出國報告（出國類別：國際會議）

參加2007年國際橋隧及收費公路協會（IBTTA）第75屆年會

服務機關：交通部台灣區國道高速公路局
姓名職稱：林炳松　正工程司兼規劃科科長
派赴國家：奧地利維也納
出國期間：96年10月6日至13日
報告日期：96年12月17日

系統識別號：C09403963

公 務 出 國 報 告 提 要

頁數：40 頁 含附件：否

報告名稱：參加 2007 年國際橋隧及收費公路協會【IBTTA】第 75 屆年會出國報告書

出國計畫主辦機關：交通部臺灣區國道高速公路局

出國人員：林炳松　交通部臺灣區國道高速公路局技術組規劃科科長

出國類別：其他

出國地區：奧地利

出國期間：96 年 10 月 6 日至 96 年 10 月 13 日

報告日期：96 年 12 月 17 日

分類號/目：H1/交通建設　H5/公路道路

關 鍵 詞：國際橋隧及收費公路協會、IBTTA、電子收費、ETC（Electronic Toll Collection）。

內容摘要：國際橋隧及收費公路協會，英文簡稱 IBTTA（International Bridge,Tunnel and Turnpike Association）於 2007 年 10 月 7~11 日於奧地利維也納的 Hillton Hotel 舉行第 75 屆年會及展覽會，本屆會議主題爲 Tolling：The Art of the Possible，計來自 25 個國家六百多名代表參加會議。本報告謹就目的、行程記要、年會議程摘要、商品展示、IBTTA 簡介、心得與建議、資料彙集等章節撰寫，並檢附所見所聞之相關照片，希望能提供相關公路主管機關及本局相關單位參考。

目　錄

壹、前言

國際橋樑、隧道及收費公路協會簡稱【IBTTA】(International Bridge, Tunnel and Turnpike Association)於 2007 年 10 月 7 日至 11 日假奧地利維也納(Vienna Austria)的 Hilton Hotel 舉辦第 75 屆年會(75th Annual Meeting&Exhibition)。本次會議主要目的,係分享及比較歐、美地區最新收費技術應用及收費設備營運的經驗及觀點;因此,本次年會及展覽可視爲是歐、美地區收費營運經驗及技術發展交流之論壇。

IBTTA 執行長 James Ely 於會議開幕致詞時指出,就橋樑、隧道及公路收費之實施發展而言,美國確實是比其他國家起步較早且已行之有年,也正因美國道路收費實施較早,爲因應收費業務處理之需要,美國地區已建置有許多複雜的收費系統。因此,美國在收費技術研究發展及系統營運問題解決等方面,確實累積有豐富的經驗,而這些難得的實務經驗,IBTTA 希望經由本次年會的交流,能提供助益歐洲及亞洲地區收費營運及技術之發展。

本次與會代表主要係來自歐、美地區,亞洲地區計有中國、日本及台灣派員參加,台灣地區僅本局有派員。時值本局目前刻正推動高速公路電子收費系統之建置工作,個人承蒙本局長官指派參加,謹秉以「他山之石,可以攻錯」之理念參與學習,期對本局高速公路電子收費計畫業務之推動有所助益。

貳、行程記要

一、與會代表

本次大會經統計共有來自 25 個國家六百多名代表參加,其中以美國代表最多,亞洲國家計有日本派三人、中國派二人及我國派一人參加。限於核定之年度預算,本局派遣一人與會。

二、會議地點

在奧地利維也納(Vienna Austria)的 Hilton Hotel 舉行。

三、行程表

96 年 10 月 6 日晚上 9：30 搭乘中華航空公司班機自桃園國際機場起飛出發，於 96 年 10 月 12 日上午 9：20 搭乘中華航空公司班機班機自維也納國際機場起飛返國，主要行程如表-1。

表-1　行程表

日期		星期	起迄地點		行程摘要	備註
月	日		起	訖		
10	6	六	桃園	維也納	桃園啓程經阿布達比抵達維也納	
10	7	日	維也納		1.註冊 2.參加（IBTTA）年會開幕	
10	8	一	維也納		參加（IBTTA）年會及展覽攤位參觀	
10	9	二	維也納		參加（IBTTA）年會及展覽攤位參觀	
10	10	三	維也納		參加（IBTTA）年會及展覽攤位參觀	
10	11	四	維也納		參加（IBTTA）年會及展覽攤位參觀	
10	12	五	維也納	桃園	維也納啓程經阿布達比抵達桃園	
10	13	六	桃園		抵達桃園	

參、年會議程摘要

本（75）屆年會有分別來自 25 個國家六百多名代表參加，會場計有 17 家廠商參加展示。本屆年會主題爲“ Tolling：The Art of The Possible ”，年會活動以英語進行，爲尊重講者著作權，會場禁止錄音，另爲因應環保及減輕會員負擔，所有論文簡報皆於大會結束兩週後在 IBTTA 網站（http://www.ibtta.org）上發表，大會不印發論文集。（年會舉行之相關照片詳如 3-1～3-16）

一、註冊

大會從 10 月 7 日起開始於 *Hillton Hotel* 辦理註冊，並接受現場報名，會員註冊費用 575 美元，非會員 1,150 美元，在 2007 年 9 月 7 日前註冊者可優待 100 美元。

二、開幕典禮及頒獎

(一) 大會於 *Hillton Hotel* 設有會場，10 月 7 日舉行開幕典禮，由現任主席 Mr. Jim Ely 主持。

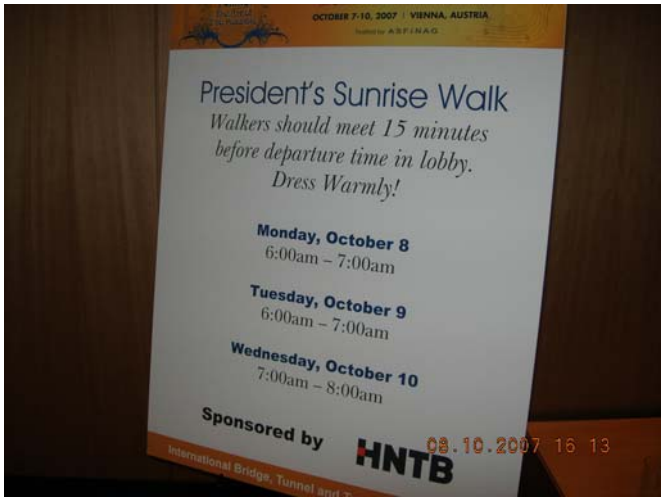
(二) 10 月 8 日大會舉行 IBTTA 2007 Toll Excellence & President's Awards Ceremony 頒發五項獎項，得獎者及得獎事蹟如下：

1. 最佳管理獎（Administration Award）：由 N3 Toll Concession Ltd 獲得，得獎事蹟爲“Hedging Srategy ”。
2. 最佳顧客服務獎（Customer Service Award）：由 Turnpike Division, Texas Department of Transportation 獲得，得獎事蹟爲“Central Texas Turnpike Project ”。
3. 最佳營運獎（Operations Award）：由 Tampa Hillsborough Country Expressway Authority 獲得，得獎事蹟爲“Crosstown Expressway Reversible Express Lanes ”。
4. 最佳社會責任獎（Social Responsibility Award）：由 Autovias S.A. 獲得，得獎事蹟爲“Waterway Program”。
5. 最佳科技獎（Technology Award）：由 Pennsylvania Turnpike

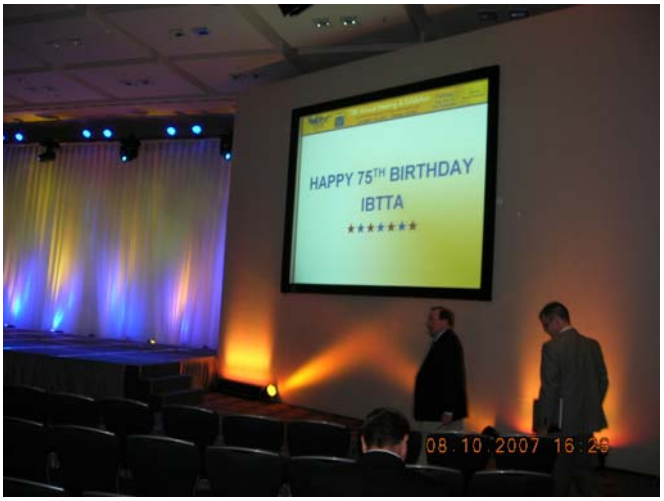
Commission 獲得，得獎事蹟爲“Turnpike Roadway Information Program”。

照片 3-1 現場註冊

照片 3-2 於大會會場設有歡迎海報



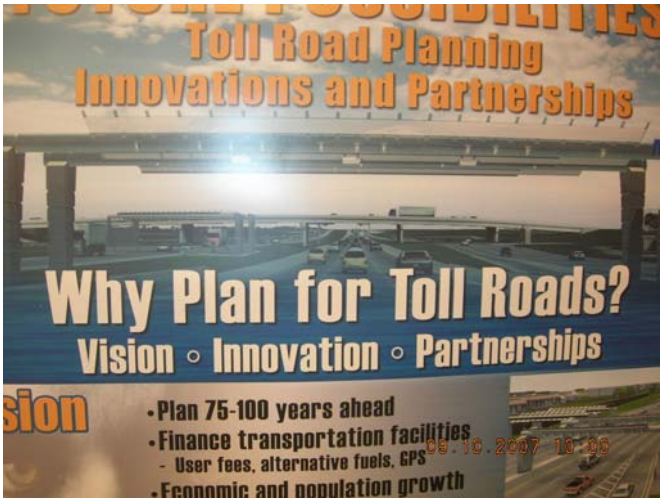
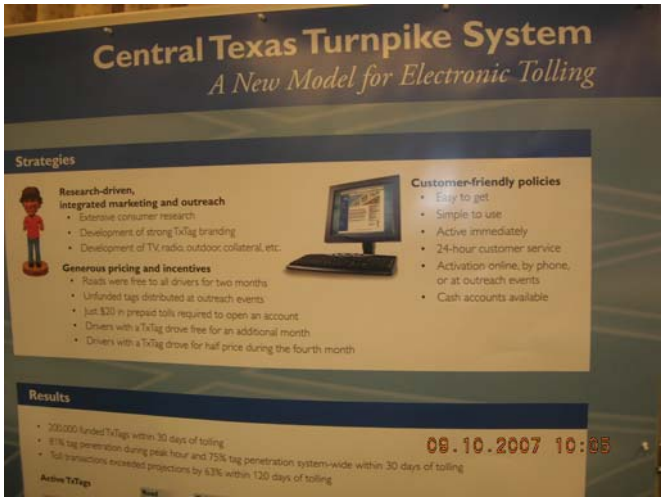
照片 3-3 會議議程



照片 3-4 大會年會現場

照片 3-5 大會現場

照片 3-6 大會現場

	
照片 3-7　大會現場	照片 3-8　大會現場
	
照片 3-9　大會現場點心－以年會爲主題之蛋糕	照片 3-10　廠商展覽海報
	
照片 3-11　廠商展覽海報	照片 3-12　專題報告現場

	
照片 3-13 大會現場餐點	照片 3-14 大會現場餐點
	
照片 3-15 廠商展覽實景	照片 3-16 廠商展覽實景

三、專題演講

大會特別安排一場專題演講(Keynote Speaker)，分別邀請 Mattias Klum 主講野生動物保育及環保方面之課題，茲將演講內容摘述如下：

(一)講者是美國國內著名的攝影師，18 歲起即開他的攝影生涯，並與許許多多的野生動物一同度過他的青年時光，他的作品亦多次於國家地理雜誌中刊載，亦多次到歐洲地區宣揚野生動物保育及環保議題。

(二)近一小時的演講，全場座無虛席，藉由其生動活潑的演講，隨著講者的敘述融入其野生動物的大自然境界，一張張透過講者細膩的角度所攝取的照片，講述其各地難忘的旅程及與野生動物近距離接觸之經驗，使聽者彷彿走了一趟非洲。他鼓勵人們走出去，多多到野外去，接觸不同的事物，就可以感受到自然生物生生不絕的生命力。螢幕上的照片展現出野生動物帶給人們的活力，充滿著契機。使與會者更了解野外的趣事及環保課題之重要。

四、分組研討

(一)大會設定之 *General Session* 主題有三，講者之題目分別如下：

1.Strategies for the Future

2.Toll Agency Best Practice- A Cross-Continent Comparison

3.Emerging Strategies to Fight Congestion Worldwide

- The Stockholm Project
- A Future Vision: Safe and Reliable Surface Transportation on Managed Highways
- Beijing 2008 - Olympic Transportation Strategy to Overcome Congestion

(二)會程另安排有 Breakout Session，分組就四個子題發表論文。

1.Promoting Economic Development – New Approaches to Financing Transportation

- Promoting Economic Development – New Approaches to Financing Transportation

Moderator: Jordi Graells, Managing Director of Toll Roads, North America & International, Abertis, Barcelona, SpanThe Global Multilane Approach

- **Promoting Alternative Funding Mechanisms to the Public for Expansion of Surface Transportation in the United States**
  - Matthew Bieschke, Consultant, PB, Washington, DC USA
- **Establishing Regional Mobility Corporations and their Progeny**
  - Joseph Giglio, Ph.D, Professor, Northeastern University, Boston, MA, USA
- **Not So Fast: Key Policy Considerations for Financing Transportation**
  - Robert Puentes, Felllow, Metropolitan Policy, The Brookings Institution, Washington, DC USA

2. **Improving Mobility - Free Flow/ORT**
   - **Autostrades' s Experience in the Implementation and Operation of Traditional and Free-flow Tolling Schemes**
     - Sergio Battiboia, Manager, Research & Development Tolling Technology, Autostrade per l' Italia, Rome, ITALY
   - **MDX - The Un-Tolled Story**
     - Alfred Lurigados, Director of Engineering, Miami Dade Expressway Authority, Miami, FL, USA
   - **NTTA Says "Keep the Change"**
     - Rick Herrington, Deputy Executive Director, North Texas Tollway Authority, Dallas, TX USA
3. **Enhancing the Quality of Life: Views on Sustainable Transportation from Inside and Outside the Toll Industry**

   Transurban' s Sustainability Initiatives and Climate Change Risk Management Program

- Ken Daley,Vice President International Development, Transurban City Link Limited, New York, NY, USA

Sustainable Transportation & Quality of Life

- Linda Steg, Ph.D., Assistant Professor, Department of Psychology, University of Gronigen, Gronigen THE NETHERLANDS

The Role of ITS in Supporting Sustainable Mobility for Society

- Josef Czako, Director, Kapsch TrafficCom AG, Vienna, AUSTRIA

4. Saving Lives: Incident Management

Emergency Scene Ahead: How Good Are You, Really?

- John O' Laughlin, Vice President, Delcan Corporation, La Mirada, CA, USA

Managing Safety Along a Coastal Motorway

- Federico Devecchi, Director of Operations, Autostrada de Fiori, Imperia, ITALY

5. **Improving Mobility - Free Flow/ORT**

Moderator: Jack Finn, Senior Vice President, HNTB Corporation, Lake Mary, FL USA

Autostrades' s Experience in the Implementation and Operation of Traditional and Free-flow Tolling Schemes

- Sergio Battiboia, Manager, Research & Development Tolling Technology, Autostrade per l' Italia, Rome, ITALY

MDX - The Un-Tolled Story

- Alfred Lurigados, Director of Engineering, Miami Dade Expressway Authority, Miami, FL, USA

NTTA Says "Keep the Change"

- Rick Herrington, Deputy Executive Director, North Texas Tollway Authority, Dallas, TX USA

6. Enhancing the Quality of Life: Views on Sustainable Transportation from Inside and Outside the Toll Industry

Moderator: Andrew Fremier, Executive Director, Bay Area Toll Authority, Oakland, CA USA

Transurban's Sustainability Initiatives and Climate Change Risk Management Program

- **Ken Daley**,Vice President International Development, Transurban City Link Limited, New York, NY, USA

Sustainable Transportation & Quality of Life

- **Linda Steg, Ph.D.,** Assistant Professor, Department of Psychology, University of Gronigen, Gronigen THE NETHERLANDS

The Role of ITS in Supporting Sustainable Mobility for Society

- **Josef Czako**, Director, Kapsch TrafficCom AG, Vienna, AUSTRIA

7.**Saving Lives: Incident Management**

Moderator: P.J. Wilkins, Toll Operations Administrator, Delaware Department of Transportation, Newark, DE USA

Emergency Scene Ahead: How Good Are You, Really?

- **John O'Laughlin**, Vice President, Delcan Corporation, La Mirada, CA, USA

Managing Safety Along a Coastal Motorway

- **Federico Devecchi,** Director of Operations, Autostrada de Fiori, Imperia, ITALY

8.**Promoting Economic Development: Comparing Public and Private Toll Agencies**

Is the Private Sector Really Better than Public Agencies at Operating & Maintaining Toll Facilities?

- **Brian Caouette**, Consultant, Parsons Brinckerhoff, Denver, CO USA **91 Express Lanes "Run Like A Business" By the Public Sector**
- **James Kenan**, Executive Director, Finance Administration and Human Resources, Orange County Transportation Authority, Orange, CA, USA

The Changing Face of Ownership: From Impression to Realism in the U.S.

- Ron Orsini, Managing Director, Alvarez & Marsal, Houston, TX, USA

9. Improving Mobility: Interoperability

A Private Sector Effort to Launch Value Added Services in the ITS Road Market: eTrip in Ireland

- Steve Morello, Business Development Manager, EGIS S.A., Guyancourt Cedex, FRANCE

Pilot Project for Technical Interoperability of Italian and Austrian Systems

- Franz Hlava, Systems Development, ASFINAG, Vienna, AUSTRIA

EZ Pass -- Interoperability - A Mature System With its Own Limits

- Jim Crawford, Executive Director, EZ Pass Interagency Group, Atlantic City, NJ, USA (invited)

Introducing EasyGo in Scandinavia

- Mogens Hansen, Finance Director, A/S Storebaelt/Sund & Baelt Holding A/S, Copenhagen, DENMARK (invited)

10. Enhancing the Quality of Life: Customer Service

Moderator: Beth Ruffing, Vice President, Human Resources, Faneuil Inc, Orlando, FL, USA

Ten Truths of Sales and Service

- Michael Tamer, CEO, Tamer Partners Corporation, Southlake, TX, USA

Tollway Users are "Customers" Demanding A Service

- Bill Halkias, CEO, Attica Tollway Operations Authority, Athens, GREECE

Global Challenges of User Relations

- Ophir Toledo, Managing Director, Companhia de Concessões Rodoviárias (CCR - USA), Miami, FL USA

11. Saving Lives: A Moral Imperative

Moderator: Ken Philmus, Vice President, National Director of Toll Services, AECOM, Iselin, NJ, USA

Saving Lives: The Art of the Possible (consider changing title)

- Kevin Hoeflich, Program Director, PBS&J, Orlando, FL, USA

Suicide Prevention on the Golden Gate Bridge: Past, Present and Future

- Kary Witt, Bridge Manager, Golden Gate Bridge, Highway & Transportation District, San Francisco, CA, USA

12. Promoting Economic Development: Toll Roads Impact on Society Moderator: Frank Thibaut

That's Billions with a "B": The Economic Impact of Toll Roads

- Jerry Shelton, Director of Business Administration, North Texas Tollway Authority, Dallas, TX, USA

The Economic Impact and Social Benefits of a Public-Private Association

- Mauricio Gatica, Vice Presidente, The Asociación de Concesionarios de Obras de Infraestructura Pública de Chile, COPSA A.G, Santiago, CHILE

Promoting Development and Mobility at a Lower Cost

- John Mike, Senior Vice President, RMS Business Development, TransCore, Inc., Hummelstown, PA USA

13. Improving Mobility: The Role of Technology and Transportation Policy

A National Tolling Program for the US - What Would it Look Like?

- Joshua Schank, Parsons Brinkerhoff, Washington, DC, USA

New Technologies for Toll Collection

- Alain Estiot, Managing Director, Quality, Toll Collect GmbH, Berlin, Germany

The Future Reality of Electronic Toll Collection

- Harold Worrall, President, Transportation Innovations, Oviedo, FL, USA

14. Enhancing the Quality of Life: Data-Driven Decisions

Moderator: Lars Møller

Value of Time: One Size Does Not Fit All

- Ed Regan, Senior Vice President, Wilbur Smith Associates, New Haven, CT USA

**Note - above link is for email. to find out more about Ed's presentation, please email him.

Mystery Driver - Create Harmony with Your Customer

- Scott Thomas, Senior Partner, Tamer Partners Corporation, Southlake, TX, USA

Measuring Driver Benefits - Predicting Willingness To Pay Tolls

- Denis Johnston, Director, AECOM Enterprises Inc., London, ENGLAND

15. Saving Lives: Road Safety; a Political Commitment

Moderator: Mauricio Rotondo

A European Directive ON Road Infrastructure Safety Managmeent

- Sandro Francesconi, Road Safety Unit, European Commission, Brussels, BELGIUM (Invited)

VII: the Next Standard of Safety

- Tim McGuckin, Executive Director, OmniAir, Washington, DC, USA

"Seat Belts Save Lives - and Lives Matter Most" - A Road Safety Campaign

- Dr. Günter Breyer, Head of Technology & Road Safety Division,

Federal Ministry of Transport, Innovation and Technology (BMVIT), Vienna, Austria

16. Improving Mobility: Fighting Congestion with HOT Lanes

Scaling the Toll Paradigm For Road User Charging/Congestion Charging

- Jack Opiola, Principal, Booz-Allen Hamilton, London, ENGLAND

Solving Urban Congestion With Innovative Design and Open Road Tolling: Tampa's Reversible Express Lanes

- Martin Stone, Ph.D., AICP, Director of Planning, Tampa-Hillsborough Expressway Authority, Tampa, FL, USA

New Ways to Increase Private ROI on HOT Lanes

- Mryon Swisher, Associate Vice President, AECOM, Denver, CO, USA

17. Enhancing the Quality of Life: Public Acceptance

Moderator: Kary Witt, Second Vice President, IBTTA and Bridge Manager, Golden Gate Bridge, San Francisco, CA, USA

The Customer Eats from a Different Dish

- Richard Gobeille, Principal, Vollmer Associates, New York, NY, USA

Tolling I-80: A Public Public Partnership

- Joseph Brimmeier, CEO, Pennsylvania Turnpike Commission, Harrisburg, PA USA

** Joe did not give a PowerPoint presentation. The link above is an email link.

VOX Populi: A Synthesis of Public Opinion on Tolling and Raod Pricing

- Dr. Johanna Zmud, President, NuStats, Austin, TX USA

18. Saving Lives - Tunnel Safety

Moderator: Roberto Arditi, SINA, Milan, ITALY

Increasing the Capacity of the AP-6 Motorway and Guadarrama Tunnels: Reversible Roadways and Evolution in Safety Systems

- Santiago Rodón Ortiz, Castellana de Autopistas, S.A.C.E., Madrid, SPAIN

  Presentation Title TBD

- Pierre Françios Linarés, GEIE-TMB Piazzale Sud del Traforo del Monte Bianco, Courmayeur, ITALY

  Tunnel Safety - Best Practices in Austria

- Gerhard Eberl, ASFINAG, Vienna, AUSTRIA

五、付費工程參觀與旅遊

因報名時已無多餘名額，故無法參觀當地工程建設，謹將相關介紹與說明臚列於後。

1. Technical Tour #1, hosted by ASFINAG

   Date: Sunday, October 7, 2007

   Time: 2:00pm - 5:00pm

   Fee: $25.00

   Registered Delegates; advance registration is required to guarantee a ticket.

   This is the first offering of ASFINAG's technical tour, for those of you who prefer to attend this at the beginning of the meeting. Attendees will visit the traffic management and information centre (TMIC) in Inzersdorf/Vienna, continue to visit a prototype rest area, Leobersdorf, and then continue the drive across the recently completed S1 Wiener Aussenring Schnellstraße to Spange Kittsee (A6 - this motorway is the first high performance road to a new member of the EU).

   TMIC: The most modern European Traffic Management and Information Centre, the traffic info from the total motorways and expressways in Austria is used to inform the drivers via traffic control units, or radio, or pda´s.

   Leobersdorf: Within the motorways and expressways in Austria there are 300 rest areas. However, within the next 10 years they will be reduced to 100 and will offer more comfort for the drivers; the rest area that is part of the tour is a pilot for this strategy.

A6: This motorway is a 22 km connecting way to the boarder of Slovakia and will be opened in the middle of November this year. It will be the final stop on the technical tour.

2. City Sightseeing Tour, including visit of Schönbrunn Palace

Date: Monday, October 8, 2007

Time: 1:30pm - 4:30pm

Fee: 55.00

All registered attendees. Advance registration is required to guarantee a ticket.

This tour gives an overall impression of the most significant historical sights of Vienna: the Ringstrasse with its magnificent buildings, such as the Museum of Applied Arts, the State Opera House, the Museum of Fine Arts and the Museum of Natural History, the Hofburg, the Parliament, the City Hall and the Burgtheater. The highlight of this tour will be a visit of the showrooms of Schönbrunn Palace.

The beauty of this palace with its 1440 rooms, the time involved in visiting it, justifies offering this as a separate and exclusive tour. This tour includes transport via motor coach, entrance fee to Schönbrunn Palace and an English speaking guide.

六、精緻旅遊－開會所在地介紹（相關照片如 6-1～6-14）

（一）地理環境：

奧地利是一個位於歐洲中部的內陸國。地勢西高東低，阿爾卑斯山貫穿奧地利的西部和南部，這使得奧地利成爲著名的冬季運動勝地。山地占國土面積的70%。山脈南北兩側是石灰岩帶，中央是結晶岩帶。最高峰爲大格洛克納山Grossglockner，海拔 3798 米。東北部是維也納盆地，東南部和北部爲丘陵地型及高原。多瑙河流經東北部，在境內長 350 千米。南部有穆爾河和德拉瓦河，西部則有因河和薩爾察赫河等。奧地利大部分地區處於溫帶海洋性氣候和溫帶大陸性氣候過渡區內，氣候溫和，冬季寒冷、夏季涼爽。

（二）首都：

爲座落於多瑙河邊的維也納。其它主要城市包括薩爾茨堡、因斯布魯克、格拉茨和林茨等。維也納是奧地利的首都，奧地利處中歐核心，北鄰德國與捷克，東有斯洛伐克與匈牙利，南爲斯洛文尼亞與義大利，西邊連接至瑞士。維也納位於奧地利東北端，通往四周的中歐大城市，如布拉格、布達佩斯、薩爾斯堡或慕尼黑等，皆相當便利。國家以德文爲官方語言，所以看原文地圖時必須以維也納的德文拼法Wien，不同於英文的Vienna，才能找到這個城市。全城人口約 150 萬，面積 450 平方公里。

維也納位處匈牙利平原的邊緣，本是塞爾特人群居的城鎮，後被羅馬人吞併，設立了文多波那（Vindobona）要塞，目的是爲了防衛鄰城卡努丹（Carnuntum）。到了西元五世紀，蠻族入侵，幾乎將該城夷爲平地。自 10 世紀起，日耳曼的巴奔堡（Babenberg）王朝統治此地長達 3 個世紀，這段期間，維也納成爲主要貿易中心。到了 13 世紀，哈布斯堡王朝開始統治維也納。但在 16 世紀時，卻又遭到土耳其人入侵，直到 1683 年才撤軍，維也納從此蓬勃發展，城裡城外陸續興建數座皇宮。到了 18 世紀，維也納已成爲奧匈帝國政治和文化的中心。1809 年，拿破侖曾佔領維也納短暫時期，到了 1914 年，維也納的人口已高達 2 百萬。第一次世界大戰後，哈布斯堡王朝垮台，結束帝制時代。接下來數年，一派強大的地方政府組織「紅色維也納」（Das Rote Wien），以改善社會問題爲號召，企圖改變市政。1938 年，奧地利被納粹德國強制進行「德奧合併」，1945 希特勒慘敗，盟軍接管維也納，直到 1955 年，奧地利從此成爲獨立的國家。

（三）人口：

奧地利絕大多數人爲奧地利裔，屬歐羅巴人種，大多爲阿爾卑斯類型，而其餘大約 10%的奧地利人口並非奧地利裔。這些人大多來自周邊地區，特別是東歐國家。另外有約 1 萬 8 千名斯洛維尼亞族人在克恩頓州和施蒂利亞州定居。地處歐洲三大族(日耳曼、斯拉夫、拉丁)之交匯處，奧地利人主要由屬於日耳曼部落群的阿勒曼尼人、巴伐利亞人、法蘭克人結合而成，並吸收有馬扎兒人、

匈奴人、斯拉夫人以及羅馬化的土著居民的成分。他們雖與德意志人在族源和語言上有不少近似的地方，但卻有著自己獨特的民族形成過程。

（四）語言：

奧地利的官方語言是德語，口語使用上德意志語的多種方言(下阿勒曼尼方言、中巴伐利亞方言、下巴伐利亞方言)，與書面語差別較大。奧地利的德語標準與德國使用的德語標準也有一些區別。

（五）美食：

今天的奧地利美食其實有不少是來自他國，如紅燒牛肉（Gulasch）源自匈牙利；維也納肉排（Wiener Schnitzel）據說是從當時奧匈帝國屬地米蘭傳進來的。在維也納，當地餐館常會掛出「維也納美食」（Wiener Kuche）的招牌，以吸引遊客，菜單上當然少不了肉排及紅燒牛肉兩道菜。

甜點推薦著名的薩黑爾蛋糕（Sachertorte），作法是在平滑厚實的巧克力外層裡面，夾了甜郁的杏子醬。在薩黑爾飯店點心舖裡供應各種尺寸的正宗薩黑爾蛋糕。飯後可以品嘗冰酒（Eiswein）的滋味，這是將葡萄留在藤枝上，直到第一次霜降才摘取釀成的酒。

在維也納用餐的費用不一，在最經濟的速簡餐廳（Snack Bar），一餐可能只要花 2 歐元就夠了。若是在酒窖（Weinkeller）裡的自助餐檯前選取想吃的食物，則吃多少算多少，但起碼也要花 3 歐元。在小飯館（Beisl）或普通餐廳，一道湯、沙拉、主菜等三道菜的套餐，配上一杯酒或啤酒則至少要 10 歐元。

（六）建築：

到維也納，必不可錯過雄偉的哥德式建築——史提芬大教堂（Stephansdom），位於市中心，歷史已超過 8 百年，但其大門和異教徒塔樓則爲 13 世紀的仿羅馬式樣。以近 25 萬塊彩色瓷磚構成的拼花屋頂，十分壯觀。在維也納，無論從哪個方向，都會看到史提芬大教堂 137 公尺高的尖塔巍峨聳立。

由藝術家家昏達瓦舍（Hundertwasser）設計的藝術家之屋（Hundertwasser Haus），1985 年完工。這棟市營公寓集合住宅，有不規則窗，每一樓層漆不同顏色，樓梯頂端加蓋洋蔥狀圓頂，像演格林童話的舞台，不太像是公寓。

（七）博物館：

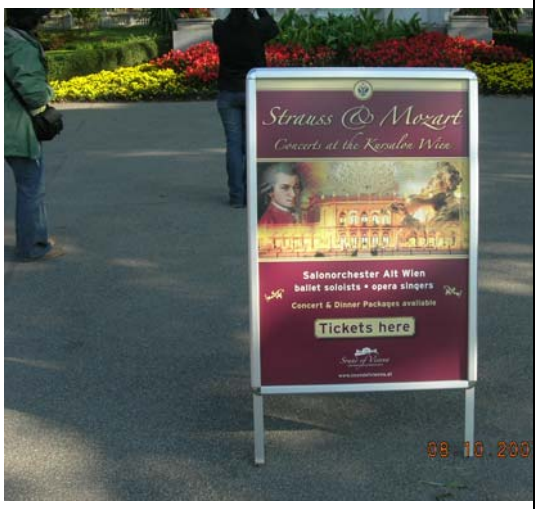
藝術史博物館（Kunsthistorisches Museum）主要收藏是歷代哈布斯堡王朝成員的收藏。每年超過 150 萬人參觀這座博物館。

博物學博物館（Naturhistorisches Museum），館藏涵蓋了考古學、人類學、礦物學、動物學和地理學，由其是人類頭蓋骨的收藏量居世界第一。

（八）音樂家：

維也納的著名音樂家包括海頓、莫扎特、舒伯特、馬勒、小史特勞斯、貝爾格、荀伯格等。也許有人不知道，世界知名的聖誕頌歌＜平安夜＞，就是葛魯勃（Francis Gruber）的傑作。小史特勞斯作曲＜藍色多瑙河＞，將位於多瑙河畔的維也納，塑造成一個無憂無慮、充滿童話色彩的地方。

圖 6-1　維也納市區街道圖

	
照片 6-1 維也納市區地鐵站入口	照片 6-2 地鐵站入口匝門，無人管制，採自我信任制
	
照片 6-3 維也納市立公園一隅	照片 6-4 維也納市立公園一隅
	
照片 6-5 維也納市立公園，音樂會海報	照片 6-6 市區導覽專車

	
照片 6-7 維也納市區電車	照片 6-8 維也納市區電車，與一般車輛併行，僅靠號誌管制，仍井然有序。
	
照片 6-9 市區觀光景點	照片 6-10 市區觀光景點－史蒂芬大教堂
	
照片 6-11 市區觀光景點－史蒂芬大教堂	照片 6-12 市區露天咖啡座

照片 6-29 熊布倫宮－王室避暑勝地	照片 6-30 熊布倫宮－王室避暑勝地
	
照片 6-31 鳥瞰多瑙河	照片 6-32 鳥瞰多瑙河

七、廠商攤位展示（相關照片詳如 7-1～7-7）

此次應邀展示及贊助之廠家主要計有 17 家，在 Hillton *Hotel,2rd Floor* 展出，廠家名單及網址如下，另查閱 2 家 ETC 廠商的宣傳資料後，部分廠商之實績及專長介紹如下：

（一）PBS&J：這是一家統包廠商，工作實績及業務範圍包括：

1. Establishing a Toll Agency
2. Agency Planning（Financial、Operational、Policy and Strategic、Resource ）
3. Project Development and Finance
4. Engineering
5. Program and Construction Management
6. Operation and Maintenance
7. Marketing and Sales
8. Research/Knowledge Management

（二）EFKON international group：offer multilane free flow system

1. Truck Tolling
2. Congestion Charging

3.Tachograph Based Charging

4.Toll Enforcement

5.Toll Audit

6.Traffic Counting

7.Shadow Tolling

8.Section Speed Control

照片 7-1　商品展示現場

照片 7-2　商品展示現場

照片 7-3　商品展示現場

照片 7-4　商品展示現場

照片 7-5　商品展示現場

照片 7-6　商品展示現場

照片 7-7　商品展示現場

- ACS, Inc.（www.acs-inc.com）
- Carter & Burgess, Inc.（www.c-b.com）
- Central Parking System（www.parking.com）
- Electronic Transactions Consultants（www.etcc.com）
- International Road Dynamics Inc.（www.ird.com）
- Interstate Highway Sign Corp.（www.interstatesigns.com）
- Magnetic Automation Corp.（www.ac-magnetic.com）
- Mark IV IVHS（www.mark-iv.com）

- Ms Consultants, Inc.（www.msconsultants.com/）
- Parsons Brinckerhoff（www.pbworld.com）
- PBS&J（www.pbsj.com）
- Skyline Products Dynamic（www.skylineproducts.com）
- Scientific Technologies Inc.（STI）(www.sti.com)
- Sureseal of New Jersey（www.givemeservice.com）
- Trans Core（www.transcore.com）
- Transdyn（www.transdyn.com）
- UBS（www.urscorp.com）

肆、IBTTA 簡介

一、組織及會員

IBTTA 是一個國際化的組織，在華盛頓特區設有辦公室，處理事務，擁有 73 年的歷史和經驗，有來自世界 25 個國家的會員，會員分下列四種：

(一)Active Member：聯邦、州、地方政府或委員會、政府機關和私人公司等機構其執行的業務凡涉及收費之橋樑、隧道、公路、渡船及類似的交通系統人員參加者屬之。

(二)Associate Member：經銷商、公司、個人和其他團體對收費產業有興趣，但並未擁有或操作收費設施者屬之。

(三)Sustaining Member：Associate Member 以財力贊助 IBTTA 及其活動者屬之。

(四)Honorary Member：凡個人在 IBTTA 有傑出貢獻者屬之。

二、委員會組成

(一) IBTTA 設有 13 個委員會，各委員會每年針對特定主題，邀請專家會召開 5~6 次研討會。會員可就收費公路特定領域參與不同的委員會，從相關的專家討論可以找到自己關心的問題，透過活動可向其他同行們學習，沿著正確的方向發展，所以 IBTTA 是一個最新的公路收費技術交換站，提供了許多收費公路行業的實用訊息，結識其他行業伙伴的機會，可避免獨自摸索浪費寶貴的時間。

(二) 13 個委員會各有不同職司及專精的領域，委員會（Committee）及其召開之研討會（Workshop）名稱如下：

1.管理委員會（Administration Committee）（Organization Management Workshop）

2.土地及商場特許、市場經營、商務等發展委員會（Concession , Marketing & Business Development Committee ）（Organization Management Workshop）

3.工程和設計委員會（Engineering & Design Committee）（Facilities

Management Workshop）

4.財務委員會（Finance Committee）（Organization Management Workshop）

5.國際事務委員會（International Crossings Committee）（Facilities Management Workshop）

6.法規委員會（Law Committee）（Not Assigned to Specific Workshop）

7.設施維護委員會（Maintenance Committee）（Facilities Management Workshop）（Separate Fall Conference）

8.營運委員會（Operations Committee）（Facilities Management Workshop）

9.公共關係委員會(Public Relations Committee)(Organization Management Workshop）

10.研發委員會（Research Committee）（Facilities Management Workshop）

11.風險管理委員會(Risk Management Committee)(Organization Management Workshop）

12.安全和法律執法委員會（Security & Law Enforcement Committee）（Facilities Management Workshop）

13.科技委員會（Technology Committee）（One Workshop in US， and One outside US）

三、出版刊物

固定的期刊有 IBTTA News Roundup （a bi-weekly summary of news articles）、Executive Director’s Monthly Report、Tollways（printed three times a year）、Annual Report 等。

四、服務宗旨

(一) IBTTA 提供一個論壇平台共同發掘各會員聯合起來的力量，一起分享會員的想法、經驗及資源，幫助會員選擇最好的作法和策略。IBTTA 一直努力達成的三項目標爲：

1．成爲世界收費公路領域的倡導者。

2．成爲世界收費公路行業中訊息和知識的中心。

3．成爲世界收費公路行業中教育培訓和專業服務的領先者。

(二) IBTTA 是一個世界性的組織，聚集了收費公路各行業中相關的企業，提供專業技術和知識，IBTTA 也歡迎承包商、監理商、供貨商及擁有道路之各私有機構加入，可彼此交換訊息和經驗。

(三) IBTTA 歡迎尚未加入這個組織的國家及早參加，將有助於交通運輸的發展，分享其他會員的技術和資訊。

(四) 有關收費相關訊息、論述、工作機會及發表之論文等均可在 IBTTA 網站上取得。IBTTA 網址爲：http://www.ibtta.org。

五、籌備第 76 屆 IBTTA 年會

2008 年年會將於 9 月 20~24 日在美國馬里蘭州巴爾的摩市舉行，歡迎各會員及各領域的專家先進投稿，相關資訊息可上網查詢。

伍、心得與建議

一、本次五天的年會會議很快就過去了，會議中所發表的文章及研究報告之中心思想即爲如何提昇公路收費系統的技術，使其更便利，結合交通管理、信用卡整合等功能，不論行駛收費公路、運輸工具轉乘、市區停車場、繳費納稅等，未來將是一卡在手可行遍天下，符合現階段 ITS 推廣的精神。

二、交通運輸是經濟與文化交流的動脈，各國對高速公路運輸的需求正以極快的速度增加。在世界上有些地方還沒有足夠的高速公路系統，然而在另外一些地方高速公路卻面臨著過度交通擁塞的問題。在這兩種極端的情形下，交通運輸設施的建設永遠跟不上車輛成長的需求，由年會中之專題報告可發現，無論是已開發或開發中國家均面臨資金需求的問題，公路收費將是唯一解決資金來源的途徑，也都採使用者付費的方式興建道路，不再仰賴稅收籌措財源，這已是目前世界的趨勢。

三、鑒於公路收費技術的發展，世界各國之公路收費型態已大幅更新，經由先進收費系統的研發，已不再需要收費站人工收費，此一變革更可使流量增加，行車更順暢。然而相對的在世界各地收費公路也面臨著下列三項相同的問題及挑戰：

(一)財政上主要的挑戰是尋求新的途徑來支持基礎建設。

(二)技術上主要的挑戰是如何實施新的電子收費設施。

(三)商業上主要的挑戰是如何改善對顧客的服務。

四、國際橋樑、隧道及收費公路協會【IBTTA】主要會員爲世界各國的道路收費營運單位或機構及收費設備產業相關廠商，該協會主要宗旨除提供有關收費系統營運經驗、系統技術交流外，尚有促進提昇收費道路運輸服務品質之研究發展；因此，IBTTA 在道路收費產業之發展上，可謂扮演重要的引導先趨。而就 IBTTA 對於道路收費所持之基本論點，個人咸認相較國內屢有高速公路是否應繼續收費之爭議，應有相當之政策參考價值，說明如次：

（一）***沒有免費的道路－只有收費與不收費***（There are no free roads – only toll roads and non-toll roads ）

道路的規劃、設計、興建、營運與管理維護都需要成本費用，關鍵是在要由直接使用的人來付，還是要由全民納稅來付，藉由直接使用的人付費，除使用者能享受便利、安全及更高品質之道路服務外，道路收費是最容易且直接籌措道路建設財源之方式。

（二）***通行費不是稅捐－是使用者費用***（A toll is not a tax – it is a user fee）

用路人對於道路付費是具有選擇性的，有使用才需付費；而稅捐是沒有選擇性，人人皆需繳納。

（三）***未來不是收費道路－就是沒有道路***（Toll road – or no road）

目前及未來道路建設之關鍵在於財源籌措；最直接可行之方式，則在於收費自給自足。

（四）***收費緩和減輕道路擁塞***（Toll facilities relieve congestion ）

道路通行費收入可以加速道路建設財源籌措，興建新的道路系統以提供新的容量，尤其是興建全國性城際公路或都會郊區公路是一個相當可行的方式。

（五）***沒有人願意排隊付費***（No one likes to wait in line to pay a toll）

用路人不是不願意付費，而是無法忍受必須停車排隊繳費之收費作業方式，而電子收費可以使用路人不必停車繳費，節省用路人時間及能源燃耗，爲目前必須及未來必然發展之收費作業方式。

（六）***收費道路提供價值選擇***（Toll facilities offer value and choice for everyone）

用路人選擇使用道路類似商品交易，選擇收費道路以付費換取節省行旅時間及享受較高品質、更便利的行旅服務。

（七）***收費道路提供安全的行旅服務***（Toll facilities provide a safe trip）

收費道路會比非收費道路具較高的安全服務品質。

五、歐、美各國與會代表均認爲各國政府財源愈來愈不敷道路建設之需，惟使用者付費已爲民眾認同且已相當普及，故藉由道路收費籌措新建、養護財源是未來道路營運之趨勢。另依據 IBTTA 所做調查研究顯示，用路人對於道路使用付費並不反對，惟用路人所不能忍受的是必須停車繳費之人工收費作業方式；故應

用電子收費技術改善收費效率及提昇服務品質，是目前唯一的選擇也是未來必然的趨勢。因此，歐、美至亞洲地區莫不致力於電子收費技術之應用發展。

六、歐美先進國家現階段對於電子收費技術之應用進展，歸納而言，概以系統佈設、前端系統通信技術、系統發展及整合方向分述如次：

（一）系統佈設

1、既有人工收費系統轉換建置電子收費系統

此類既成已收費之道路，均興建有人工收費作業之收費站設施，電子收費系統概均建置架設於既有之收費車道，因此多屬於單車道（Lane-base）電子收費系統，且目前仍多屬人工與電子收費方式並存，逐漸轉換建置電子收費系統。

2、原無收費之既有道路建置電子收費系統

此類既成原無收費之道路，可能於匝道入口或主線路段以門架來裝置電子收費系統，多屬多車道（multilane）系統。德國高速公路目前規劃採衛星定位收費技術之載重車電子收費系統，其虛擬收費區係規劃於主線路段。

3、新建道路建置電子收費系統

此類典型的代表爲加拿大 407 公路 ETR 電子收費系統及澳洲墨爾本電子收費系統，於道路規劃設計時已將電子收費系統納入，係於匝道或主線路段上建置多車道自由車流（Multilane Free-flow）電子收費系統。

（二）前端系統通信技術

1、特定短距離通信技術（DSRC）

（1）微波：

歐洲及日本已訂定5.8GHz之標準，目前正發展各廠商生產發射器、接收器相容使用之標準協定。另北美洲早期發展的系統係採用915MHz，現亦已著手下一代之應用標準，係朝5.9GHz發展。

（2）紅外線：目前爲歐洲單一供應商，尚無歐洲標準之訂定。

2、長距離通信技術：主要係以GPS、GSM通信方式，目前僅有德國規劃使用GPS結合DSRC做爲電子收費之通信技術。

（三）系統發展及整合方向

1、 多車道自由車流電子收費系統。

2、 車上單元朝向與智慧型IC卡結合應用。

3、 結合交通管理提升爲電子收費暨交通管理（ETTM）系統。

4、 智慧型運輸（ITS）整合性服務，如道路定價（Road Pricing)、特定地區進出管理（Zone Access Control System)、車隊管理、即時交通訊息或緊急求救傳送與接收、加油或停車付費等。

七、 本次會議見聞歐、美相關國家電子收費系統建置營運經驗，再審視綜觀國內高速公路電子收費計畫推動之歷程，就國內高速公路電子收費計畫內容規劃而言，係尚與歐、美國家發展應用趨勢一致。惟個人會議見聞歸納之淺見，或可提供爲國內電子收費未來推動政策之參考，說明如下所示：

（一）隨著經濟發展，國民平均所得的增加及經濟活動的日益頻繁，使得私有車輛的持有率居高不下，造成道路車流的減緩、用路人的旅行時間增加，高速公路整體服務水準之降低，除間接造成了用路人繳費延滯成本的增加外，更產生空氣的污染、嚴重耗油等增加社會成本之衍生問題，由此可看出因交通車流衝擊受影響之層面相當廣泛。世界各國之交通主管單位爲了解決此日益嚴重交通問題，紛紛尋求解決之道，無不想盡各種交通管理策略以改善交通擁擠問題，除了以傳統之交通工程手段興建道路外，亦引進先進科技，達到既有路網下容量最大化之目標。

（二）在國內爲因應交通成長之需要並分散原南北交通主要動脈中山高速公路流量，在傳統交通工程方面，除了已將西濱公路提升爲快速公路外，並完成第二高速公路之興建，構建南北之高快速公路走廊，此外，政府爲加強西部城鄉之橫向連絡，亦逐漸完成十二條快速公路之通車，台灣西部地區高快速公路將形成一線密之路網，加上未來國道 5 號及國道 6 號之規劃興建，台灣地區之環島高快速公路整體路網亦將逐漸形成，提供用路人更多路徑選擇。然而複雜之公路網必須依賴一規劃完善之先進交通管理系統（Advanced Traffic Management System, 以下簡稱 ATMS）相配合，才能實際發揮路網效果。

（三）ATMS 乃智慧型運輸系統（Intelligent Transportation System, 以下

簡稱 ITS）之基礎與核心，其發展目標乃於既有道路上，提供交通狀況之預測、交通管理策略之分析、評估與執行，達到運輸效率最佳化並提升服務安全等目的。國道高速公路局（以下簡稱高公局）除了已完成北、中、南三區之交通控制系統工程外，並配合行政院「挑戰 2008：國家發展重點計畫」中之『籌建高快速公路整體路網交通管理系統專案計畫』，架構智慧型高悚速公路管理系統，以充分發揮高快速公路之高機動性。

（四）順應科技的發達，已有許多先進科技應用於交通領域，針對道路壅塞問題，除了採用先進交通管理系統，世界先進國家亦紛紛採用電子收費系統（Electronic Toll Collection, ETC）來解決傳統人工收費的缺點。電子收費技術是以車輛爲主的付費方式，整合了電子、電腦、控制與通訊等先進技術。其方法是利用 IC 卡做爲付費的工具，透過車上單元、收費站與車輛兩旁間的整合系統，利用偵測、判讀、照相及記錄的方式，而達到自動扣繳通行費作業的目的。採用 ETC 進行收費，可有效提昇收費之服務品質、減少車輛延滯成本、增加道路容量，並可減少人力及人事成本、能源的消耗及減少空氣污染等問題。

（五）我國高速公路自 63 年 7 月國道 1 號三重中壢段通車成立泰山收費站開始收費以來，迄 67 年 10 月國道 1 號全線通車至今，均採用主線柵欄式電腦計數人工（計次）收費方式辦理。至 72 年 2 月推出不找零車道，85 年 12 月推出回數票專用車道，平均每部車輛持用回數票繳費過站時間縮短爲約 3.7 秒，每車道每小時可通過 900 餘輛，雖已至人工收費作業效率之極限，但仍無法滿足更優質收費效率之需求。唯有提升轉換實施結合電子、電腦與通訊等科技技術之自動化電子收費，方能突破達到無須停車、無現金之收費服務。推動高速公路電子收費，除可大幅提升行車效率、改善服務品質外，且能進一步實現使用付費之公平收費目標；更重要的是高速公路電子收費計畫攸關未來之交通管理走向及智慧型運輸系統發展，也攸關到國內智慧化運輸應用之利基，爲一影響深遠之計畫。

（六）ETC 除了具有自動收費、扣款功能外，當車輛通過收費站時，透過系統

辨別車輛資訊後，可同時蒐集高速公路相關車流資訊，以符合高公局對交通資料之需求，經系統計算統計後可取得各類車種之交通量、區域間平均行駛車速及行駛時間等交通資料，以每 5 分鐘爲一週期進行資料更新，各類車種旅次長度及交通旅次起迄兩種原始資料亦將依高公局需求而提供。若將所蒐集到的交通資料配合相關交通軟體作進一步之應用分析，可獲得策略性交通管理資訊供高公局參酌使用，成爲 ATMS 之重要數據來源，也可將資訊加值服務提供給高速公路用路人。

（七）

1. ETC 之架構分別包含前端系統功能、後端系統功能及未來發展目標。在未來發展目標方面，系統能提供電子收費暨交通管理(Electronic Toll and Traffic Management System, 以下簡稱 ETTM)、智慧型運輸應用之介面，因系統除了爲開放架構、高度模組化設計，並預留連接介面可與未來的 ETTM 及 ITS 進行整合。日後透過電子、電腦、控制與通訊等先進技術達成自動收費之功能，ETC 所蒐集到之各項交通資訊與交易資料可轉化爲交通資料參數，作爲先進交通管理技術之延伸應用與推展提供智慧型運輸整合性服務，如道路定價(Road Pricing)、區域性進出管理（Zone Access Control System)、車隊管理（Fleet Management）、即時交通資訊（Instant Traffic Information）推估路網狀況、平均車速、事件偵測管理、交通量調節或緊急求救傳送與接收、加油或停車付費等交通管理措施等，順利推動高速公路智慧化之管理發展，達到最終發展目標—配合高速公路智慧化之推動發展及整體運作整合爲電子收費暨交通管理系統。針對此，如何將既定規劃之 ETC 與 ATMS 之系統架構進行整合，並提供實際系統建置之具體改善措施，乃是未來推動電子收費計劃時之重要課題。

2. 最新的 ETC 採用「汽車定位系統(Vehicle Positioning Systems, VPS)」技術，看起來非常有前途。這種結合電子收費和 GPS 技術的系統，主要優勢是完全不需要地面上的基礎建設，而由 GPS 做車輛的定位與追蹤，每部汽車走過的路徑都可完整記錄，可以更彈性地

定義「虛擬收費區」，不必真的建置實體收費站或自動車輛辨識系統。這種以 GPS 爲基礎的 ETC 在歐洲的奧地利、丹麥、英國、德國、和香港，都在進行進一步研究與測試中，也被期待成爲交通監控的主流技術。

3. 再把時空拉到二〇一〇年。想像一下，只要透過車上的無線連結，在高速公路上以時速一一〇公里高速巡航下，你可以直接與紐約的同事透過影像電話開會，直接連接公司資料庫處理客戶需求，而後座的乘客還可同時觀看正在英國銀石舉行的F1 比賽實況轉播。這時或許你覺得肚子餓了，一個指令之下，方圓十公里內的美食餐廳地圖立刻出現在導航螢幕上，並根據交通流量幫你計算到達不同餐廳的時間，只等你決定方向。此外，趁著停車吃飯前，你還可以趕緊進入網路商店付款購物，請他們在晚上七點準時將禮物送到朋友的生日宴會上。當然，在處理這些事情的過程中，完全不用放慢車速，高速公路通行費已透過系統自動從你的電子錢包中扣除……。

4. 根據交通部 96 年 5 月的統計資料顯示，目前全台灣共計六百五十二萬五千多輛汽車，若以電子收費將達到七成普及率爲目標計算，光是第一階段配合電子收費系統而裝設的車上單元以及相關系統的建置，產值便超過百億。若再加上周邊擴大應用的停車場等小額付款系統，每年預估可再創造百億以上產值。整個龐大的電子收費商機，的確爲相關產業帶來新的發展可能。這其中除了初期估計約六百萬個車用單元的龐大商機外，其他牽涉到的行業還包括金融、製造、光電、通訊與資訊產業，甚至包括以後的隨選視訊服務，甚至是車用數位內容產業，都將可能因爲新的需求而創造出全新的服務內容。

5. 不過從另一個角度來看，利用科技塑造的秩序與系統化，勢必也將帶來更精準的控管系統。想像一下，未來通過高速公路電子收費閘道的瞬間，包括車輛資料、使用者金融與信用資料、以及車輛影像，都將攤在整個電子收費系統下無所遁形。甚至以後多車道電子收費以及結合 3G 的遠距定位、GPS 系統一旦全面啓用，任何車輛影像、位置、行駛速度、車籍以及使用者的金融資料，都將隨時攤在巨大

的監控系統底下，系統內的渺小個體，就形式上來看的確毫無招架之力。該如何處理此類監控的焦慮與隱憂，顯然也不是科技能完全解決。建議相關單位應該採取比較積極的作法，即是透過法律規範資料使用，以制度的合理性來降低憂慮，使國人在享受系統自動化愉悅的背後，不需付出過高的代價。

附　錄

第 75 屆年會發表之部分論文簡報（共 26 頁）

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IBTTA
75 YEARS OF DRIVING CHANGE

kapsch >>>

The Role of ITS in Supporting Sustainable Mobility for the Society

JOSEF ACZAKO
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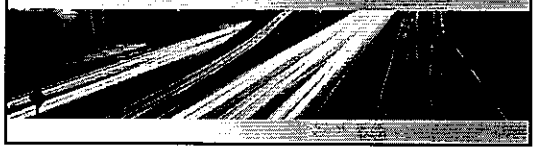

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IBTTA
75 YEARS OF DRIVING CHANGE

kapsch >>>

What does Kapsch actually do?

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About the Kapsch Group

- Kapsch is headquartered in Vienna, Austria
  - Founded 1892
  - Privately owned by Kapsch family
  - 2.500 employees
- Kapsch Group Companies
  - Kapsch BusinessCom - Solutions for Business
  - Kapsch CarrierCom – Solutions for Service Provider & Carrier
  - Kapsch TrafficCom - Road Traffic Telematics
    - Kapsch Telematic Services
    - Kapsch Manufacturing Services

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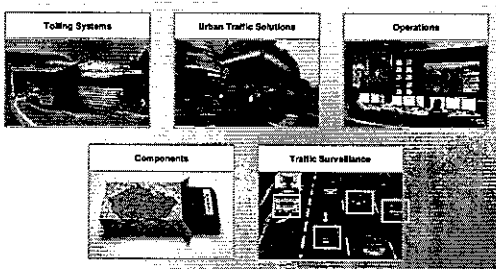
Kapsch TrafficCom Products and Services



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References of Kapsch TrafficCom (selection)

Urban Electronic Tolling Schemes

- Melbourne City Link, Australia
- Santiago de Chile, Chile
  Costanera Norte, Autopista Central (Norte Sur), Vespucio Norte Express
- Sydney, Western Sydney City Orbital, Australia

Nation wide complete tolling systems

- Truck Tolling System Czech Republic
  Nationwide MLFF / ORT Scheme including operation road length ~1.000km
- Truck Tolling System Austria:
  The world's first nationwide microwave-based cashless electronic toll scheme, road length ~ 2.200km

133 references in 30 countries

- 9,6 million tags sold worldwide
- 5.881 single lanes equipped
- 4.533 multi lanes equipped

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What is ITS?

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ITS in Road Transport



Roads | Cars | Travellers

More Comfort | Higher Efficiency | Better Safety | Less Impact on Environment

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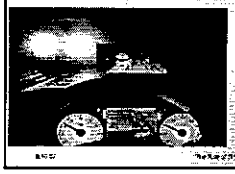
ITS applications today – vehicle related

- Vehicle control systems - active safety (ABS, ESP, etc.)
- Advanced Driver Assistance Systems - Preventive Safety
- On-board route guidance and navigation
- Monitoring traffic and road conditions
- Control and management of freight fleets and loading units
- Car-to-car communication

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ITS applications today – infrastructure related

- Monitoring traffic and road conditions
- Traffic management
- Traffic and traveler information systems
- Control and management of parking, on-street and in parking areas
- Control and management of traffic-lights

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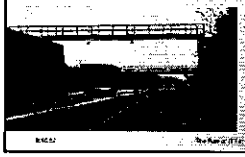
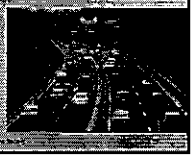
ITS applications today
Vehicle & infrastructure

- Electronic tolling and enforcement
- Monitoring and management of transits and routes
- Traffic infraction detection devices and enforcement systems
  - pre-trip information
  - on-board information
  - systems for user information and data exchange

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Do we really recognize the challenges?

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Main Challenges

1. Congestion

Main Challenges

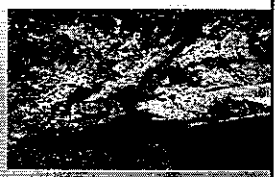
1. Congestion
2. Accidents

Main Challenges

1. Congestion
2. Accidents
3. Financing

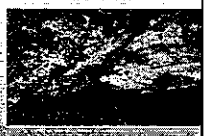
Main Challenges

1. Congestion
2. Accidents
3. Financing
4. Environment protection



Main Challenges

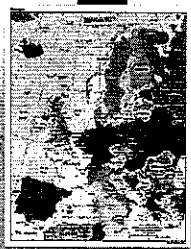
1. Congestion
2. Accidents
3. Financing
4. Environment protection



Key Problems in Europe

The European Commission has identified the following key problems faced by European transport:

- The loss of 40,000 lives each year on EU roads
- Mounting congestion, costing the EU 1% of its GDP around €100 billion – a year
- The threat from terrorism to transport
- The consumption of 30% of all the EU's energy by transport



How can ITS help?

1. ITS to reduce congestion

Situation in the EU Transport Sector

Transport growth for the period 2000 – 2020:

- GDP growth + 52%
- Freight transport + 50%
- Passenger transport + 35%
- Private cars + 36%
- Environmental cost is estimated = 1.1% of GDP
- Road congestion cost estimated = 1% of GDP

Congestion Mitigation by Traffic Management

- Congestion have very negative impact on GDP
- New, improved, and better utilized infrastructure will be needed
- Traffic Management required for complete intermodal trips
- Intelligent mobility solutions and transport demand management will alleviate congestion
- Co-modal logistics chains which optimize the use of transport infrastructure within and across the different modes
- Urban Charging Schemes

2. ITS to reduce accidents

Challenge - Road Safety

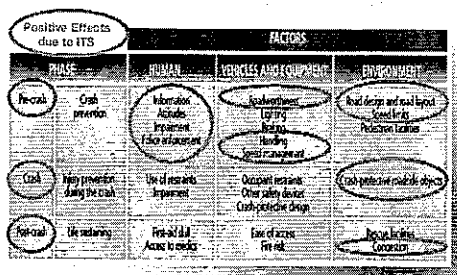
- Worldwide, 1.2 million people die in road accidents per year (WHO, 2001)
- Europe, 40.000 fatalities per year
- Goal: reduce to 50% by 2010
- Road crash costs in Europe per year:
  - 1.5% of GDP, equals to ~ €8bn

The Haddon Matrix

PHASE		FACTORS		
		HUMAN	VEHICLES AND EQUIPMENT	ENVIRONMENT
Pre-crash	Crash prevention	Information Attitudes Impairment Police enforcement	Roadworthiness Lighting Braking Handling Speed management	Road design and road layout Speed limits Pedestrian facilities
Crash	Injury prevention during the crash	Use of restraints Impairment	Occupant restraints Other safety devices Crash-protective design	Crash-protective roadside objects
Post-crash	Life sustaining	First-aid skill Access to medical	Ease of access Fire risk	Rescue facilities Congestion

Source: WHO World report on road traffic injury prevention 2004

Positive Effects due to ITS



ITS to reduce fatalities

- Speed monitoring and enforcement
  - section speed monitoring
- Wrong way driving detection
- Alcohol detection and engine locking
- Traffic information
- eSafety

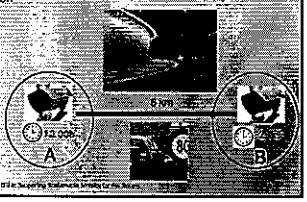
Speed Limiting Instruments

- Speed enforcement, that automatically catch drivers, reduce road traffic deaths and serious injuries by 14%,
- Whereas enforcement by police officers achieves a 6% reduction. [1]
- Publicizing the presence of speed cameras or radar reduces the incidence of crash and injury substantially.
- Speed limits are a matter of driver-education and strong enforcement
- Integrated speed monitoring better than punctual speed monitoring:
  →Section Speed Monitoring

[1] WHO World report on road traffic injury prevention 2004

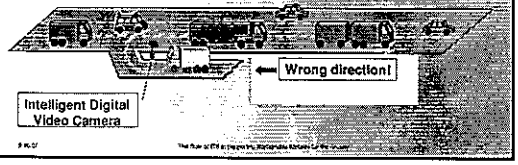
Section Speed Monitoring by Digital Image Processing

- The higher the speed, the shorter the time a driver has to stop to avoid a crash.
- The higher the speed, the more severe is the impact, when a crash occurs.
- Example:
  - License plate and time are monitored at begin and end of the section
  - Distance from A to B is 8 km
  - maximum allowed speed is 80 km/h
  - Must results in minimum travel time of 6 minutes
  - If time is e.g. 5 minutes, then speed is 96 km/h !!!



Detection of Wrong Way Drivers by Digital Image Processing

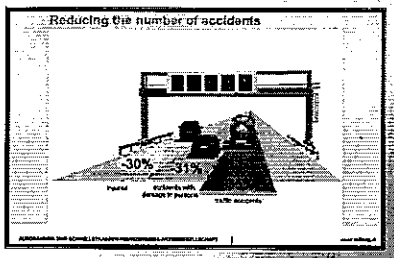
- Intelligent digital video camera installed at exits
- If a vehicle with wrong driving direction is detected, the following actions are started:
  - report to a traffic control centre
  - alarming police
  - warning of drivers on that particular stretch of the road



Hazardous Goods Management (HGM) by Integrated Data Management

- Actual Information on load in On Board Unit and in back office
- Identification of position of vehicles at critical locations, e.g.: information as approaching tunnels
- Separation of vehicles
- Real Time Information in case of accidents
- Action plan for emergency services

Plan for Austria: Reduction of Accidents until 2010



3. ITS to finance infrastructure

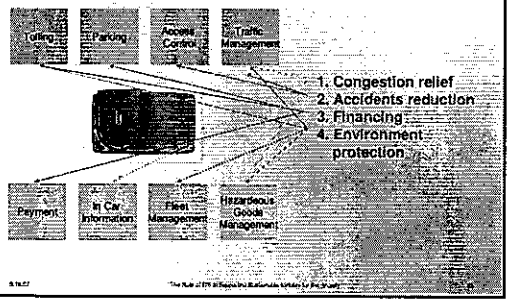
Bottlenecks in Financing of Infrastructure

- Bottlenecks in financing of road infrastructure exist for:
  - EU: Investment level in transport infrastructure in all EU Member States has fallen to less than 1% of GDP
  - New Roads
  - Extensions
  - Maintenance (e.g. bridges)
- Impacts of lack of financing:
  - Reduced quality of roads →accidents
  - Work zone completion is delayed →congestion and accidents
  - New roads can not be built →congestion
- Action: mobilize all available sources of financing, and improve the "finance engineering" tools:
  - Concessions, PPP, PFI, BOT
  - Road User Charging & Electronic Tolling for trucks and/or all vehicles

Electronic Tolling: A major financing platform for ITS

- Electronic Tolling is THE precursor for ITS
  - Financing
  - Sensing
  - Data generation
  - Infrastructure improvement

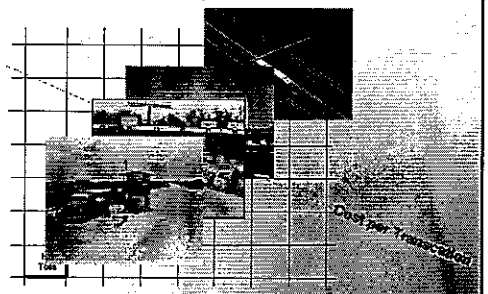
Vision: Every Car has an OBU to Serve ITS



Intentions for Tolling

- Revenue collection for the service
  - at bridges, tunnels, sections, regions, cities, nationwide, first level roads, all roads, ...
- Support of national taxation
- User based charging instead of time based fees (vignette)
- Refinancing of PPP, BOT, PFI, ...
- Traffic management
- Environmental interests
- Behavior change

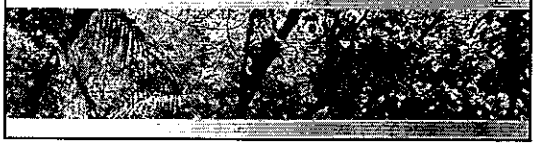
Tolling Modes of Operation



Synergies of Tolling and ITS

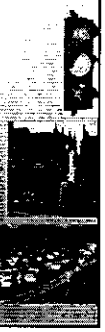
- Parking
- Access Control
- Section Control (speed measurement)
- Hazardous Goods Management
- Traffic Management (electronic traffic signs, closing lanes, changing speed limits)
- HLS – Homeland Security

4. ITS to help the Environment



ITS to help the environment

- Traffic Light synchronization – green waves
- Urban goods logistics delivery management
- Traffic Management & Direction Instructions
- Temporary one way traffic diversions to ease flow
- Motorway congestion measures – variable speed limits
- Ramp metering
- Construction site congestion management
- Improved vehicle control using external sources of data
- Source: Erbse Think Tank 2008



Developing High Quality Urban Transport

- The most effective measures to reduce traffic volumes in urban areas are:
  1. Charging (e.g. the London Congestion Charging),
  2. Access restrictions (e.g. the "Zone a Traffico Limitato" in Rome)
  3. Parking management (e.g. Winchester, Rotterdam).
- Although there is no technologic challenge in introducing these measures, the political challenge is considerable

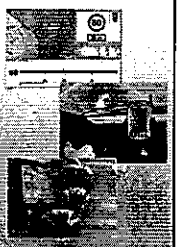
Future Options

Why is the use of ITS still limited?

- Telematics too complex ?
  - Lack of public awareness, must be understandable for everybody
  - Must be non-discriminatory
- No cost – benefit understanding ?
  - For Customers
  - For Road Operators
- Insufficient funding ?
- Missing policies and legal framework ?

ITS Applications Tomorrow

- eCall
- Cooperative systems for traffic management
- Advanced driver assistance systems in vehicles
- Integrated Communication (VII)
  - Vehicle to Vehicle
  - Infrastructure to Vehicle
  - Infrastructure to Infrastructure
- Combining information from various sources, with consistent driver/passenger information
- Improved management of incidents



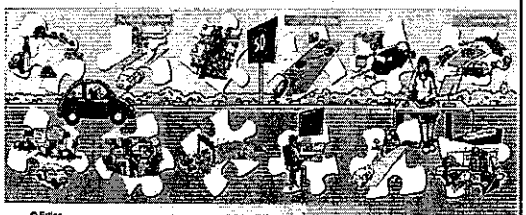
ITS Applications - Future

The various telematics applications in road and intermodal transport, may be achieved by a combination of basic or shared technologies:

- Telecommunication supporting ITS
- 4G Communication technologies, 5.9 GHz
- Automatic identification systems to track and trace vehicles, goods, ...
- Automatic location systems to manage supply chains
- Traffic data collection (and automatic classification of vehicles)
- Electronic data interchange
- Electronic maps and geographic information systems
- Different correlations between such telematics elements, necessarily including at least the telecommunication generates the different mentioned ITS
- Standardization

Summary

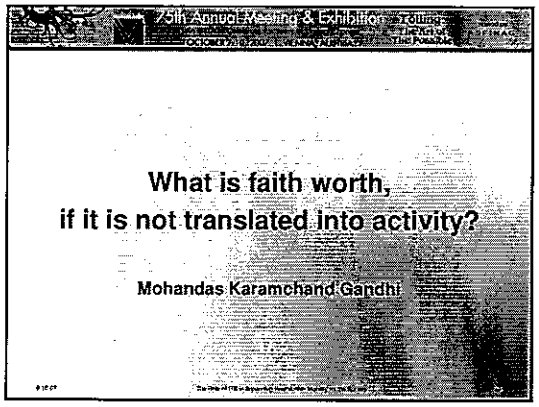
ITS - Benefits



© Erico

ITS – The Way Forward

- We need more ITS:
  - Better Road Service
  - Improved Road Safety
  - Higher Road Utilization
  - Reduction of Congestion
- We need to develop the proper policy
- We need to cluster in partnerships
- And ...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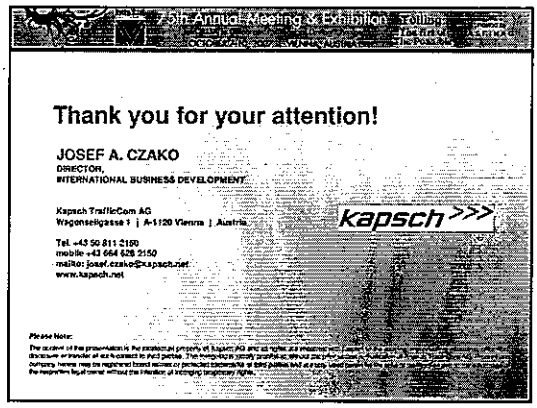
What is faith worth,
if it is not translated into activity?
Mohandas Karamchand Gandhi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Thank you for your attention!
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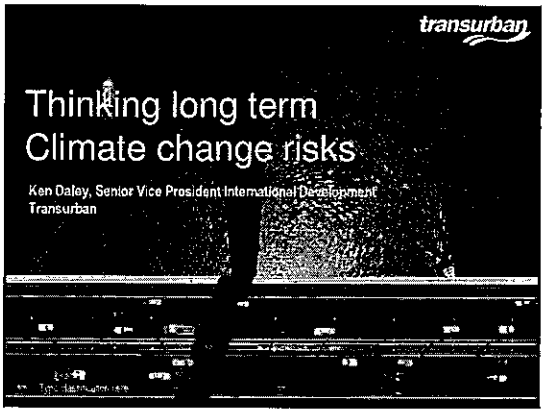


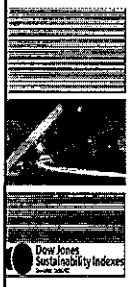
Disclaimer

Presentation Overview

1. Who is Transurban?
2. Why does Transurban care about sustainability?
3. Transurban's approach to sustainability
4. Climate Change and our industry
5. Climate change risks
6. Food for thought
7. Climate Change opportunities
8. Making progress: climate change initiatives
9. Case study: Carbon Neutral Construction

*Insert note here

Who is Transurban?



- Long term developer, investor, manager of toll roads
- Market cap: US$6.5 billion
- More than 750 staff in office in Australia and North America
- Majority interests in six of Australia's most important toll roads
- Operating one toll road and developing two major HOT lanes projects in Virginia, US.
- Unique mix of in-house capabilities, including: customer service, stakeholder engagement, project development, concession management, financial management, traffic modeling, open road tolling and enhancing road performance
- One of the world's most sustainable companies as recognized by the Dow Jones Sustainability Index (DJSI) 2006 & 2007

*Insert note here

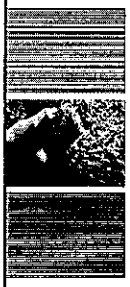
Why does Transurban care about sustainability?

"CSR is a strategy for aligning our business with the long term interests of its stakeholders. Without their support we won't have a business for very long."

Kim Edwards, Managing Director Transurban

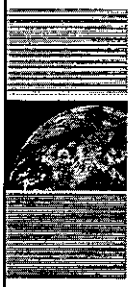
- Our business model is based on long term thinking
- Our success relies on long term government / community support
- Helps us to manage risk
- Stimulates innovation and new ways of thinking
- Protect the jobs we provide and create new ones
- Protect our investors' long term interests and deliver returns to them

Transurban's approach to sustainability



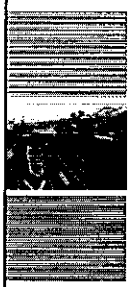
- Build it in don't bolt it on
- Four 'pillars' of Transurban's sustainability program
  - Our customers
  - The community
  - The environment
  - Our employees
- Involve our employees, our most senior management, our customers and local communities
- Develop standards that can be applied consistently within Transurban's new operations.

Climate Change and our industry



- Transportation is a major contributor to carbon emissions.
- Toll roads generate motor vehicle travel and that travel produces greenhouse gas emissions
- As public policy responds to the need to minimize climate change impacts, regulatory frameworks will continue to change
- Companies will need to accurately report and offset or reduce energy use and GHG emissions
- Transurban aims to be ahead of regulation in both of these areas.
- We believe we have a responsibility to reduce our climate change impacts.

Climate change risks



Direct risks

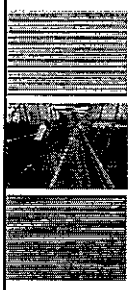
- Increase in the cost of road construction and maintenance[1]
- Extreme weather conditions could reduce travel and therefore revenue on our roads

Indirect risks

- Customers switching their travel to public transportation
- Governments deciding to reduce the number of new toll road projects
- Population moving away from areas served by our roads

1. CSIRO estimates road maintenance costs will increase 17% if average temperatures increase > 2%

Climate change opportunities



Pricing structures

- Working with governments to use road pricing to manage demand
- Congestion pricing spreads demand and transfers some travel to public transportation

Intelligent Transport Systems

- Electronic tolling, dynamic lane control systems and other technology-based solutions aid efficient traffic flows
- Average speed increases, travel times and stop-start traffic decreases

*Insert note here

Climate Change Opportunities

High Occupancy Toll (HOT) Lanes

- Fluctuating toll prices regulate demand, keeping lanes congestion free even during peaks
- HOT lanes provide an incentive to carpool because carpools travel free
- Transurban's HOT lane projects in Northern Virginia support new and enhanced public transportation in the area.

New business development

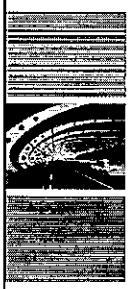
- Sustainability credentials are increasingly important to Governments awarding new toll road projects, including management of climate change risks
- Transurban is developing leading skills in reducing and off-setting GHG emissions during construction and operations

Making progress

During the past year, Transurban has:

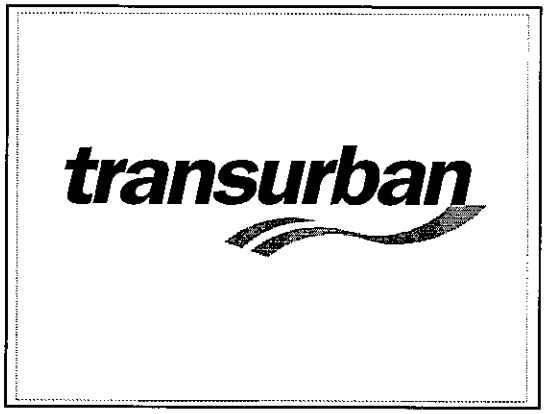
- Implemented an Environmental Management System to better monitor the GHG emissions we produce
- Reduced GHG (CO^2) emissions from the operations of CityLink in Melbourne, by 4,900 tonnes per year with a corresponding 9 percent reduction in energy use
- Delivered a carbon offset and education program for Australian customers
- Developed a demonstration project incorporating new sustainability standards for road construction.

Carbon neutral construction



Southern Link Upgrade

- Partnership with Victorian State Government in Australia
- We have set 'carbon neutral' target for construction work
- GHG emissions to be estimated at project design phase
- GHG emissions to be tracked throughout construction and offset upon project completion
- Incentivize construction and road design partners to reduce GHG emissions
- Project will allow us to develop a framework to assess the cost of factoring carbon neutrality into all our new development projects.


transurban

E-Z Pass Interoperability
A Mature System With its' Own Limits

Jim Crawford
Executive Director
E-Z Pass Interagency Group (IAG)
Atlantic City, NJ USA

WHAT IS E-ZPass ?

- An Electronic Toll Collection System
  - Toll Agencies and Companies joined together in offering the public a common method of Toll payment
  - Unified by a common belief of "ONE TAG, ONE ACCOUNT"
  - Committed to prompt reconciliation of accounts and charges
- A Well-Known and Highly Accepted Brand

WHAT IS THE E-ZPass IAG ?

- The organizational structure established to ensure common goals, reciprocal procedures, equipment testing and information exchange processes
- The joint efforts of 23 Members representing 68 toll facilities in 12 states in their efforts to provide seamless toll collection to all their customers

HOW DID THE IAG GROW?

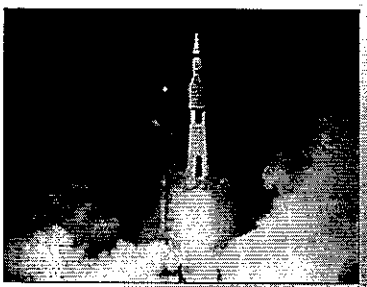
1994 · 1999 · 1999 · 1998 · 2000

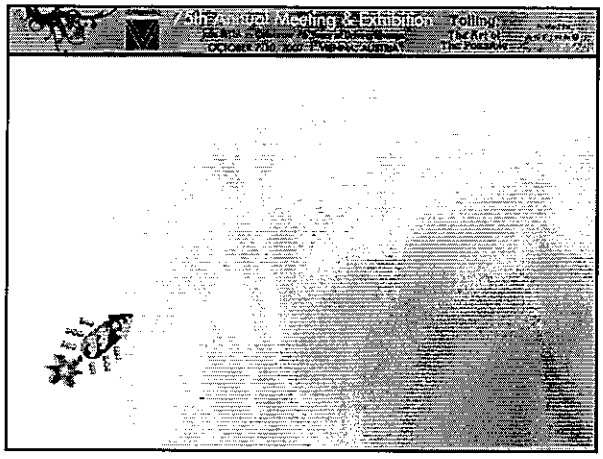
THE PORT AUTHORITY OF NY & NJ — 1997

Bridges and Tunnels — 1996

BUT BY THEN THE ORIGINAL SEVEN HAD BEEN JOINED BY OTHERS

And it Took Off




75th Annual Meeting & Exhibition
Tolling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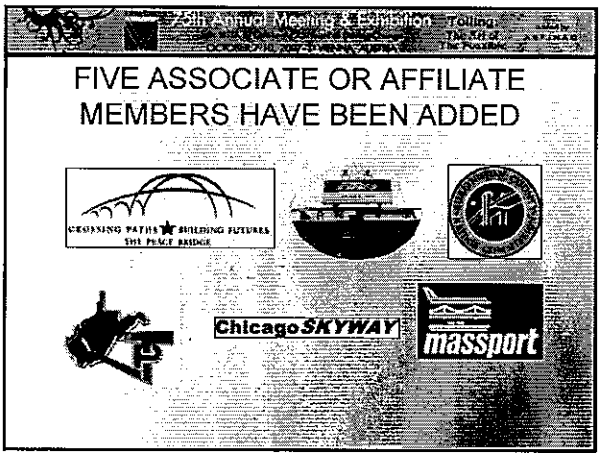
Tolling
THE PORT AUTHORITY OF NY & NJ
Bridges and Tunnels
Department of Transportation
VDOT
DELAWARE RIVER PORT AUTHORITY
Illinois Tollway
Open Roads for a Faster Future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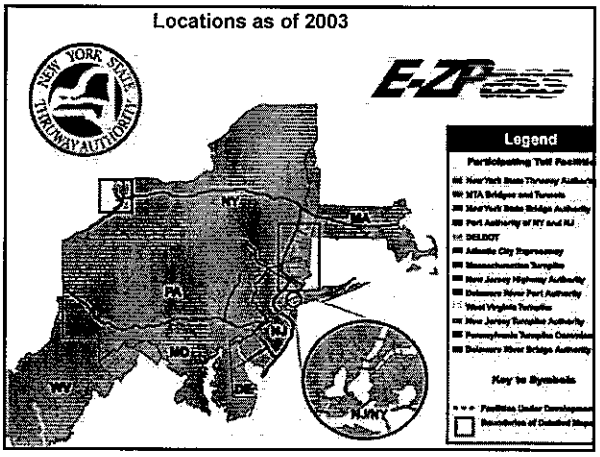
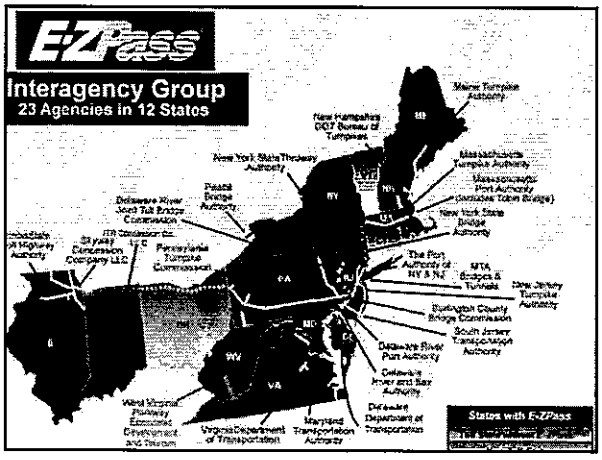
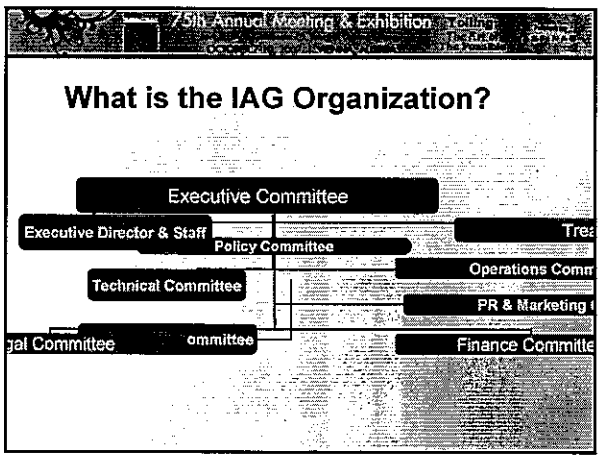
Tolling
FIVE ASSOCIATE OR AFFILIATE
MEMBERS HAVE BEEN ADDED
CROSSING PATHS ★ BUILDING FUTURES
THE PEACE BRIDGE
Chicago SKYWAY
massport


Locations as of 2003
E-ZPass
Legend
Key to Symbols


E-ZPass
Interagency Group
23 Agencies in 12 States
Maine Turnpike Authority
New Hampshire DOT Bureau of Turnpikes
New York State Thruway Authority
Massachusetts Turnpike Authority
Peace Bridge Authority
Delaware River Joint Toll Bridge Commission
New York State Bridge Authority
Pennsylvania Turnpike Commission
The Port Authority of NY & NJ
MTA Bridges & Tunnels
New Jersey Turnpike Authority
Burlington County Bridge Commission
South Jersey Transportation Authority
Delaware River Port Authority
Delaware River and Bay Authority
Delaware Department of Transportation
Maryland Transportation Authority
Virginia Department of Transportation
West Virginia Parkway Economic Development and Tourism
States with E-ZPass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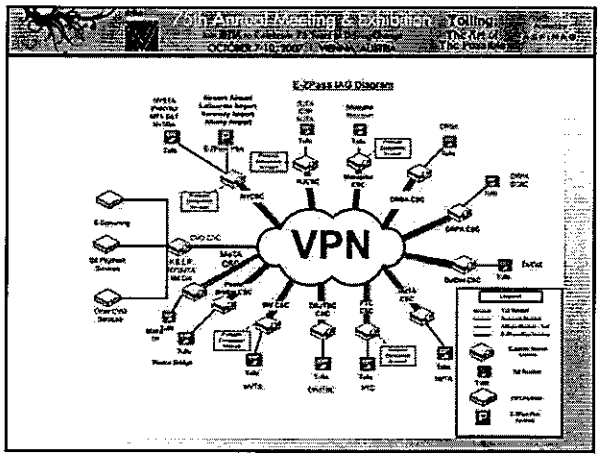
Tolling
What is the IAG Organization?
Executive Committee
Executive Director & Staff
Policy Committee
Technical Committee
Finance Committe

HOW DOES E-ZPASS RECIPROCITY WORK?

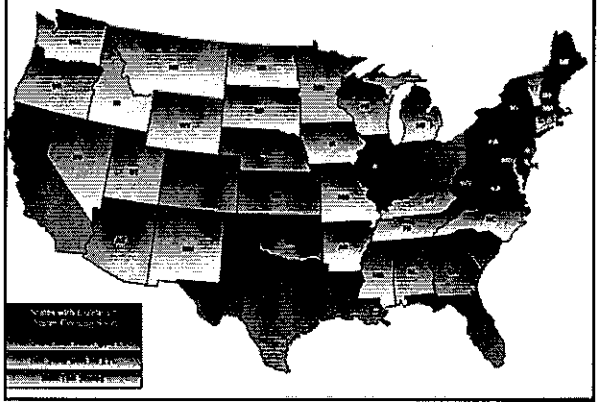
- Reciprocity
  - Daily
    - Validate Accounts
    - Validate License Plates
    - Note Lost and Stolen
    - Provide Transaction Transmission
  - At least Monthly
    - Full Payments for Tolls
    - Reconciliation of Differences
  - Quarterly
    - Payment of Credit Card Fees



WHY RECIPROCITY?

- Trips throughout the region cross multiple facilities
- Reciprocity provides method, timing and rules for paying those transactions without customer involvement
- Reciprocity ensures each agency is treated equally
- Reciprocity = One tag, One account

Electronic Toll Collection in the United States



HOW DOES RECIPROCITY WORK?

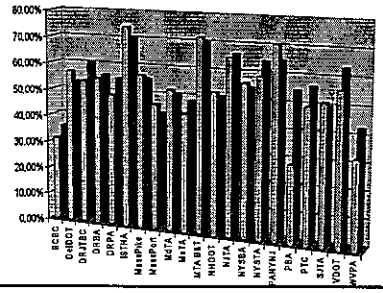
- Each transaction is coded by the agency issuing the transponder (Home Agency)
- The collecting agency (Host Agency) groups transactions daily and forwards to the appropriate agency each night
- The Home Agency pays at least monthly the full amounts due for their customers transactions (wire transfers)
- The Host pays the Home agency for credit card fees

What we are doing?

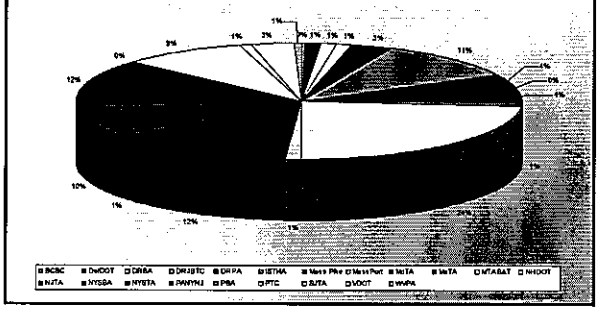
- Serving over 9 million accounts
- Servicing 16 million transponders
- Collecting $3.5 billion annually electronically
- Exchanging $1.6 billion annually
- Handling over 2 billion transactions electronically

TRANSACTION & REVENUE

2006 Penetration Rates by Agency



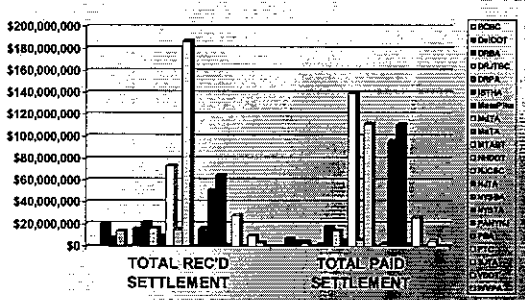
TOTAL REVENUE DISTRIBUTION BY AGENCIES (2006)



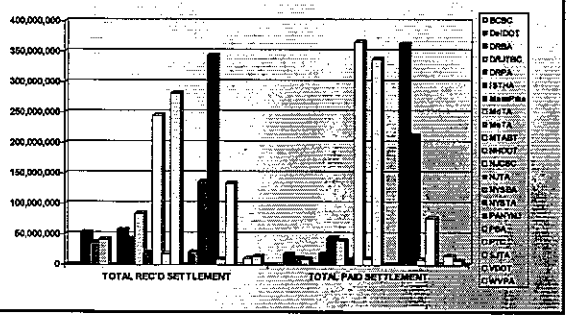
KEY INTEROPERABILITY ISSUES

- 73% of all transactions are from the Host Agencies' Customers
- However 46% of Revenues flow from Home to Host (importance of commercial accounts)
- Credit Card fees are between $60-100 million annually
- Accountants look for tractability of transactions therefore gross payments not net payments are conveyed

2006 Cash Settlements

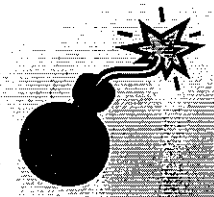


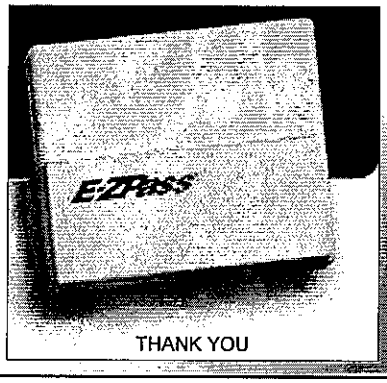
2006 Transaction Settlements



LIMITS ON INTEROPERABILITY

- Trust
- Frequency
- Balance
- Integrity
- Violations





THANK YOU

For Further Information

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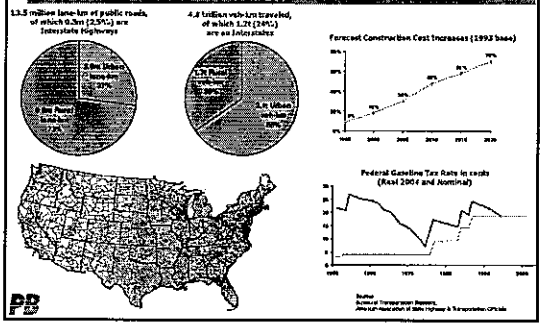
Promoting Alternative Funding Mechanisms for the Expansion and Rehabilitation of Surface Transportation in the US

Matthew Simon Bieschke

PB Consult, Inc., a Parsons Brinckerhoff Company

9 October 2007

US road network is mainly rural/local, but traffic is mainly on urban roads & Interstates



Why Transportation Finance is Changing

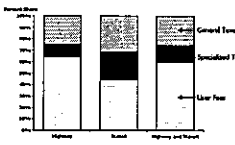
US Transportation Infrastructure Benefits
- Dedicated Fuel Tax
- Tax-Exempt Bond Market
- Freight

Fundamental Shifts Occurring
- Flat Fuel Tax Losing Ground
  - Inflation
  - Expensive urban improvements
  - Increased freight factor
- Trend of DECREASING Fuel Revenues
  - Higher fuel prices, more MPG & alternative fuels

What are the typical sources of public funds?

- General Taxes: Income, Property, Sales/Use, and general taxes not dedicated to transport
- Specialized Taxes: Special taxes levied for/ partially dedicated to transport, value capture
- User Fees: Motor fuel tax, vehicle registration fees, vehicle excise tax, tolls, fare revenues

Percent Share of Highway and Transit Funding, 2004



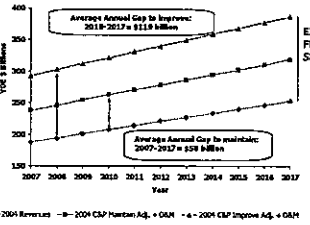
Federal	State	Local
• Motor Fuel Tax • Vehicle Taxes & Fees • General Appropriations	• General Revenue • Motor Fuel Tax • Motor fuel tax indexing • Sales tax on motor fuel • Petroleum franchise or business taxes • Vehicle registration & license fees • Vehicle personal property tax • Excise tax on vehicle sales	• General fund appropriations • Fares and fees • Property tax • Sales Tax • Investment income • Bond proceeds

Funding Challenge: Needs Growing Faster than Resources

The cumulative gap in highway and transit funding over 2007-2017 period is projected at $634.7 billion for the need to maintain, and $1.3 trillion for the need to improve

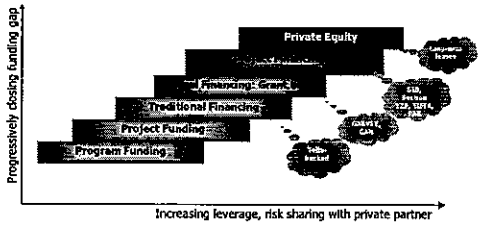
Financial health of the Highway Trust Fund: HTF is expected to incur a $4.3b deficit in 2009.

If this default cannot be bridged, Federal government will need to cut more than $16b in the $43b SAFETEA-LU funds to State governments.



ENORMOUS FUNDING SHORTFALL!

How can this "Gap" be bridged?



Leveraging transportation assets and increased private participation can help bridge the funds deficit in transportation funding

Are Toll Roads the Answer? Financing gets us part way there, but still has to be repaid

Reasons Why Toll Roads are Key

- Creates new revenue & readily monetized
- Electronic toll collection & video tolling
- More than revenue – Congestion management
- User fees not taxes
- HOT/TOT lanes
- Value as PPP

Other Non-Taxed Based Sources

- Value Capture
- Shadow Tolling / Availability Payments

More conceptual & controversial, but potentially highly valuable, options

- Mileage fees
- Tolling existing capacity
- Public Sector Comparators
- Public benefit corporations
- Privatization

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There are a variety of opinions on how best to address the shortfalls (crisis?)

- Should we just keep raising the gasoline taxes and peg to inflation?
- Should valuable assets like the Pennsylvania, New Jersey turnpikes be monetized?
- If so, should the money be spent on transportation only?
- Additional value can be derived solely from pricing, but are we willing to accept the prices?

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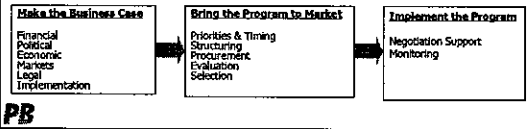
Education & admitting there is a problem is key to succeeding project implementation

- Before publicly introducing options, gain support from senior stakeholders
- Embrace that tolling isn't the only answer; Nor is a PPP – but we should evaluate to be better armed and to educate
- Build external support after running numbers and quantifying gaps
- Projects must be 'bankable' and meet financial performance criteria
- How do we overcome skeptics? How do we close competing objectives?



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Who Still has to Play What Role?

An important role for the federal government

- Capturing and disseminating Best Practices
- Creating an enabling federal legal environment
- Developing and streamlining federal revenue sources

State & Local governments face critical challenges

- Each State is progressing at its own pace – no national framework
- Locals can be more creative and have more control today
- Traditional procurement practices favor design, bid, build and lowest price contracting

Opportunities and Challenges for Contractors

- Willingness to take on Design-Build risks & participate in long-term equity

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Questions

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75 YEARS OF DRIVING CHANGE

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Aligning Public and Private Interests Through Tolling Regime in Concession Contracts

Michael A. Benoualch
PB Strategic Consulting Service Line

Agenda

- What is the role of government in the delivery of road assets:
  - Under a public authority model?
  - Under a toll concession model?
- How do tolling regulations in concession contracts reflect public policy choices?
- How can these regulations be structured to better align public and private objectives?
- How is this implemented in practice?
- Can tolling do it all? What are the other tools in the "tool box"?
- Concluding remarks

Why are governments involved in the delivery of road assets?

- Benefits accrued to users and non users: National security, trade corridors, regional development, individual mobility
- Negative externalities (spillovers)
- Universal access to personal mobility is viewed as a fundamental right
- Difficulties in assembling right of way requiring the use of eminent domain
- Economies of scale
- Modal distribution choices (EU vs. US)
- Road assets (as well as other infrastructure) exhibit the characteristics of natural monopolies

What are the challenges associated with public delivery of road infrastructure and services in the OECD?

- Increasing demand
- Aging infrastructure networks
- Increasing capital and maintenance costs
- Competition for limited public funds (budget constraints)
- Weak incentives for innovation, competition, and efficiencies

PPPs provide one (out of several) way(s) to address the challenges facing the public sector

In concessions, the role of government shifts from delivery and operations to performance specifications and oversight

Public Authority Model

- Roads deliver public service
- Rates are set to cover life-cycle costs (including public debt service)

Concession Model

- Private equity investors aim at maximizing yield
- Delivery of assets and services are *set by contract* to pre-specified levels of performance. And so are user charges!
- Strong market incentives to provide superior service, but...
- Main objections:
  - Protecting the public interest
  - Avoiding "excessive" prices and/or "excessive" private return
  - Preserving the government's flexibility and control

As quasi-monopolies, toll roads require strong contractual provisions protecting users and non-users

- Non-compete clauses
  - Attractive for private sector but may be against public interest
  - Limited non-compete clauses could add value without restricting the flexibility of the public sector to add capacity (Indiana Toll Road, Texas SH130)
- Limiting private return
  - Traditional approach in the U.S. utility and infrastructure sectors
  - Costly audits to monitor and evaluate
  - Perverse disincentives leading to overinvestment and decreased efficiencies?
- Limiting revenue
  - If well structured, revenue sharing clauses have no material disincentives
  - Government use of the proceeds is a policy decision impacting public perception
- Regulating Toll Rates
  - HOW?... *This question will be our main focus today*

A new paradigm for tolling policy

Original premise: "Turnpike tolling"
- Tolls historically set to cover life-cycle costs or maximize revenue
- Significantly impacted by political pressures

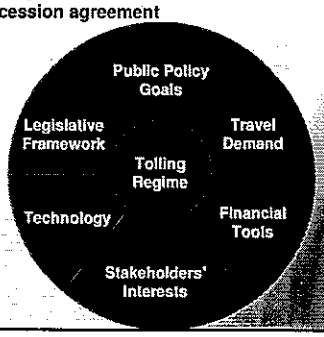
New paradigm: Balance multiple & conflicting public policy objectives
- Maximize financing capacity (private debt and equity) / Minimize government costs
- Manage congestion / Maximize throughput
- Promote capacity expansion / Improve safety
- Protect / Promote / Manage specific user categories
- Protect users against "abusive" toll rates
- Avoid "excessive" private sector return

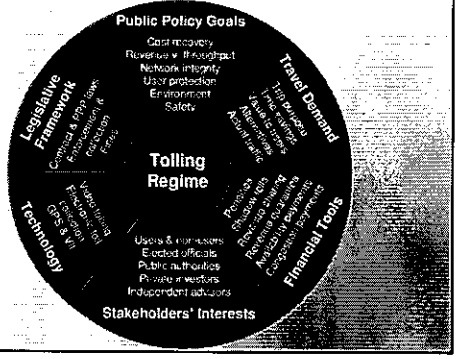
→ Necessary prioritization and trade-offs are *government decisions*
→ Public policies diverging from private interests reduce concession value

Balancing public and private interests has become the primary function of tolling policy in concession contracts

Yet, not all public objectives can be achieved through pricing *(more on next slide)*

The tolling regime is the central and most visible piece of the concession agreement





The tolling regime is the contract clause defining which and how users are charged, and how tolls vary over time

Who pays a toll?
- All users
- All users but exempt users: HOV+2, HOV+3, transit and emergency
- Users in a given lane, corridor, area, or system

How users are charged?
- Vehicle characteristics reflecting road usage (weight, height, # axles)
- Distance traveled (price per mile can vary); limit crossed (bridge, cordon)
- Discounts: mode of payment, vehicle type, occupancy, residency, volume…
- Administrative charges, cost of violation

How do tolls increase/decrease over time?
- Daily, weekly, seasonal, and annual cycles
- Traffic conditions on the facility or adjacent facilities
- Adjustment procedures governing increases over the life of the concession and limiting the maximum toll rate

Complexity and main value drivers

Tolling regimes can be classified based on time-of-day variability and procedures limiting the maximum toll rates

Toll variability by time of day: Degree of congestion management
- **Uniform Charge** - Tolls do not vary by time of day but may vary based on seasonal cycles
- **Static Congestion Pricing** - Tolls vary by time of day (or week) based on a pre-set schedule
- **Dynamic Congestion Pricing** - Tolls vary by time of day based on actual traffic conditions on the facility or adjacent facilities (hourly or up to the minute variations)

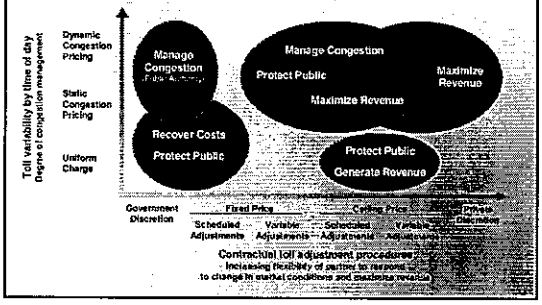
Contractual adjustment procedures: How high can tolls go? And who decides?

- **Government Discretion** - Tolls set by public authorities without private sector control
- **Private Discretion** - Tolls set by the concessionaire without governmental control

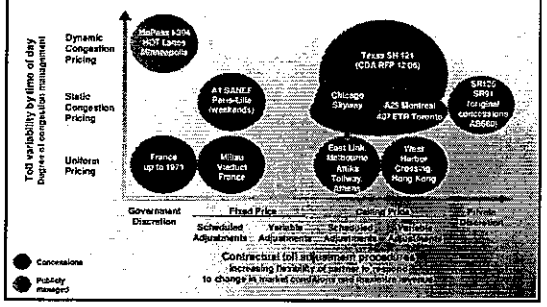
- **Fixed Price** - Toll adjustment procedure regulates the actual toll rates
- **Ceiling Price** - Toll adjustment procedure regulates a not-to-exceed toll rate (ceiling) and the concessionaire is free to set tolls below the ceiling

- **Scheduled Adjustments** - Set by schedule based on formula linked to economic indices
- **Variable Adjustments** - Based on actual traffic conditions or revenue level

Choice of time-of-day pricing and contractual adjustment procedures reflects prioritization of public policy objectives



Time-of-day pricing and contractual adjustment procedures: Project examples



The Completion of A25 in Montréal: balancing revenue and throughput objectives while protecting users

Public Policy Goals

- High quality, efficient, and safe road
- At the lowest cost for the Government
- Encourage (peak) usage of the Bridge
- Open Toll Road (100% ETC)
- Respect equity among users
- Prevent prohibitive tolls / toll increases
- Respect environmental constraints

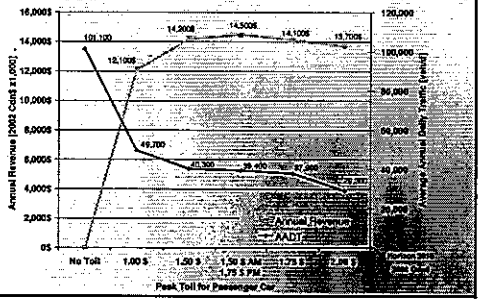
Demand Characteristics

- "Tumultuous" history with tolling
- Congested adjacent free facilities
- Without tolls, A25 Bridge congested during peak hours
- Relatively small time savings
- Time-of-day pricing pushes up the revenue curve (commuters)

Tolling Policy

- Set peak toll ceiling to allow revenue maximization
- Set off-peak toll ceiling to "encourage" off-peak utilization
- Toll floor to respect environmental decree (max traffic 68,000 AADT) and prevent "manipulation" of toll increase mechanism
- Tolls set freely between cap and floor
- Automatic toll ceiling increases when traffic thresholds are met (variable)
- Tolls set ahead monthly (static)
- Toll ceilings adjusted for inflation every year (scheduled)
- Low revenue → Availability payment
- Revenue guaranteed
- Revenue sharing

The Completion of A25 in Montréal: Tolling regime must be based on sound traffic and revenue forecasts



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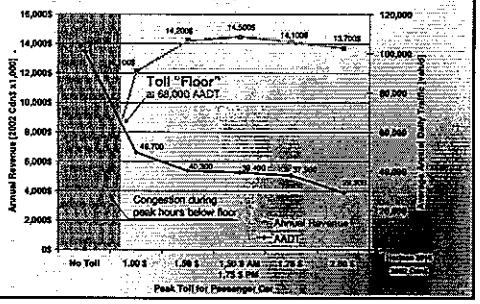

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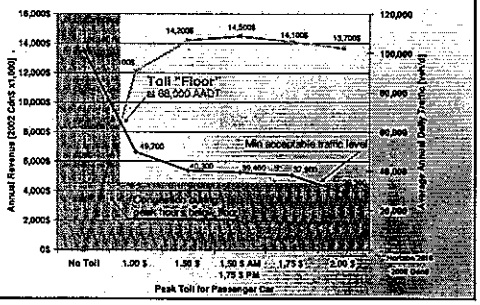

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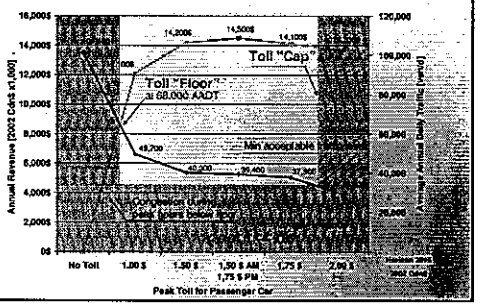
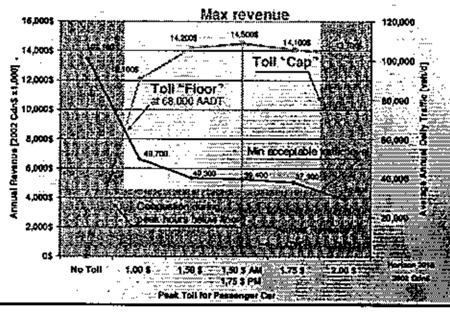


The Completion of A25 in Montréal: Tolling regime must be based on sound traffic and revenue forecasts



Not all public objectives can be achieved through pricing: Other tools to reconcile revenue and throughput objectives

In general... Toll @ max throughput < Toll @ max revenue

Some other tools in the "tool box"

- Other types of PPPs (DB, DBOM) where tolls can be controlled by public agency
- Government agency can control tolls in a concession... as long as there are other tools to guarantee investment return (concession period)
- Availability/performance payments can be used to complement/replace toll revenues
- Penalties can be used instead of caps (e.g. 407 ETR)
- Revenue sharing and guarantees ensure equitable distribution of T&R risks
- Shadow tolls can be used to create incentives to increase volume (UK experience)
- Texas "pass-through toll financing" (for public or private sector)
- UK "Congestion Management Payments" and "Safety Payments"
- "Concurrent Shadow Tolls and Real Tolls" for congested facilities could be implemented to reconcile revenue and throughput objectives"
- Active traffic management (variable speeds, lane shifts)

Concluding remarks

- Toll concession is a business deal... but the government is in the driver seat
- Concessions provide long-term visibility to investors by removing toll increase decisions form the political sphere
- Tolling policy is the main tool to align public and private interests and the main value driver of the concession (i.e. some toll policy choices have a cost)
- Pricing cannot answer all public policy goals: other financial tools are also needed
- Understanding demand and good traffic and revenue forecasts are as important for the public sector to establish tolling policy as for the private sector to assess value
- Advances in technology allow for increasingly complex user charging schemes
- Public acceptability can be the real limit, no matter the intent of the tolling policy: success stories and "tolling disasters" can be traced back to public outreach
- Public sector adopting "concession-like" tolling policies increasing visibility:
  - "91 Express Lanes Run Like a Business by the Public Sector" by James Kenan
  - Florida House Bill 985 mandating annual toll increases indexed to CPI
  - ➔ "Good old PPP" Publicly run & financed by public debt bought by private sector

Credits

The author of this presentation gratefully acknowledges the contribution of the following people in the development of the tolling policy for the Completion of Autoroute 25 Project :

Alain Audette, President, Loctrans, and Coordinator for Traffic and Revenue Studies, Bureau de la mise en œuvre du partenariat public-privé Ministère des Transports du Québec

Sandra Sultana, Director, Bureau de la mise en œuvre du partenariat public-privé Ministère des Transports du Québec

Rémi Coulneau, Director at the Agence des partenariats public-privé du Québec

LOCTRANS

Transports Québec

Project notes

• I-394 MnPASS Express Lanes, Minnesota, USA is not a concession, but "was developed and completed through a public/private partnership [...] The private firm funded 20% of the project's estimated $10 million." Tolls vary automatically every six minutes from $1.0 to $4.0 up to $8.0 to maintain speed above 50-55 mph. HOVs and public transit riders use the lanes for free. Project aims to "generate revenue and manage congestion to achieve maximum efficiency of the highway system." Opened in May 2005.

• 407 ETR in Ontario, Canada is a 100% ETC facility. Concessionaire is free to raise tolls after the base year (1999 in operation) while maintaining traffic levels above traffic threshold. If tolls are above toll threshold and traffic below traffic threshold, penalties apply. Regular increases based on formula.

• 1955-1970 in France. Construction and operation of toll highways through concessions awarded to public-private corporations (SEMCA, "Société d'Économie Mixte Concessionnaire d'Autoroutes") in which the government had controlling interests. Tolls controlled directly by Ministry of Finance up to 1971.

• A1 SANEF Paris-Lille, France. Discounts around 25% are offered to passenger cars toward Paris on Sunday (or Monday when it is a holiday) when toll booths are crossed between 2.30pm and 4.30pm or 8.30pm and 11.30pm (lesser congestion).

• Chicago Skyway, Illinois, USA is operated under a 99-year lease concession awarded to the Skyway Concession Company in 2005. Toll rates are set per axle and are higher during peak hours (4am to 8pm). Contract allows increases after five years to the highest of 2%, CPI, or GDP.

• SH 121, Texas, USA. RFP CDA as of 12/06 fixes maximum toll rates with scheduled increases and mandates operator to implement "time of day pricing" for peak periods. If tolls during peak periods are above ceiling, off-peak tolls are reduced so that toll revenues approximate total revenues in the absence of time of day pricing.

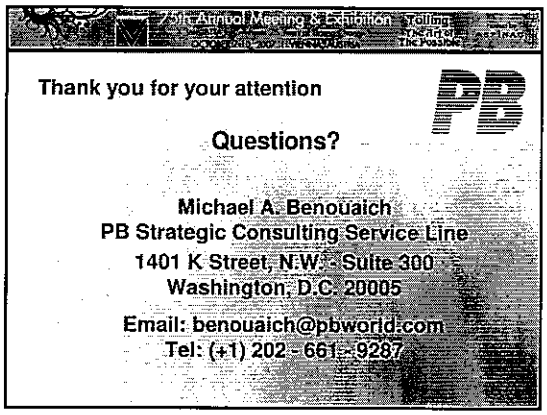
• Attika Tollway, Athens, Greece. Tolls are set by the concessionaire below the Contract Maximum Upper Toll Rate (part of the concessionaire's proposal). Though tolls may vary +/- 30% during the day by contract, a uniform rate is currently charged. The Upper Toll is adjusted based on inflation. The concession period extends up to the date where the pre-set Return on Equity is reached. Discounts are provided to ETC users based on the volume of transactions.

• East Link, Melbourne, Australia. Tolls are set by the concessionaire below a specified ceiling. Though tolls may vary during the day by contract, a uniform rate is currently charged. Toll ceiling increases annually by CPI. Toll based on a variable per-mile rate, higher for tunnels. Revenue risk born entirely by concessionaire. 30% discounts for cars only for weekends and holidays and for "single section trips" (i.e. between interchanges). 39-year concession awarded to ConnectEast in October 2004.

• Western Harbor Crossing, Hong Kong, China. The original toll adjustment regime allows operator to advance toll increase if traffic and revenue fall below forecasted thresholds; conversely, scheduled toll increases can be differed if revenues exceed forecasts.

• SR91 and SR125, California, USA were originally developed under concessions authorized by the pilot legislation AB 680. Original concession contracts placed no limit on maximum toll [illegible]. SR91 is now publicly operated. SR125 is to open next month. SR91 uses a static congestion pricing, and SR125 a uniform pricing based on variable per mile rate and # of axles). SR91 offers discounts to HOVs and zero emission vehicles. SR125 offers discounts for [illegible] use.

References


Thank you for your attention
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Autostrade's Experience in the Implementation and Operation of Traditional Free-flow Tolling Schemes

Sergio Battiboia
Manager, Research & Development, Tolling Technology
Autostrade per l'Italia S.P.A.
Firenze, ITALY

Overview of Atlantia Group and Autostrade

- "Atlantia", a holding company specialised in infrastructure has full control of the sub-holding Autostrade per l'Italia (ASPI), the operational parent company in the field of infrastructure held in concession
- ASPI is the main motorway operator in Italy:
  - 3,408 km of network operated as concessionaire, amounting to 50% of the national toll network
  - € 11 billion investment programme to upgrade the network
- First European operator to introduce free-flow toll collection with about 6 million TELEPASS® customers in Italy
- Significant international experience in toll road projects:
  - Launched first toll roads in UK (the "M6 Toll" in Birmingham) and US (the "Dulles Greenway" in Virginia)
  - Developed a free-flow multilane electronic toll-collection system for heavy vehicles in Austria (Europass® on 2,100 km road network)
  - Also present in Brazil, Argentina, Chile and Poland (directly or through Impregilo)

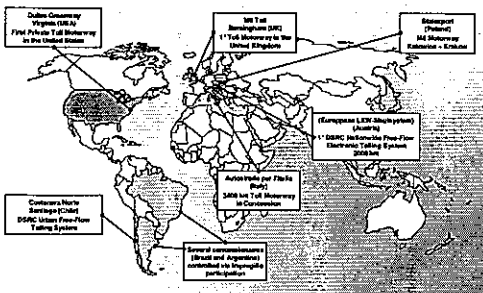
An history of industry leadership and innovation over time

1924-25	First toll motorway in the world (Milan-Varese, 42 km)
1958-64	Opening of Milan-Naples motorway (800 Km)
1963	First ever "Eurobond" issue
1990	First dynamic toll collection system in the world (TELEPASS®)
1995	First privately financed toll motorway in the US ("Dulles Greenway" in Virginia)
1999	Largest privatisation in the industry worldwide
2003	First toll motorway in the UK ("M6 Toll" near Birmingham)
2004	First nationwide dynamic free-flow multilane toll collection system in the world (Europass in Austria)
2005 - 2006	Acquisition of a controlling stake of Impregilo, the largest construction company in Italy, holding several motorway concession companies in South America

Business strategy based upon core competencies

Construction	Operation and Maintenance	Toll Collection
Core Assets	**Core Business**	**Core Knowledge**
• Focus investments on de-bottlenecking of core network • 1997 Investment Programme • 2002 Additional Investment Programme	• Focus on network maintenance and development • Commitment to operational efficiencies and cost reduction • Improvement of quality of services delivered to customers	• Industry leadership to drive efficiencies and exploit further revenue opportunities • Leverage market leadership internationally

Autostrade: Worldwide presence and experiences

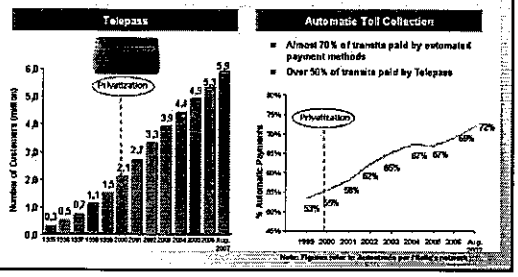


An history full of experiences

- Different roles
  - Technology Supplier
  - System Integrator
  - System Operator
  - Concessionaire
- Different configurations
  - Single lane
  - Open Road Tolling
- Different technologies
  - DSRC 5.8 GHz (UNI TELEPASS & CEN TC278)
  - 915 MHz (E-ZPass)

Electronic Toll Collection in Italy

Improvement of the accessibility to the network, from 28% of automatic tolling transactions in 1999 to 70% during 2006



Nationwide Interoperability

- First nationwide interoperable ETC scheme (TELEPASS)
- A single Interoperability Agreement among 23 Concessionaires, established already in 1985
- One contract, One invoice
- Common procedures and processes for:
  - User management
  - Accounting and billing
  - Enforcement and exception handling
- More than 4 million transactions/day

A REAL SUCCESS STORY FOR A REAL USER DEMAND

United States (Virginia): Dulles Greenway

- First private toll road in Virginia since 1816 (24 km. long)
- Completed in 1995 at a cost of $325 million, raised on a "Project Financing" basis. Autostrade set up "Autostrade International of Virginia O&M, Inc." to operate and maintain the Dulles Greenway for 40 years
- Electronic toll collection accounts for over 70% of all toll transactions
- In 2001 the Greenway Concession was extended until 2056

LKW-Maut: Austrian Free-Flow Tolling Project

- In operation since 1° January 2004
- 2,100 km overall network length
- Vehicles weighing more than 3.5 tons are tolled
- Entire network is subject to the new toll scheme (including 6 special sections)
- Fully electronic free-flow system (first time installed at a national level)
- System covers 500,000 vehicles (70% of which are international)
- Mandatory on-board unit

LKW-Maut: Rolling out the Project

Through its fully-owned subsidiary Europpass GmbH, Autostrade guaranteed the project delivery in full compliance with the service agreement

Setup in 18 months | *Management for 10 years*

PLAN → DESIGN → BUILD → OPERATE

FINANCING

- Construction works started on July 1st 2002
- Service started on January 1st 2004, on time and on budget
- 52 million transits per year forecast along the tolled motorway network

- *System operation and maintenance*
- *Running the distribution network (OBU distribution and handling)*
- *Violation handling (Enforcement Centre)*
- *User interface (Call Centre & CRM)*

Costanera Norte toll motorway in Chile

- **Costanera Norte** is a 43 km.-long motorway, 3+3 lanes, passing across the metropolitan area of Santiago along the East-West direction, in operation (the first 33 km) since 12 April 2005
- In 2005 a consortium of Autostrade S.p.A. (45%), SIAS S.p.A. (45%) and Mediobanca (10%), acquired the 100% of Costanera Norte for about 220 mln €
- Costanera Norte has an **Open Road tolling system**, operating by means of 12 multilane stations; OBU's technology is interoperable with the other 3 toll motorways in Santiago
- Currently **98% of new vehicles recorded** in Santiago (over a total of 900,000 units) is endowed with OBU
- **Tariffs are automatically raised according to inflation rate,** and diversified according the traffic intensity. Traffic risk is shared between Concessionaire and Granior, being a minimum level of toll revenues provided for by the Ministry of Public Works.