MANAGEMENT REPORT TO METROLINX

Report Title:	UK / Madrid Study Tour				
Report Number:	**CEO 08-003**	***Date to Board:***	**Jan 25, 2008**	***Date to Committee:***	N/A
Report To:	☒ **BOARD**	☐ **ADVISORY COMMITTEE** ☐ **AUDIT COMMITTEE** ☐ **GOVERNANCE COMMITTEE** ☐ **HUMAN RESOURCES COMMITTEE** ☐ **TECHNICAL ADVISORY GROUP** ☐ **OTHER:**			
Report Referred From:	**N/A**				
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Item Class:	IN CAMERA ☐		DECISION ☐	INFORMATION ☒	

1.0 RECOMMENDATION:

RESOLVED:

THAT the findings outlined in Report CEO 08-003 be referred to appropriate Metrolinx staff and consultants for consideration in connection with the Regional Transportation Plan and the Metrolinx Investment Strategy.

2.0 PURPOSE & EXECUTIVE SUMMARY:

In November 2007, Metrolinx officials visited the UK and Madrid, to examine the experiences of English, Scottish and Spanish transportation authorities with a variety of issues. Topics included:

- Methodologies for selecting and assigning transportation project priorities;
- Developing and implementing metropolitan transportation plans and policies;
- Implementing transit capital construction programs quickly and economically;
- Customer-service improvement initiatives, including the use of new technologies;
- Promoting active transportation and cycling;
- Measures to eliminate transportation barriers for those with disabilities and seniors;

- Application of alternative financing and procurement methodologies;
- The role of congestion charges, “value capture” and tolling in financing transportation systems and achieving environmental and transportation policy objectives;
- Implementing integrated fare cards and common fare media in regional transit systems;
- Design, creation and financing of mobility hubs and inter-modal terminals; and,
- The role of regulation and de-regulation in promoting efficient and customer-responsive transportation systems.

3.0 BACKGROUND:

The attached document outlines the findings, conclusions and recommendations arising from a Study Tour of the UK and metropolitan Madrid.

4.0 DISCUSSION:

See Appendix A: Summary of Findings and Areas for Further Examination Arising from a Study Tour of the UK and Metropolitan Madrid.

5.0 FINANCIAL MATTERS:

N/A

6.0 HUMAN RESOURCES MATTERS:

N/A

7.0 ENVIRONMENTAL MATTERS:

N/A

8.0 COMMUNICATION MATTERS:

N/A

9.0 LEGAL MATTERS:

N/A

10.0 CONCLUSION:

The CEO recommends the findings and examples cited in Report CEO 08-003 be referred to appropriate Metrolinx staff and consultants.

Respectfully submitted to the Board,

W. Michael Fenn, Chief Executive Officer

On behalf of Metrolinx Chair Rob MacIsaac and Director of the Board, Bill Fisch

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Appendices:

Appendix A: Summary of Findings and Areas for Further Examination Arising from a Study Tour of the UK and Metropolitan Madrid
Appendix B: Summary of Study Tour Itinerary
Appendix C: Madrid Metro Ridership Growth and System Expansion

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Appendix A:

Summary of Findings and Areas for Further Examination Arising from a Study Tour of the UK and Metropolitan Madrid

A. UK / METROPOLITAN MADRID STUDY TOUR

A.1 In early November, Metrolinx's Chair Rob MacIsaac, Metrolinx Board Director York Region Chair Bill Fisch and Metrolinx CEO Michael Fenn accepted an invitation from British Consul General in Toronto, Nicholas Armour, to participate in an Ontario / Quebec Study Team touring the UK. The program's focus was on British metropolitan areas with experience in the financing and construction of public infrastructure and the delivery of public services. The Consulate's program included several days focusing on both infrastructure and technological systems in the field of public transportation and other areas of public service, such as education facilities and health-care delivery. Metrolinx officials decided to modify the Consulate's proposed program with two substitute days in northern England and Scotland, focusing on UK experience in areas such as transportation priority-setting and with two additional business days examining the metropolitan Madrid public transportation system - the putative inspiration for the MoveOntario 2020 initiative.

A.2 Over the course of five business days in the UK, the Study Team met with representatives of transportation agencies and transportation experts in Edinburgh (including a delegation from metropolitan Glasgow / Strathclyde), Leeds / West Yorkshire, Manchester and London. Members of the Study Team also took part in an Infrastructure Ontario presentation at Canada House, aimed at attracting interest in Ontario's extensive program of infrastructure construction, refurbishment and finance, from an array of European professional firms and investment houses. At the same time, the Study Team met with some of those same officials and others, concerning the UK experience in developing and financing transportation infrastructure using alternative financing and procurement models (AFP).

A.3 Following a week of UK meetings, the Metrolinx Study Team met with a range of Spanish officials from both the public and private sectors. The meetings included tours of a number of major transportation infrastructure projects in the Madrid metropolitan region, over the course of two days. Since metropolitan Madrid has many parallels to the Greater Toronto and Hamilton Area (GTHA) – geographic scale, modern urban infrastructure and well-established communities and neighbourhoods, its metropolitan population size and distribution, and similar economic circumstances – there were a number of interesting comparisons to be drawn and lessons to be learned. Madrid's achievements are well known: as much new subway construction in a decade as Canadian cities have produced in a generation; and, costs of subway construction that are less than 40% of those in Canada and the US, within far shorter timeframes.

This report summarizes a number of findings and conclusions from that Study Tour, as well as listing potentially productive areas for further examination, verification and future meetings.

B. INTRODUCTION

B.1 Much was learned in the UK about both positive and cautionary aspects of several "generations" of transportation planning and policy, by a succession of national governments, from Margaret Thatcher to new Labour Party Prime Minister Gordon Brown. The experience of metropolitan Madrid proved to have much to recommend it to Metrolinx, not only in the field of public transit, but also in other transportation fields, as Metrolinx embarks upon a fundamental re-thinking and recommending large-scale investment in regional transportation services and infrastructure.

B.2 Uppermost in the Study Team's considerations were five principal questions:

1. How was it possible to advance public transit systems – infrastructure, fleet, technology, and service offerings (more service, often at modest cost to the traveler) – so quickly and, apparently, so economically, especially in Madrid?

2. What are "best practices" in key areas of transportation policy – multi-modal terminals and transportation "hubs"; integrated fare regimes, fare media and technology; promotion of "active transportation"; approaches to road-based transportation, including road-pricing, infrastructure redesign and goods movement?

3. What "alternative approaches" and innovation were brought to the organization, procurement, financing, ownership, regulation, licensing, commissioning and delivery of transportation systems, and in expanding transportation infrastructure and services? Are there lessons on measures to avoid? Does some level of de-regulation or "provider competition" need to be part of the mix?

4. What processes have proved the most successful in allocating scarce resources among competing transportation initiatives, and other public priorities (economic development, sustainability, fiscal constraints, social progress and social equity, energy policy, etc.)? Are there proven, reliable, sustainable priority-setting models?

5. To what extent has experience with the various manifestations of alternative financing and procurement (AFP) contributed to:

    (a) Reducing costs of designing, construction, operation or maintenance of transportation projects, or component elements thereof, such as technology, refurbishment or rolling-stock?

    (b) Increasing the scale, number or extent of transportation initiatives and services beyond those that would have been produced using conventional approaches and a fixed amount of public financial resources?

(c) Producing more projects in the same time frame, or the same range of projects sooner?

(d) Demonstrating financial and program results that fully off-set the added cost of the private sector's higher cost of capital and its need to earn a reasonable level of profit for its investors; and / or,

(e) Developing projects on a timely basis and delivering them consistently on time?

C. THE ABILITY TO REDUCE COSTS AND DELIVER QUICKLY

C.1 While UK costs of construction for public transit infrastructure seemed to roughly parallel those in Canada, there appeared to be a more active program of construction and more private-sector and quasi-public investment in the UK. This new equilibrium followed a somewhat tumultuous three-decade period of widespread system restructuring and refurbishing, some of which was quite successful and some of which was not – or least resulted commercial failures, cost-overruns and/or transitional disruption.

C.2 Madrid was found to be roughly equivalent to other European capitals and major North American metropolises, in terms of standard of living, civil engineering practices, transparent public procurement and public finance. Despite those parallels, however, it appeared that the capital cost of major transportation infrastructure was considerably lower than in Canada and project-delivery quicker and more consistently on time. (In addition and perhaps not unrelated, the overall scale of civil engineering projects appeared to be more extensive. See "multi-modal" hubs). These lower capital costs reflected themselves both in lower "hard" costs of capital construction and in lower "soft" costs of pre-engineering, public tendering, contracting, process delays, and in resolving environmental, financing and legal issues.

C.3 Interestingly, the Madrid public transportation (subway) infrastructure achievements (1995-2007) were financed by a level of investment (C$10.7B) similar to the value of the Ontario Government's own-share commitment to Move Ontario 2020 (C$11.5B). In just twelve years, that level of investment in Madrid produced nearly 150 kms. of subway lines and 120 subway stations, at a per kilometre cost of less than C$90M/km.

C.4 While direct comparisons between jurisdictions can be somewhat unfair, the order of magnitude differences between Madrid and Canada are nonetheless notable, as the two tables below demonstrate:

Higher Order Transit Costs – Madrid , Toronto, Vancouver					
Project	**Period**	**Length**	**Stations**	**Cost/km (CAD)**	**Total Cost* (CAD)**
Madrid 1995-1999	**4 years**	**37.9 km**	38	$52.15 M	**$2.0 B**
Madrid 1999-2003	**4 years**	**54.7 km**	36	$71.52 M	**$3.9 B**
Madrid 2003-2007 (Metro Tube)	**3 years**	**53.6 km**	46	$89.40 M	**$4.8 B**
Madrid 2003-2007 (Metro-Tram)	3 years	27.8 km	34	$37.25 M	$1.0 B
Madrid 2007-2011 (Metro Tube)	**4 years**	**11.2 km**	7	$98.34 M	**$1.1 B**
Madrid 2007-2011 (Metro Tram)	4 years	10.0 km	20	$67.05 M	$0.7 B
Toronto Sheppard Subway	**8 years**	**5.5 km**	6	$181.81 M	**$1.0 B**
Toronto Spadina Subway Ext.	**8 years**	**8.6 km**	6	$244.18 M	**$2.1 B**
Vancouver Canada Line	**4 years**	**19km****	16	$105.26 M	**$2.0 B*****

* total costs are rounded
** total length includes 9km for underground portion
*** total cost is a combination of tunnelled and above ground portions

Madrid Mayor's Term of Office	Transportation Budget (C$)
1995-1999	$2.4 B
1999-2003	$5.0 B
2003-2007	$7.3 B
2007-2011	$8.4 B ($3.2 B Transit + $5.2 B Roads)
Total	**$23.2 B**

C.5 While the specific comparisons above are with the TTC and Vancouver's new Canada Line, it should be noted that the TTC's construction-cost experience parallels that of much of North America over the past decade, in the range of $225-250M per km. for conventional subway construction. In addition to the obvious advantage to the taxpayer and lower public debt obligations, Madrid's ability to reduce costs allowed it to favour subways over LRT and BRT in urban settings, and to build subways (and LRT / BRT) at an accelerated rate, over the course of two decades. This capacity for producing a great deal of higher-order transit at a reasonable cost in record time was combined with an integrated, low-cost fare regime and fare media. This combination had the effect of producing a level of transit ridership that far exceeds equivalent metropolitan areas in Europe – performing on a level with megacities like Paris, Moscow and London – and of course, vastly out-performing anything in North America, except for New York City.

C.6 How was this performance achieved? The answer appeared to a combination of favourable factors, some of which were natural advantages (e.g., soil conditions) but many due to sound, efficient decision-making and following a comprehensive, priority-based strategy. By setting out very ambitious multi-year financing and construction plans, major technological investments in tunnel-building were amortized early and over large projects.

This appeared to have allowed major capital equipment (such as expensive tunnel boring machinery) to be used more economically over time and over other projects. In the specific case of tunnel-boring equipment, additional machinery was then acquired due to the savings, for a compounding effect as it, too, was amortized. At the time of the Study Tour's visit, Madrid had an estimated 41 boring machines in operation, including some 30 that were used at one point in subway construction.

C.7 Subway construction was done on an uninterrupted, continuous-bore basis, year-in, year-out. Since the boring equipment technology used by Madrid can be operated with very few workers, once the equipment itself was amortized, there was little reason to discontinue its use, even if labour costs involved shift-work and overtime. To avoid adverse impacts on neighbourhoods and commercial enterprises, as well as to avoid buried utilities and structural foundations, tunnel-boring was done at a very deep level. Among the issues to be examined would be the degree to which Madrid's evidently favourable sub-surface conditions made this level of achievement easier than would be possible in (say) Toronto, Mississauga or Hamilton (although it was noted that much the same form of technology was employed with the Chunnel project, with its broad range of geo-technical challenges).

C.8 The subway and highway tunnelling technology involved an ability to contain and "seal" water infiltration immediately, without either pumping or diversion, so the presence of water tables and underground streams was less of an obstacle to continuous digging than would generally be assumed. Deep tunnels also permitted the subway system (Metro) to intersect more easily with established lines above and below the new tunnel alignment, including both subterranean urban regional rail lines (GO equivalent) and other subway lines. Deeper alignments seemed, as well, to facilitate construction of terminal facilities that incorporated underground parking facilities, taxi-marshalling areas, airline ticket counters on the airport line, PATH-type walkways and retail concourses, and large-scale below-grade bus terminal facilities. In the case of the Avenida de America project (as well as the Moncloa project and the Nuevos Ministerios station, both of which Study Team representatives visited in their final phases of construction), the engineering approach to subterranean construction minimized disruption to commercial and office activity and automobile traffic during an extended construction program. (Details were provided by Madrid authorities).

C.9 Deep tunnels did, however, require a considerable investment in transit passenger access, including the use of unique devices (e.g., large-capacity passenger elevators, in place of escalators). The safety and handicapped-access implications of deep-tunnel evacuation might also deserve attention, based on our observations of the depth of the buried highway tunnels on the Calle 30 (Road 30) "buried expressway" ring-road project and the evidently limited means of emergency egress.

C.10 Another interesting feature of Madrid's strategy was the unapologetic linking of subway, terminal and light-rail construction "promises" to specific terms of municipal councils in the Madrid region. Each major program of subway, light-rail and station construction was organized in a fashion that allowed municipal leaders to specify the

intended cost and completion targets for their projects, and to be held accountable for that implementation performance at the end of the term of council.

This approach appeared to have moved public transportation projects away from the recognized North American pattern of individual project announcements and a focus on *beginning* projects. In Madrid, while individual projects received considerable public attention, the focus of public discussion was evidently more directly upon on-time, on-budget completion and on steady progress with an on-going, wide-ranging but phased construction program.

Although political and managerial credit for the success and popularity of Madrid's transit plan was shared by the Mayor of Madrid and political leadership of the regional transportation authority, the intellectual credit for the initial scheme and its overall delivery was universally attributed to an internationally renowned Madrid engineering professor, Dr. Manuel (Manolo) J. Melis (Maynar), who is Professor of Railways at the Madrid Politechnical University (and Professor of Soil Mechanics at Coruna University) and who also now serves as the President of the Madrid Metro (subway system).

Conclusions:

C.11 Both Madrid and London took a comprehensive, multi-phased, priority-ranked approach that avoided isolated and piece-meal approaches both to new lines and to individual projects. System-performance, potential ridership increases and catchment-area extension were placed ahead of other considerations. Their approach to construction and environmental impacts avoided many of the commercially and socially disruptive aspects of conventional engineering practices. These measures combined to create an atmosphere of sustained, predictable investment in public infrastructure, especially in the field of transportation, and competitive, economies-of-scale practices in the construction industry and in project financing.

C.12 In the case of high-cost underground construction (subways, heavy rail, and their terminals), Madrid's costs were reduced by employing a typical commercial productivity approach: the one-time capital cost of technology was used to reduce the overall and on-going cost of construction.

C.13 A very active, long-term, predictable infrastructure investment environment in both the UK and Spain seemed to promote growth in the construction sector, both in terms of commercial capacity and levels of employment, as well as attracting international investment and technical expertise. It appears to have created a more competitive environment for bidding on public construction projects. It also seems to have reduced the level of job-protection or trade-restriction features in public tendering, in the construction trades and in the construction industry generally. Finally, the accumulated expertise developed by engineers and workers, often associated with repetition of processes and familiar technology, seemed to have the effect of driving down costs, especially in Madrid.

C.14 In Spain and elsewhere in continental Europe, it was suggested that predictable, codified construction industry practices – dealing with issues such as liability, dispute resolution, performance assurance, on-site decision-making and the like – allowed both bidders and clients to reduce their overhead and collateral costs. Special mention was made of things such as sureties, non-standard construction contracts and legal drafting, insurance levels and scope, tendering complexity, and so on, as contributing to bid-price add-ons in other ("common law") jurisdictions, including North America.

C.15 A culture and practice of practical on-site, non-hierarchical construction issue-resolution also seemed to reduce Spain's costs of pre-engineering and client's engineering oversight. The number and levels of engineering design and construction oversight appeared to be much lower than in other contexts. Being able to rely on these practices on an on-going basis seemed to contribute to better bid prices and more efficient resolution of disagreements that would otherwise produce project delays and additional costs.

D. IMPACT OF DE-REGULATION, TRANSPORTATION POLICY AND SENIOR-GOVERNMENT FINANCES

D.1 Since 1979 in the UK, there were several discrete rounds of de-regulation and, in some instances, outright privatization – e.g., regional and inter-urban trains, local transit buses, etc. During the Thatcher regime, virtually all local bus transit services were moved from the public sector to the private sector. Until recently, municipalities apparently did not even play a significant market-regulator role, such as restricting the number and quality of services offered on transit routes, or awarding non-subsidized route franchises. Initially, any bus firm wanting to offer a service could essentially do so. Predictably, this generated a chaotic pattern of bus services, with unprofitable routes being abandoned or service degraded. Of course, it also led to a spirited competition among providers, competing for customers on the basis of price, service, convenience, and comfort – including widespread introduction of newer bus fleets and a variety of consumer-oriented vehicles and services. Over time, market forces yielded larger, better-financed bus operators and a rationalization of routes and service, both through supply (commercial consolidation) and demand (market preferences of customers).

D.2 Professor George Hazel, a recognized international expert in transportation planning and priority-setting models, has recently been appointed to the IBI and MRC International Experts panel for the Metrolinx Regional Transportation Plan (RTP). While the Study Team was in Edinburgh, he convened a meeting of experts to discuss a range of issues. He also hosted a meeting of the metropolitan Glasgow regional transit authority (Strathclyde) which manages a subway, bus and regional rail systems. These discussions proved helpful in securing a range of views, across the political spectrum, on the experience of the UK with public transportation restructuring and infrastructure investment, including the role of the private sector.

D.2.1 The political and managerial leadership of the Strathclyde Partnership for Transportation (SPT), which is equivalent to Metrolinx or Vancouver's TransLink, outlined

their current regional transportation planning process. They expressed a desire to visit the GTHA and to meet with Metrolinx Board members and our municipal, provincial and transit partners, as they develop a transportation plan addressing similar issues to those being addressed by the Metrolinx RTP. Metrolinx Chair Rob MacIsaac indicated that GTHA officials would be pleased to exchange experience and information with Glasgow officials, and that an invitation to visit Ontario would be issued to them upon our return.

D.3 Among other issues discussed in Edinburgh were the AFP experience of London's highly successful Heathrow express, the London Jubilee Line, the Docklands Light Railway (DLR) and the London Underground's "Tube Lines" P3 contract. These were contrasted with the AFP "failures" of the London Underground's "Metronet" consortium and the initial privatization of British Rail. Among other factors, it was noted that the differences often related to inappropriate risk-transfer assumptions between the public and private sectors, and interestingly, among private sector partners. In a number of instances, failure was attributed to ignoring the fact that public acceptance and commercial success would be related to the quality of the services provided: "valued" services, customer focus and seamless delivery.

D.4 The Edinburgh discussions also addressed transportation project prioritization experience in the UK, and particularly in northern England (see "Northern Way" below).

D.5 In addition, the Study Team inquired about Professor Hazel's recent GlobeScan / MRC McLean Hazel research project, "Megacity Challenges", which examined the issues facing major metropolitan regions, focusing on 25 "megacities" around the world. The study produced several enlightening findings, particularly in relation to infrastructure needs and strategies, and their impact on issues ranging from health-care to civic finances. Two especially interesting aspects of the study were the crucial role of transportation infrastructure and a confirmation that the success of a "city region" depends on its political and managerial leadership building on the "three pillars" established by the Metrolinx Board for the Regional Transportation Plan. In the words of the study report: "….City managers must strike the balance between three overriding concerns: Economic competitiveness, environment and quality of life for urban residents."

While the Megacities study only included New York, Chicago, Los Angeles and Mexico City in the North American portion of its sample, there appeared to be lessons here for the Toronto / Hamilton metropolitan region. It was suggested that a seminar on the study and its findings, as they might apply to the Greater Toronto and Hamilton metropolitan region might be worthwhile and could be hosted by Metrolinx.

Conclusions:

D.6 Despite its somewhat chaotic launch, public transport de-regulation produced a long over-due reform and client-focused modernization in the way in which bus services were offered in the UK. Of more particular interest, it evidently reduced the direct-cost of public subsidy to public transit system operations. Governmental financial support, especially at the local and municipal level, came to be focused on sustaining otherwise unprofitable

routes or providing service to areas or clienteles requiring special consideration, rather seeing the budget diffused by subsidizing the entire public transit system's overall operating losses.

D.7 Hidden from view in the outline of UK service operations was the fact that the public sector, through the National Government in the UK, played a large role over time in providing financial support for fleet expansion and railway system infrastructure.

D.8 Although far more modest in scale than in North America, the public sector in UK provides school busing and some "yellow buses" through the public transportation and public transit systems, not through the school boards. This appeared to help to rationalize the delivery of student transit services, make marginal public transit routes more sustainable, and allowed public transportation expenditure choices to be made more equitably.

D.9 In both UK and Spain, the National Government essentially played the same role as a Canadian Provincial Government in the fields of transit and transportation, with the European Community (EU) having the same range of jurisdiction as the Federal Government in Canada and the US. As in the US, but unlike in Canada, the EU provided and continues to provide sustained funding for public infrastructure and transportation pilot projects under its mandates for the environmental, commercial competitiveness and promotion of open-markets. In the Madrid metropolitan region, a regional transportation authority (Consorcio de Transportes) plays the role of Metrolinx. In West Yorkshire (Leeds) and Greater Manchester, the regional authority also had other community planning, infrastructure planning, and economic development responsibilities.

D.10 Metrolinx may wish to consider hosting a workshop for a local and international audience, to examine the lessons that might potentially be applied to the GTHA, based on the finding of the GlobeScan / MRC McLean Hazel research project entitled "Megacity Challenges", perhaps with third-party sponsorship.

E. PROJECT PRIORITIZATION, ALTERNATIVE REVENUE SOURCES AND DEVELOPMENT VALUE "UPLIFT"

E.1 In Scotland and Yorkshire, there was discussion of the transportation investment prioritization process used in North England, entitled "Northern Way". A brief recap of this project was presented to the Metrolinx Board in April 2007 by MRC staff. While in Leeds, the Study Team met with representatives of West Yorkshire "Metro" and with officials of the Yorkshire Forward Regional Development Agency, which led the development of the "Northern Way" transportation project prioritization model.

E.2 Discussions with Professor Hazel and his team in Edinburgh also included highlighting UK domestic and international experience, noting some practical examples of tools used in other jurisdictions:

(a) The privately financed Jubilee Line in central London, with 12 stations, saw a UK £ 3B investment produce UK £ 13B in commercial development-related revenues;

(b) Cardiff City Council (Wales) experience was cited as interesting example of coordinating the use of a range of transport assets, including private bus companies, parking revenues, and road-pricing revenues;

(c) Although not entirely transferable due to the differences in population density and land-values, the Hong Kong transportation authority's sale of "air rights" over and near terminals was cited as an example of a large proportion of transit operating costs being off-set by capturing value created by public infrastructure investment in transportation;

(d) An examination of the concept of the "voluntary contribution agreement", which was a device used successfully in Copenhagen's Orestad project, yielding UK £980M in revenues;

(e) Interest by at least one major international insurance company in distance-based, point-of-service, time-of-driving pricing, as a way to promote lower automobile use by rewarding lower mileage drivers with lower insurance rates;

(f) The potential for alternatives to road-pricing was explored, using surrogates such as parking. In Perth, Western Australia, increased parking levies were "paired" with new tramway routes. This allowed a clear correlation between new fees and new services, which is widely seen as a necessary *sine qua non* for any new levy or charge in the transportation field. Rather than impose a levy, the transportation authority required "licensing" of all parking spaces, which were granted upon application and payment of a fee. Politically sensitive issues were addressed by ensuring that the levy regime was responsive to the needs of existing communities and businesses: five commercial spaces or fewer, no parking levy; no householder parking levy; each business applies for a parking "license". Interestingly, the number of business parking spots was significantly reduced by business choice, once a license fee was imposed;

(g) In France, a payroll tax of 1% is imposed on employers with more than 10 employees, with the proceeds being used for public transit services; the amount increases on a time-limited basis when transportation infrastructure is improved in the vicinity;

(h) Although not metropolitan in scale, the experience of the Nottingham and Croydon public transit systems (tramways) were cited by a number of officials as models for achieving significant transportation "modal shifts" through the use of contemporary technology and an integrated approach to policies and service-delivery; and,

(i) The potential for privately-led infrastructure renewal project: The Boston Post Office parking garage was an unsafe, underused and unsightly 60s-era parking garage that was converted into a dynamic retail hub.

E.3 In the UK and Spain, telephony and other electronic technology were being routinely incorporated into transportation systems. In Edinburgh and elsewhere in the UK, motorists can access on-street paid-parking using cell phones and others were using cell-phones to provide up-to-the-minute traveller information on transit routes.

Conclusions:

E.4 If the private sector knows its financial contribution is a pre-condition to advancing a crucial or potentially attractive transportation project, they will participate financially; if the project will likely proceed irrespective of a private-sector financial contribution, the private sector will use their resources to enhance the development opportunities arising from the project. In Greater London, it was suggested that the value of privately owned residential properties had grown by 10-20% as a direct result of new rapid-transit infrastructure. One practical caution was the experience that voluntary contribution agreements were said to work best for fixed infrastructure (e.g., stations, rail lines, BRT fixed infrastructure, ferry docks), but not for discretionary services subject to policy changes.

E.5 Successful regional transportation authorities commonly had independent, transportation-dedicated sources of revenues upon which to rely in developing their long-term plans and in enlisting private-sector and pension-fund investors. As with the voluntary contribution agreements referenced above, dedicated revenues were seen as a more effective measure to stabilize investor confidence, by insulating longer-term or risk-affected investments from periodic subsequent governmental policy shifts.

F. MOBILITY HUBS AND TERMINALS AND ROADWAY ACCESS

F.1 In the course of the Study Tour, the Study Team had occasion to visit a number of rail and bus terminals, both as formal guided tours by facility operators, and as users. They included Edinburgh, York, Leeds (Leeds bus terminal and Waverley rail terminal), Manchester (Piccadilly), London (Euston and Paddington, and those stations associated with specific rapid transit lines, including the new Jubilee Underground line, lines serving redeveloped east London and the Heathrow express line). Much has been made of the steady refurbishing of UK transit terminals (most recently, St. Pancras “Chunnel” high-speed train terminal) and several, such as Edinburgh and Manchester Piccadilly, were a crucial contributing ingredient to downtown revitalization programs.

F.2 Of potentially more interest to the GTHA communities, however, was the "mobility hubs" experience of metropolitan Madrid. These terminals are a key feature of the Madrid Transport Authority’s (Corsorcio de Transportes) grand design for promoting greater transit ridership and reducing urban congestion. The facilities, known in Spanish as

"intercambiadores" (exchanges / interchanges), were an interesting alternative to the "central terminal" model common to North American and British cities.

F.3 As part of its transportation planning and construction programs, metropolitan Madrid identified major transportation corridors, reflecting inter-regional and intra-regional passenger and commercial traffic patterns. Road network accesses to Madrid span the points of the compass, but are then linked by ring-roads at intervals. To reduce congestion and enhance transportation system performance, road concessions were granted to build toll-expressways to "parallel" no-charge highways and arterial roads following the same corridors and rings.

F.4 One such regional "inner-ring road" – Calle 30 (Road 30) – intercepts auto, bus and delivery-truck traffic otherwise destined to cross downtown Madrid using local streets. Although a key transportation artery, this ring road represented a major inner city visual barrier and was a source of significant congestion and air pollution. As part of the most recent generation of transportation infrastructure projects, Calle 30 is being buried in an extensive tunnelling program, using the construction technology pioneered in the building of the Madrid metro system. The cost of the Calle 30 project, undertaken by one of Spain's global-scale construction firms as a public-private joint-venture, is estimated to be C$5B – at a cost of €100M per km of tunnelled expressway. The surface area created by burying the expressway has been earmarked for a corridor of urban parks and public amenities. The Study Team had an opportunity to inspect the construction program in a near-completed section deep under Madrid.

F.5 In Madrid, the challenges arising from rapid suburban growth and improved transportation corridors had been a tendency to have large volumes of passenger and commercial traffic move toward the centre of the urban area, despite the presence of "ring" roads. The metropolitan authorities determined that a key ingredient in reducing congestion was to reduce single-passenger vehicle and bus traffic traveling to the centre of the urban area that did not have the city core as their final destination. As in the GTHA, the patterns of commuting have evolved from a hub-and-spoke, morning-in, evening-out pattern, to one of increasing all-day, cross-network commuting and commercial traffic.

F.6 As a result, the Madrid authorities designated a series of "gateway" facilities at the end of the transportation corridors in the near-suburbs or at the edge of the city core, for up-grading to a full multi-modal transportation hub. Typically built around pre-existing railway or bus terminals or major subway stations, these multi-modal hubs were designed to afford passenger traffic with an opportunity to transfer to other modes of transportation conveniently and generally using the same fare-media. This had the effect of siphoning-off the absolute volume of passenger-traffic vehicles competing for road-space with commercial vehicles, as well distributing passenger traffic in a way that ensured a quicker elapsed trip time, a key ingredient in influencing the choice between using transit and a car.

F.7 These "gateway" facilities ("intercambiadores") are being built in a multi-year capital program, complementing the expansion of subway and regional train lines, and

intercepting inter-urban and local buses, otherwise destined for downtown destinations or transfer points.

F.8 The “gateways” each have some or all of these features:

(i) Some “gateway” facilities were built by single-purpose joint-venture companies established by the transportation authority or the municipality, including private-sector investment in the facility and its adjacent commercial precinct (retail, commercial and residential parking garages, office commercial, high-density residential, etc.); the governance and investment structure of the “intercambiadores” companies reflects this investment and management partnership. (Av. de America Terminal was one such example).

(ii) The “gateway” facility is typically built around a rail terminal, but it is largely subterranean. In many cases, the facility was excavated to as many as four levels below street level, using techniques that allow uninterrupted street-level activity after the initial first-level excavation phase. Each level of the facility is devoted to one or more modes of transportation or related uses (public and residential parking, one or two levels of subway stations, with up to four distinct subway lines, one or more regional rail lines, a full-service local and inter-regional bus terminal, taxi marshalling area, PATH-type retail uses, airline departure processing facilities, et cetera). The levels devoted to buses and trains are large and airy, reflecting high ceilings, extensive change-of-air facilities, large bright, well-lit, well-ventilated, secure and technologically contemporary passenger waiting and client service areas. (For example, Principe Pio Terminal, a tour of which was provided by Madrid engineering staff).

(iii) The gateway facilities are typically located near major road arteries, allowing public and commercial inter-urban buses to off-load and to return-loop by underground expressway access to suburban bus-staging and service areas. This significantly reduces the volume of an otherwise extensive use of inter-urban coaches and local buses in the metropolitan area. These connections are also often underground and do not materially affect street-level traffic flows, nor do they present the aesthetic issues associated with monumental above-ground concrete works.

(iv) The scale of the “gateways” is physically quite large, although largely hidden from public view at street level. With the exception of street-median bus entrance tunnels, street-level aspects of the gateways are sensitively devoted to such things as heritage building preservation (e.g., vintage railway station architectural facades incorporated into commercial or transportation uses), for public spaces or even very modest “hidden” entrance points designed not to detract from surrounding architecture (e.g., historic squares, modern commercial centres, public plazas, etc.). Below ground, however, the facilities and the access tunnels are vast and multi-levelled. The location of these subterranean facilities allows them to be expanded over time, as demand rises. (A tour of the inter-urban bus

marshalling facilities at Moncloa Terminal, for example, revealed an extensive construction program aimed at doubling passenger handling capacity, along with extensive new, multi-level road-way access tunnels, all with little impact on existing busy bus and subway terminal operations, or on public activities at street level).

F.9 In North America, discussion of transportation hubs has a tendency to emphasize the land-use planning aspects and impacts of such facilities -- and the positive aspects of those effects were evident in Madrid. The "gateway" approach taken in Madrid suggests, however, that interchange points can have a primarily transportation role. This type of transportation terminal can materially improve the transportation system's performance. In doing so, moreover, they help to create an environment where parallel urban intensification can occur and transportation-supportive revenues can be derived from those collateral benefits.

G. ALTERNATIVE FINANCING AND PROCUREMENT (AFP)

G.1 The basis of the UK Consul-General's Study Tour program was to introduce Canadian officials from government, law and project-development fields to the British experience with public/private partnerships in the full range of AFP modes (project design, construction finance, on-going project finance, project management, system operation, system maintenance, public concession and franchise awards, etc.). As in Ontario, the UK experience in AFP prominently features hospitals, airports, bridges and highways, but the UK has also been actively engaged in public-private partnerships (P3) work in the area of public transportation, ranging from railways and subway systems to terminal redevelopment and inter-urban motor-coaches and local / regional public and private passenger bus systems.

G.2 The Study Team met with a variety of UK entities, from public authorities to private providers, and covered the range of experience from disappointing to excellent. The Governments of Canada and Ontario also hosted a presentation at Canada House in London at which Infrastructure Ontario, with support from Metrolinx representatives, outlined the MoveOntario 2020 initiative to a range of European firms and agencies with experience and expertise in transit and transportation projects. The presentation provided this audience with the opportunity to learn about the potential for introducing international best practices and investment into the range of construction and technology projects that will come to be associated with the MoveOntario 2020 initiative over the next decade.

G.3 While in the UK, very frank and productive meetings were held with public transportation officials about the mixed experience of AFP in the public transportation sector. These included the now evidently very successful Jubilee Line of the London Underground, where an investment in a newly refurbished, privately operated subway line generated substantial new development-related revenues for the system builder / operator. A similar experience was reported for the Docklands Light Railway line, which benefited from and contributed to the renaissance of the financially troubled east London Canary Wharf project. Measures that included the use of innovative technology (automatic train

control, fully automated operation), efficient design features (like parallel platform-side doors) or enhanced value-capture (through voluntary contribution agreements) often contributed to the general success of these ventures. (In Madrid, it was suggested that automated train technology aimed to achieve a remarkable 1.5 minute head-way for subway trains on its busiest line, Line 10).

G.4 An interesting set of "P3" lessons were drawn from the contrast between the two private consortia undertaking the refurbishing of the old and over-crowded London Underground (subway system). One consortium has been quite successful and economical ("Tube Lines"), while the other (Metronet) has had widely-reported financial, legal and performance difficulties.

G.5 In the UK and Europe, Spanish firms play a surprisingly prominent role in financing, construction and operation of public infrastructure, ranging from Heathrow Airport to tolled expressways in a number of countries. The European Union, which provides funding for transportation and infrastructure in a manner equivalent to the practices of the US Federal Government under the Clinton Administration, imposes conditions that endeavour to ensure that public finances are supplemented by private investment wherever possible. This stipulation is not based on an ideological predisposition in favour of the private sector, but rather apparently aims to achieve greater levels of infrastructure repair and expansion than would be possible relying on public funds and public debt alone.

The response of the public sector has been creative, notably in jurisdictions that are not ideologically predisposed to favour P3s. They have created joint-ventures for specific projects and other such devices to attract private equity capital and purpose-based revenue streams, without relinquishing public ownership or requiring a guarantee of public policy direction. In Spain, the Study Team observed that AFP techniques figured prominently in the rapid and extensive construction of regional and interurban expressways, often using a toll-road format or joint-investment / joint-benefits model for "hubs" and transit lines.

G.6 In Britain and the UK, AFP projects involving major new construction or structured-financing often received the greatest interest from major commercial construction and investment interests. Less popular were AFP projects involving long-term operation and maintenance, or revenue-guarantees, which also typically generated the greatest level of public and media debate. However, the Study Tour found that some public-private partnerships in the fields of technology and transportation services were projects of considerable interest and success: the area of integrated Fare Cards (Oyster Card – City of London / EDS partnership); universal urban cycling programs (e.g., cyclocity and Velib programs); congestion-charge implementation (City of London / Siemens); and terminal redevelopments (both UK and Madrid).

H. CONGESTION CHARGES

H.1 While in London, the Study Team met with those responsible for London's congestion-charge regime, both those responsible for policy ("Transport for London" (TfL)

agency) and those dealing with technical aspects (TfL and Siemens). The regime has recently doubled its catchment area westward and will soon see modifications / increases to its fee-charging regime – targeting types of vehicles (SUVs) and times of use, in order to achieve air-quality and other non-fiscal objectives.

H.2 Of particular note in the discussion on the London "congestion charges" experiment were the following facts: the fee-charging regime can be imposed by the London Mayor and the TfL authority without requiring the endorsement of either the London City Council or the National Government; and, that the current regime reports revenues of £125M from those presently paying £8/day to enter the "zone", while the cost of administering the program is reported as £90M. Although there are miscellaneous and enforcement revenues that yield a further £88M, it does seem to suggest that the catchment area could only be as small as it is and still be economically viable by imposing a relatively substantial daily charge (£8 or C$15 per daily trip). An extensive review of the London congestion charge and the application of its net proceeds was completed in 2007 and was the basis of the discussion. In the case of the TfL charge, £123M net "profit" was realized from the existing London congestion charge collected in 2006/07, with £101M going to public (bus) transit, £14M for bridges, £5M for road safety measures and £3M for cycling programs.

H.3 In discussing Greater Manchester's proposed application for Transportation Investment Fund (UK TIF) funding, it was noted that Manchester is one of several UK cities considering a wider "ring" for a congestion charge zone, but with a lower charge, in order to reduce congestion and to tie road costs more closely to road use and new infrastructure. There was general agreement that congestion charges could only be justified to the public if the proceeds achieved some obvious and tangible public transportation benefit. It was also agreed that any public evaluation or referendum on such proposals should only be undertaken after the public has had a reasonable period of time to experience them and to identify the collateral benefits. Failing to take this approach was cited in the negative public reaction experienced in Stockholm and Edinburgh.

I. ACTIVE TRANSPORTATION / ACCOMMODATING THE PHYSICALLY IMPAIRED

I.1 During the course of the Study Tour, there was an opportunity to observe the wide variety of relatively new measures being taken in the UK and Spain to promote walking, cycling and mobility of the physically challenged (particularly those in wheeled devices, like scooters). Chair MacIsaac arranged to meet with the representatives of the Transportation for London office that is promoting active transportation in London, funded in part by proceeds from the congestion charge. (As noted above, 2-3% of the net revenues of the London congestion charge were earmarked for cycling programs in 2007 totalling an incredible £36 million).

At its inception, the cycling program in London was met with scepticism. However, after building and extending the cycling network throughout the city and by improving greenways and providing extensive bicycle parking on the street, at railway and underground stations, in schools and in workplaces across London, cycling has seen an

80% increase since the year 2000. TfL has made similar commitments to improving the lot of pedestrians throughout the city with an impressive capital program.

I.2 Much has been made of the City of Paris' new universal, no-charge, publicly funded bicycle program for its urban core (Velib). It should be noted, however, that commercially-sponsored regimes using the same custom-designed bicycles and touch-less card technology are in use across Europe. The "cyclocity" systems are operated on contract by a pan-European bus-shelter outdoor advertising firm, JC Decaux. The systems typically provide low-cost, short-term bicycle rentals and use commercial sponsorship to reduce the cost of the program. However, in the observing bicycle stations at busy intersections in one major urban centre in Spain, the rate of utilization appeared low (a typical rental station seemed to have a large volume of its bicycles available for use).

I.3 In addition to technology, however, some of the more interesting aspects of measures to promote a safe and efficient transportation system for cycling and vehicles for the handicapped were more related to street and intersection design and traffic regulations. In the UK and Spain, "advanced greens" for turning motor vehicles allowed busy intersections with long queues of turning vehicles to be cleared more quickly without mixing of through traffic (including buses), off-loading buses, cyclists and pedestrians. This phasing appeared to reduce the tendency to have cycles, pedestrians and motor vehicles involved in an unequal and occasionally unsafe competition for priority at busy intersections. It also greatly shortened the length of the idling queues of turning traffic, which would otherwise delay through traffic and pedestrian crossings.

I.4 In Spain, the simple expedient of relocating the marked intersection crossings for pedestrian, cycles and handicapped vehicles / baby carriages, by setting them back 2-3 meters from the intersection itself, seemed to reduce dramatically the conflicts between turning auto traffic, through auto traffic and pedestrian / cyclist cross-walk traffic. In part, this effect was achieved by "stacking" and stopping turning traffic on the destination street, but behind the cross-walk -- rather than the North American practice of stacking turning traffic on the originating street and then turning through crossing pedestrians, scooters and cycles within the intersection.

I.5 In Madrid and elsewhere in Spain, cycle paths were frequently located on a widened sidewalk right-of-way, rather than on marked pavement on the roadway itself. These pathways for cycles and handicapped vehicles were typically on two-directional, green-tinted asphalt, immediately behind the curb. As a result, there was far less prospect for car / cyclist accidents, as the both the pedestrian and auto traffic were clearly segregated from cyclists – space permitting, by small boulevard trees. By using two-directional cycling paths on the sidewalk right-of-way, cyclists and automobile passengers were always facing one another, so the risk of opening-door and turning-vehicle collisions was dramatically reduced. Given the growing problem of cyclist fatalities and serious injuries, and the widespread but largely under-reported rate of minor collisions, these measures have much to recommend them, where street geometrics would permit them.

I.6 Audio signalling at intersections for the hearing impaired was widespread, as were pavement pebbling for the visually impaired, in subways and at street intersections. There did appear to be less attention to extensive and expensive retrofitting rapid transit vehicles and train carriages for wheelchairs and bicycles. An interesting practice emerging in the UK was to encourage seniors, many of whom eventually face physical mobility issues, to use public transit (including rail) after the morning peak, at no charge to them. Some argue that blanket subsidies for demographic groups such as seniors, are not sound transportation economics. In this case, however, the policy appeared to be to use economic incentives to encourage mobility among seniors (a health-policy objective), which would achieve the additional transportation policy objective of transferring largely discretionary travel from peak congestion periods to periods where public transit service was underutilized.

I.7 This last objective – promoting a more even distribution of transit demand and motor-vehicle road-use – appeared to produce significant, supply-side cost reductions in both Spain and the UK. It seems to have had the effect of reducing the tendency that persists in the transportation infrastructure field to 'build churches for Easter'.

J. ADVANCED TECHNOLOGY AND TRANSIT FARE INTEGRATION

J.1 Pursuing the Metrolinx Board's direction to engage the public through the most contemporary means of communications, the Study Team met with the principals of the Limehouse software firm, at its London headquarters. Limehouse is delivering an important component of the Regional Transportation Plan's on-line public engagement program and Metrolinx officials were pleased to establish personal contacts with both senior management and technical staff.

J.2 While in London, the Study Team met with the regional management of the firm (EDS) that delivered London Mayor Ken Livingstone's universal, integrated touch-less transit fare card – Oyster. The firm's local management claimed that the Oyster card had been moved from proof-of-concept stage, to full implementation with scores of transit operators, within eighteen months, achieving an enrolment of some ten million card holders. (This rapid progress may also be due to the firm's involvement with the equally successful Hong Kong "Octopus" integrated fare card). It has also been suggested by others involved that the full implementation period should more properly be described as taking 24 – 30 months.

In addition to this remarkable achievement, the Study Team noted that the extensive use of the Oyster fare card as a "purse" was being exploited to public advantage by TfL. Prepaid cash deposits made to TfL/Oyster by users were helping to reduce the system's operating costs. Coincident with the Study Tour's arrival, the Oyster card operators were also rolling-out a commercial relationship with the large Barclay's Bank chain. Under this widely promoted arrangement, an extensive use of embedded-chip credit card technology allowed touch-less access to all Greater London's public transportation systems, as well as enabling card/pass-holders to make routine debit or credit purchases.

J.3 Madrid regional transportation officials outlined the remarkable growth of transit ridership in the past two decades. However, the sudden resurgence of transit ridership in the late 80s and early 90s was queried by a Study Team member, as it coincided with the creation of the regional transportation authority but it predated the opening of the first generation of new subway lines. The response from Madrid officials was that the initial, dramatic upswing in ridership across the metropolitan area came about as a result of the new regional authority introducing a low-cost, universal zoned-fare system, employing an integrated fare card. Although not using the most contemporary "touchless" radio-frequency identification or RFID technology at the time, simply making an integrated fare card available to all transit users across the metropolitan area produced a level of new ridership that equalled the increases achieved by introducing new subway lines in subsequent years. Appendix C illustrates the relationship in Madrid between the implementation of a regional fare system, metro expansion and ridership.

For more information on the Study Tour Itinerary, see Appendix B.

Appendix B: Summary of Study Tour Itinerary, November 3 – 13, 2007

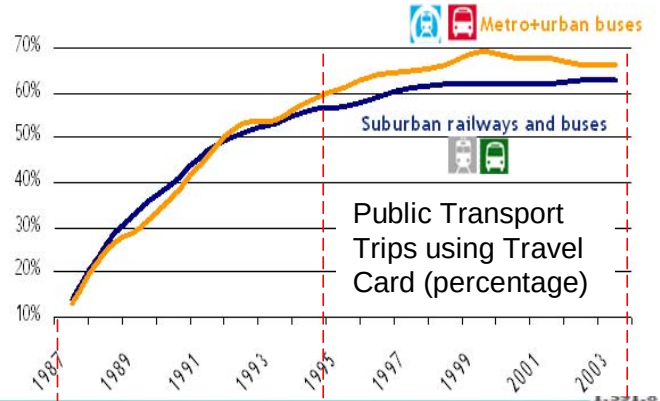
Date / Time	Morning	Mid-day	Early afternoon	Late afternoon
Sun		Arrive Edinburgh	Daniel Haufschild, MRC	
Mon	"Northern Way" and prioritization frameworks; George Hazel, Managing Director; John Saunders, Associate; Daniel Haufschild, Associate; MRC McLean Hazel	Public Transportation Authority - Strathclyde Partnership for Transportation (SPT), Glasgow: John Halliday, Assistant Chief Executive, Transport & Strategy; Alistair Watson, Chair, SPT Glasgow	Edinburgh terminal; Great North Eastern train to York; First Train (First Bus) to Leeds	Edinburgh Terminal; York Terminal; Leeds Waverley Terminal
Tue	Metro Leeds; Leeds Metro Bus Terminal	West Yorkshire "Yorkshire Forward" agency/"Northern Way"; John Jarvis; Jason Cooper (MRC)	Leeds Waverley Terminal, Virgin Rail train to Manchester	Manchester Piccadilly Terminal
Wed	Manchester Metrolink / Greater Manchester Passenger Transport Authority (GMPTE)	Manchester terminal, Virgin Rail train to London; Euston Terminal, London	International Financial Services (IFSL), Tube: Bank / Monument P3 experience in the UK and around the world, Stephen Harris, IFSL	
Thu	Partnerships UK, Edward Farquharson, Project Director www.partnershipsuk.org.uk	Round Table Discussion with private sector firms and (IFSL)	Case Study/stakeholder roundtable: the Oyster Card and Transport for London; EDS, Stephen Chandler, VP, London Oyster Card Project	Limehouse Software Ltd. Giles Welsh, CEO
Fri	Infrastructure Ontario information session to UK industry, Canada House	TfL: London cycling program	Graeme Craig (Director, Congestion Charging, TfL) – presentation and discussion on London's Congestion Charging scheme; Siemens IS & Infrastructure Industrial Solutions & Services	
Sat/Sun			London Heathrow Airport Express train, London Paddington terminal	
Mon	Breakfast meeting with Enrique Diaz-Rato and other CINTRA directors	Field visit to above-ground and underground segments of Calle 30; burying trans-urban expressway	Metro de Madrid, tour new Downtown-Airport Rapid Transit Line; security measures at airport post-bombing	Tour Terminal 4 Barajas Airport, incl. control centre and automated handling facilities (SATE)
Mon		Fernando Moral Medina, Head of 1st zone of Railways in Infrastructure Ministry (MINTRA); tour Nuevos Ministerios multi-modal transportation terminal and new regional rail tunnels	Ferrovial-Agromán Managers at new Barajas airport Terminal-4 Aena (Spanish Airports) Authorities (Crisis Centre)	Officials at Cintra's Headquarters, downtown Madrid
Tue	Fare integration in Madrid region public transport; introduction to administrative integration (the objectives of CTM, PT Authority)	Consorcio Regional de Transportes de Madrid: inter-modality "projects and reality".	Tour Moncloa (under construction) and Príncipe Pío (completed) multi-modal terminals and interchanges	Atocha Terminal (refit post-terrorist bombings), AVE train

Appendix C: Madrid Metro Ridership Growth and System Expansion

Madrid Metro

Ridership growth can be attributed to:

- Integrated region-wide fare system
- Infrastructure expansion



Two distinct phases:

- '87 - '95; rapid uptake of travel card (region-wide fare system) by public
- '95 – '05; rapid infrastructure expansion