in Amsterdam. **René** responded that the media has historically been against the plans but it is now changing to a positive reaction.

Keith Gardner offered encouragement to Amsterdam pointing out it took 15 years to set up the system in London. It is not the technical issues which are a problem it is obtaining the political commitment. Public opinion will turn positive as seen in both London and Stockholm.

Jean-Paul Wouters asked whether Amsterdam was under pressure to increase revenue via the scheme? He also queried why not wait for a national Galileo based system? **René** responded that revenue generation was not the driver, it is anticipated tax revenues would be the same. Amsterdam is keen to get moving as did Stockholm, so see no benefit from waiting for Galileo.

The **representative from Riga** asked what were the problems with GPS? **Henrik** responded that the issue was too many fallouts in coverage from the satellite link. In the long run this could be OK but not mature enough yet.

Ása Romson noted that the use of the car is decreasing and wanted to know in what areas this was occurring. **Henrik** responded that this was in the city centre where car owners tended to use cars at weekends etc. but in the wider region use was increasing. Congestion in the city was largely coming from outside the city.

Patrick Lefebvre sought clarification on who paid for the Stockholm implementation and covered the financial risk. **Gunnar** responded that the trial was funded by the national government. The risk is not so large as it has an ultimate revenue stream. **Henrik** commented that the small ring solution in Copenhagen will cost around 50 million euro and the GPS solution maybe 200 million euro. Added to this will be running costs. For Stockholm **Gunnar** thought the operational costs might be 25-30% of revenue.

Session 3

Roundtable Discussion – Is there a future for Congestion Charging?

Claude DARGENT took the chair to moderate discussion.

Claude Dargent opened the roundtable by inviting back onto the platform the speakers from the previous sessions. He began by raising the title of the round table. After listening to the days discussion the answer seems to be Yes! But would it be good for all cities. There is no consensus amongst politicians and technical solutions are very different. The systems are different because the problems are different.

As regards Amsterdam and Copenhagen the problems go beyond the city and onto the national highways. In this case the GPS could be a good solution. Alternatively you could just use a tax on fuel. Both penalise the high car user and the fuel tax approach can also address those cars that contribute most to pollution.

The discussion today has shown three types of objectives for congestion charging: pragmatic objectives, financial objectives, and environmental objectives. In what order should these be addressed? In Paris the environmental objective might come higher for health reasons.

Lastly, we should think about who is going to give up driving his car?

The floor was then opened to a general debate:

John Mason observed that the solutions for congestion charging are very different for each city. You can achieve various objectives, for example, London has successfully achieved its target of a reduction in congestion. In the case of London new ideas will be explored including charging by time of day or type of vehicle based on emissions. Initially, London used tried and tested technologies, but it is now investigating new technologies and different charging scenarios.

When asked if London was charging the right people based on social ability to pay **John** responded that the positive points outweigh the negatives. **Gunnar SÖDERHOLM** stated Stockholm has a similar experience to London. So far it is not possible to measure differences in social class acceptance, but there seems to be no big difference in polls.

Birger HÖÖK commented that congestion charging is not the solution for all transport problems the important thing is to decide what you want to achieve in your city in respect to traffic management. Congestion charging can be one approach. Congestion will always exist in cities. You need to consider what is the optimum level of traffic, then discuss whether congestion charging is the way forward or another management option.

Gunnar JOHANSSON observed that the politicians need to be clear why congestion charging is being introduced. There has been lots of research looking at social costs from traffic and freight. It looks like the decision makers are following the advice from social economists. There will always be winners and losers in any congestion charging scheme. You need to use the revenue to balance these out.

René MEIJER observed that to move people from car to public transport you need congestion charging and traffic management measures. You can change space for cars to space for public transport so that public transport becomes a quicker mode than car for city trips. You could reduce parking spaces and locate new office developments close to public transport. Congestion charging is therefore only one way to solve the problem, but probably the most effective to remove of congestion.

Henrik SYLVAN commented that congestion effects behaviour and activity in a city. However, retail patterns are already affected by the high congestion, so that is why you see little adverse effect on retail when charging is introduced. Spare capacity on the road network is disappearing, for example, most cities are already reducing road capacity to create cycle lanes. This has a high benefit-cost ratio.

Antonio Hodges suggested that so far priority in Geneva has been given to improvement of road infrastructure to benefit public transport and cycling. In Geneva there is a process of discussion of schemes followed by a referendum. This raises the difficult problem of gaining public acceptance before a scheme is implemented and demonstrated as in Stockholm. He noted congestion charging schemes were expensive and suggested an alternative might be to make people buy public transport tickets even if they are car users to create a logic to switch modes. It also avoids the need to create costly congestion charging infrastructure.

John Mason responded that each city is different. The proposition is similar in principle to the UK road fund tax. The problem with the suggestion is that enforcement costs could be high to carry out any meaningful checks.

Gunnar SÖDERHOLM Stockholm had similar discussions years ago. He believed that every city must find its own solution. No matter what system you use there are costs. The IMPACTS conference gives an opportunity to learn from the experiences of others.

Julio Garcia considered the main problem of the road pricing principle to be the cost of using a car. There is a large fixed cost (eg about 60% of cost per km is fixed) so there is an incentive to use the car

more. This might be redressed if insurance were charged according to distance travelled each year. Road pricing is one solution, not necessarily the final solution.

Herman Dector-Vega agreed with both Julio and Gunnar. Congestion charging provides a flexible solution, but the underlying problem is market distortion. Congestion charging could also tackle social inequality. The final solution could be distance charging.

Jean-Paul Wouters thought that a variable solution might be needed where miles travelled reflects also the time of day and location where trip is made. Revenue from charging needs to be put back into improved public transport to redress social inequalities.

René MEIJER the more demand there is the higher price will be. The market will make the price.

Gunnar SÖDERHOLM In Sweden about 66% of fuel price is tax. This means higher tax for inefficient cars.

Birger HÖÖK Green cars have lower tax for environmental reasons – about 20% of new cars are now green in Stockholm.

John Mason considered that the concept of putting high taxes on fuel would not resolve the city congestion problem. It is not tied to where the cars are used.

Finally, **Fredy Wittwer** suggested that a fiscal solution is not the answer. In Geneva the possibility to park a car has been diminished. This is an example of how the transport solution can be achieved by an attack on parking.

30 June
Unexpected Events

Session 4
Lessons from Recent Events

René MEIJER - Chaired the session which included contributions from:

Steve BURTON, Deputy Director of Transport Policing and Enforcement at TfL on Public Transport after July 2005; and

Iris WEINSHALL, Commissioner New York City Department of Transportation on New York City Department of Transportation's response to the recent transit strike

Steven BURTON gave an overview of what happened in London on 7 July 2005 when 4 bombs exploded on the underground a bus network, the effects on the transport system and how TfL dealt with those effects.

The explosions occurred at the end of the morning peak. There were lots of people on the network (about 500,000) and already in the City who would need to get home that night. There had been no planning for multiple bombings in such a time period. Initial reports were of power failures leading to early confusion. It was decided to close the entire underground network. By 10:03 all buses were taken out of service, leaving central London with no public transport.

One lesson is you not only have to deal with the incident sites, you also have to deal with people (about 1.5 million) stranded everywhere at other sites. Staff had to help at all emergency scenes (on cordons, etc) as they were first there.

There were immediate joint planning meetings and the remaining outer London services were stabilised to keep them running. Communication lines were established with police, etc and information had to get out to public via press conferences. The media need to be properly informed to avoid confused messages.

All bus services were operational by about 3pm. This was impressive given most major road were still closed at incident sites. Some rail services were reinstated. Police presence was made very visible to reassure public.

The next day all bus services operated and 80% of underground service. The main issues for TfL included: complicated jurisdiction issues at incident sites, difficulties in removing damaged trains, and reassuring the public. What worked well was: having a dedicated transport police who knew the network, contingency planning helped, response and recovery plans worked well, communications held up, the dedication of staff to put things back in order was essential, and public response was impressive.

CCTV cameras were used to find out what had really happened. Confidence in the tube system held up.

What did not work so well? The roll of higher decision makers (eg all the way to PM wanting to take decisions) was not clear as it had not been desktop planned. Mobile phone communication in the city failed because everyone was trying to use it at once. It is therefore important to have an alternative dedicated communications system.

Since the event staff and passengers are informed more and visible policing has been increased. Technology is being investigated to increase security. More desktop planning is taking place and the command and control systems are being linked more effectively.

Iris WEINSHALL described the effects of the transit strike in New York city in December 2005 which displaced 7.5 million passengers. It is not common in USA cities for strike to occur on the transport system.

A lot of effort had been put into planning for similar events which helped on the day. The New York DOT does not manage the network, but it does regulate the use of infrastructure. During the strike the DOT liaised with several agencies.

New York has seen a 15% increase in population since 1980 and an employment increase of 8%. 7.5 million passengers per day use the network, so the scale of the impact of a strike is large. Coupled with this was the winter weather at the time.

An immediate response to the strike was possible. The traffic management centre and its 250 camera sites provided an overview of the situation with the possibility to adjust signal settings at junctions to keep things moving. Real time information was a great help. The contingency plan overreaching goals were:

- Limit vehicular access to Manhattan;
- Maximise vehicle occupancy;
- Add roadway capacity where possible;
- Promote alternative modes;
- Widely publicise strike regulations

High occupancy vehicle restrictions were imposed at entry points (HOV4) including taxi. This moved more people efficiently. Lane reversals were used to add road capacity. No parking rules were imposed and lorry loading and unloading was restricted. Bicycle lanes were increased to provide capacity.

The plan was fluid, for example, reserved emergency lanes and bridge reversals were scaled back on day 3 as there was unused capacity.

Walking and bicycle mode choice was high. Cars were the primary way people moved around. The commute started earlier, and many also came in later after the 11:00 removal of the HOV4 restriction. The outbound commute also started later. Traffic was worse going out than coming in. With the HOV4 in effect the number of cars entering Manhattan was reduced by nearly 50% compared to a normal day.

Lessons learned: People will rely on private vehicles, so you need to maximise occupancy and experience shows this is possible. Walking remained a viable option. Traffic got worse later in day. In attempting to minimise congestion the plan might have been more cautious than necessary (eg the HOV4 restriction could have started later).

The subsequent debate addressed the following questions:

Roland Rydin asked how TfL worked with the various emergency services. **John** responded that there is group of senior managers from all the agencies who work on planning. The fact this was in place beforehand made a real difference.

In response to the presentation on the New York strike clarification was sought as to whether the car occupancy remained high (1.5 rose to 3.5). **Iris** responded that it immediately returned to 1.5 with no lasting effect.

Ian Johnson asked if the restriction on freight and deliveries resulted in any backlash from the retail community and given the beneficial effects of lorry restrictions on free flow of traffic were there any plans to develop these restrictions since the strike? **Iris** responded that there was no problem. Deliveries

were being made into the night which caused some noise complaints. There are issues with maintaining restrictions (eg noise issue at night, and businesses have problems maintaining this situation).

Julio Garcia asked about the delay in the evening rush hour and the efforts regarding enforcement of regulations. **Iris** responded that there is no clear indication why the evening rush changed, but it might have been effected by lorry deliveries. Enforcement was crucial.

Session 5

Planning for the Unexpected

Grace CRUNICAN, NACTO Vice-President chaired the session which included contributions from:

Iris WEINSHALL, Commissioner New York City Dept. of Transportation on Security Initiatives in NYC since 911;

Jean-Pierre SALIN, Director Health & Safety, Viola Transport on Planning for pandemics; and

Grace CRUNICAN, Natural disaster planning with specifics on earthquakes based on experience in Seattle.

Iris WEINSHALL Terrorist attacks are something New York has to plan for. After 911 the reaction was to take extreme precautions. However, over time it has become evident a balance is needed to allow for the normal flow of everyday activity.

The public response to 911 required a multi agency response. New York DOT has introduced enhanced protection on bridges and stepped up security on the ferry operation. There are some high profile bridges in New York, so prioritizing security measures is important. Army engineers have undertaken analysis and recommended solutions to improve security. Police have also increased their presence on these key structures.

Many enhancements on ferry systems have occurred since 911. Federal guidelines concentrate on the boats at sea, whilst the DOT activity focuses on the terminals. Measures include increased lighting, cameras and security locks. Staff have been given additional training and explosive detection dogs are used at the terminals. In addition, the Stanton island ferry no longer carries vehicles as there is no time to monitor vehicles for the risks they could propose.

Tourism and special events (eg Marathon and parades) pose a special problem. Planning has identified the need to impose construction embargoes during events, traffic planning and barriers around convention centres. Traffic is monitored through a multi agency control centre.

Barriers outside buildings (eg planters) have proliferated. However, it is apparent they are a poor form of protection. They can be easily demolished and rendered ineffective. An approved standard bollard has therefore been designed for use in these sites. The city is working to minimise the impact of such structures on public mobility and to provide adequate footpaths.

In reality New York has not changed much since 911.

Jean-Pierre SALIN Veolia Environnement and Veolia Transport are a French utilities company and transport operator. The transport organisation has carried out planning for the possibility of a bird flu pandemic so as to be ready to face an unknown event which is extremely serious and fulfil its public transportation mission.

A key consideration is training staff to handle these events, both to inform and protect each employee at work. The World Health Organisation is the authoritative body providing information. It predicts that there is an 80% probability it will happen someday. To avoid panic in such an event requires careful communication with good connections to the media.

Planning needs to be pragmatic and identify simple solutions. The organization has therefore created information packs and protective clothing kits (eg masks) to “inform and protect” staff. These resources are dispersed to key sites to be more easily distributed when needed.

Another possible solution to keep staff operational is to create opportunities for them to work remotely rather than come together. This has telecommunication and IT implications.

Veolia has created a network of specialists supported by a website with technical documents. It has also developed active partnerships (eg authorities, company doctors, health committees, unions, etc). If all prevention precautions fail there has ultimately to be local preparation of a continuance plan for transportation according to how the pandemic evolves.

Grace CRUNICAN Natural disasters, like terrorist attacks, cannot be predicted, but as with potential attacks, cities can anticipate, coordinate and be prepared for action should a disaster strike.

The first challenge we face is our topography. Seattle is a hilly city surrounded by water on three sides. The second challenge Seattle faces is a growing, diverse population that speaks many different languages and may not have ever experienced an earthquake. In 2005, 30,000 new residents moved into the region, and 20,000 were from other countries. Another example of the trend is seen today in Seattle's school system, where 88 different languages are spoken.

The third challenge is our transportation network. There are only two roads traversing Seattle from north to south. She described the vulnerabilities of one, SR 99 and the portion known as the Alaskan Way Viaduct. Seattle is cut in half by a ship canal. If the two highways are not available, motorists must cross a drawbridge to go north or south. Seattle has a thriving marine industry, so our drawbridges are often up. For example, during the month of July, the three drawbridges along this canal were open an average of 56 times a weekday.

Since 1900, the United States has suffered 169 major earthquakes along the west coast. When you live on, or near, a fault line you know that sooner or later the big earthquake will come. All we can do to predict when one may occur, is to study past incidents and continue measuring a fault's movement.

Major earthquakes are considered strong enough to damage or destroy buildings. To help you understand the danger and economic burden they can cause three examples were presented.

California's main vulnerability is that is astride one of the most violently active seismic zones in the world. In 1989, an earthquake centered 113 kilometers away, shook San Francisco. While only 65 people were killed, it caused seven billion dollars in damage. Over half of the casualties were victims of the failure of a freeway. Anchored in weak soils, the upper deck of the freeway crashed on to the lower deck and two and a half kilometers went down. Luckily America's favorite pastime—baseball—was in the middle of a playoff series and both teams happened to be from the San Francisco area. Otherwise 10 times as many vehicles could have been on the freeway.

Five years later the Northridge earthquake hit. Infrastructure designed to withstand earthquakes stronger than this one collapsed. One hundred thousand people were instantly homeless. This earthquake woke structural engineers up to the fact that while not visible, many state-of-the-art, flexible, steel framed structures could be badly damaged internally. In many cases it was cheaper to simply tear them down and rebuild. Causing forty billion dollars in economic damage, the Northridge earthquake was the costliest natural disaster in the United States prior to last year's hurricanes.

The third example is an earthquake that recently affected Seattle. In February 2001 a quake shook western Washington. It lasted 40 seconds and was located 57 kilometers from Seattle. It was the largest earthquake we had experienced in 50 years.

Regionally between two to four billion dollars in damage was incurred. One of the first things Seattle DoT did was inspect the 150 bridges within the city. As a result, we learned three major structures had to be replaced: the Alaskan Way Viaduct and Seawall and Magnolia Bridge. We also needed to upgrade or replace 49 smaller bridges.

Grace went on to discuss the three major structures damaged and planning to keep them safe until they can be replaced. First is the Magnolia Bridge. It is one of three bridges providing access to what is basically an island. It is the most direct link to downtown and the region's freeway system and has been designated as the emergency link. Because of its importance, the federal government gave us nine million dollars to identify and begin design on a new bridge. The bridge had to be closed for months after the earthquake while damaged concrete and steel braces were replaced and cracks filled. The closure resulted in 15 to 30 minute traffic delays for those going to or leaving the Magnolia neighborhood. Continuous repairs are still needed. SDOT monitors the safety of the bridge using remote sensors. The sensor is essentially a steel wire stretched tight. When plucked it vibrates at a certain frequency—the frequency is dependent on how tight the wire is stretched. As the portion of concrete (or steel) pulls apart this slight movement the wire becomes tighter. The sensor reads in fractions of an inch. Which are then entered into a data log. A modem sends the information to a computer at SDOT and software creates graphs so movements can be analyzed.

The Kobe Earthquake illustrates what could happen in Seattle. Strong ground motions led to collapse of the Hanshin Expressway and also caused severe liquefaction damage to port and wharf facilities. This is what would happen to the Alaskan Way Viaduct. It would not collapse, but rather fall over on its side.

By 1999 approximately 75 to 90 percent of economic activity had returned to pre-earthquake numbers, however, not for the port. It permanently lost container business to other Asian ports.

The second major structure needing replacement is the Alaskan Way Viaduct. It is 53 years old and no longer meets national highway safety standards. Not only was it damaged in the Nisqually earthquake, it continues to move—three times since 2001 for a total of four and a half inches. If it moves one and a half more inches, costly repairs will be necessary. We know that it cannot withstand another major earthquake. Replacing it is important, because it carries 25 percent of all north-south traffic. It is not just a matter of keeping Seattle moving, is a matter of public safety.

To make sure it is okay to use, the state conducts semi-annual inspections. They shut the structure down for a weekend and look at the joints, scan for additional movement and make repairs. To help minimize this movement, truck and bus weight restrictions are in place. These vehicles may only use the outside lane in both directions. We also have two emergency plans in place. One plan directs repairs if the Viaduct sinks too much. The other is an emergency traffic management and closure plan that identifies evacuation and emergency access routes for four different scenarios should the viaduct become unusable for a few hours, or days.

The Alaskan Way Seawall is failing. Gribbles, teredos and other marine borers are eating it. Seattle relies on the seawall to support its downtown waterfront and the viaduct just mentioned. Short term repairs include routine maintenance such as patching holes. In one section of the Seawall that will not be replaced soon, cathodic protection is being installed to prolong the life of the steel portions. A monitoring system similar to the Magnolia bridge is used on the seawall. However, not only does the sensor measure cracks, but tilt. Frequent underwater and above water inspections also monitor known defects. We've engineered concepts that can be implemented if we detect a significant change in the Seawall's stability. Because there are different failure scenarios we have developed different solutions. Basically we would replace lost tieback function with new tiebacks. We also have options to buttress the wall from the waterside.

Getting prepared is important. A recent scenario based on a major (magnitude 6.7) earthquake showed losses similar to those of Northridge. The economic damage to the region and the state would depend mostly on how quickly the transportation system begins working again. As the Director of Transportation in Seattle, it is my responsibility to make sure we have a plan to get this done. Each transportation agency in the region has a comprehensive, defined emergency protocol and dispatch center. During an emergency of significant size all centers are likely to be operating. The state government, regional government, port and coast guard are some of the agencies must be coordinated. The importance of working together cannot be overstated. Infrastructure and services overlap and messaging must be consistent to avoid confusion. Strategies, actions and messages are agreed upon in advance.

Good plans carried out by knowledgeable staff can minimize confusion. The transportation department has the responsibility of ensuring:

- managers are informed,
- a thoughtful response to event conditions occurs, and
- resources (stock and staff) are prioritized.

Emergency plans must be reviewed and exercised periodically and revised to meet changing conditions. Seattle has held 11 drills since mid 2004. The drills have test different scenarios from power outages, long-term closures of the Alaskan Way Viaduct, terrorist attacks and earthquakes. The most recent Viaduct exercise lasted four hours, cost \$100,000 and was funded through a federal grant. This cost does not include the hours city staff used in preparing, only the overtime required to pay our crews for their work the day of.

We stockpile signs at five of our facilities throughout the city. Deployment would take to long if we relied on one location. We've also chained signs up at strategic points along the Alaskan Way Viaduct. Police can easily access them in an emergency. They don't have to wait on us. Four portable changeable message signs are staged at three different locations. We could have these positioned so that within one hour of an emergency, notification signs are installed in the north, central and south portions of the city. Signs are solar, so no fuel is needed.

All the planning and practice in the world will make very little difference if the public does not know what to do. In Seattle we have a slogan: 3 days, 3 ways. It reminds people they need three days worth of supplies and should:

1. Make a plan
2. Build a disaster kit
3. Get trained

If phones are working the city has an emergency phone network where a message can be recorded and sent out to specified areas.

Finally, we continue to replace our infrastructure. Construction is happening right now on the Fremont bridge. It is a nine month project that is very disruptive. A huge educational campaign and a series of street improvements were implemented far in advance. The effort allowed people to plan alternative travel routes or to add time into their commute. It is a project that must happen to keep our citizen's safe. The city of Seattle is also building a new Emergency Operations Center and upgrading our Public Alert phone system.

You can never be completely prepared, but you can anticipate, coordinate and be prepared for action.

The subsequent debate addressed the following questions:

Grace Crunican sought more information on how the design for bollards was tested and how were the guidelines put in place? **Iris** responded that even before 911 there had been test cases on bollard design and installation guidelines. Private sector installers have to gain approval first which adds to standardisation.

Herman Dector-Vega asked if there is any methodology used to find the best balance between car users and pedestrians. **Iris** responded that side walk space is a big issue for example in Time Square. A study showed that there was overcapacity for vehicles and under capacity for pedestrians. So there is now major construction work underway to increase sidewalk space. The formula for street furniture is used for planning.

Jean-Paul Wouters asked how the issues of protecting employee families as well as the staff was handle and was the company taking over a role that belonged to the public authorities? **Jean-Pierre** answered that kit would be supplied to staff and their families to reduce the spread of the virus. It cannot be freely given to everyone. This has to be the public authorities role, but the state cannot be expected to face pandemics alone.

Session 6

Roundtable Discussion

Fredy WITTEWER took the chair to moderate discussion.

He opened the roundtable by inviting back onto the platform the speakers from the previous sessions. He began by suggesting the session include a roundup of the discussion from the previous presentations, questions and answers, and discussion of content for future meetings.

Unidentified events cover a vast field. Natural disasters require a rapid assessment of the needs to devise a reaction plan. Identifying of the available transportation resources is essential closely followed by establishing a chain of coordination between the various owners of those resources. In the end you have to look at how to rebuild something quickly that is better than before?

Planning involves identifying and managing risk. The Swiss approach to risk management is based on impact studies. He posed the question, how can this be done in other countries, covering all the risks?

Iris Weinshall responded that the key to dealing with unexpected events is coordination and communication. Speed is important. Things have to get back to normal as soon as possible, then move to thinking about how to make things better than before. After 911 there were thoughts of changing the street pattern, but 5 years later for various reasons the design is back to the original grid.

Grace Crunican commented that what IMPACTS can offer is an exchange of knowledge. Where a city has done a good assessment of a potential problem it ought to be shared with others through visits. Mutual aid agreements need to be established to address problems up front. Also without doubt communication systems between agencies need to work well.

Steve Burton agreed with the previous comments. He noted that the transport service becomes the 4th emergency service. There is a need to share best practice. In London there was little visible infrastructure damage after 7 July as did New York in 911. It was therefore imperative for London to return to normality quickly.

Grace Crunican pointed out the need for agencies to plan for route diversions. Otherwise this can lead to massive increases in traffic congestion on surrounding roads that create another problem. Models have now been run to develop basic diversion plans for given areas.

Fredy Wittwer commented that simplicity is often the best solution. Too often complexity is added with models etc.

Steve Burton mentioned that in the UK transport security has been examined on all new transport schemes (originally mainly focussed on rail). TfL have agreed that every new development should have a crime and disorder impact assessment.

Fredy Wittwer gave an example of how planning for a new football stadium in Geneva included a rail station close to the ground for transport reasons, but the football association will not permit its use as it is impractical to segregate the different supports.

Grace Crunican commented that the new homeland security agency brings together many agencies. However, it is not accustomed to funding cities to follow through on initiatives.

Julio commented that unexpected events give an opportunity experiment. He observed that following 911 New York is giving more priority to pedestrians and public transport.

Iris Weinshall responded that lots of barriers put up after 911. 40% of people in New York are not car owners and people rely on public transport. You have to provide a balance between security and viability to continue a normal life, so additional barriers on the pavements a not necessarily a good idea.

General Conclusions - Gunnar SÖDERHOLM

Gunnar expressed his thanks to participants on behalf of IMPACTS for coming to Stockholm and invited them to a final cocktail.

In accordance with the new statutes of IMPACTS Gunnar formally handed over the presidency to Keith Gardner from Transport for London. The next meeting will therefore be in Spring 2007 in London.

Gunnar SÖDERHOLM brought the conference to a close by thanking the interpreters, city staff, and Impacts Secretariat for carrying through a successful conference.