PROVISION OF BUS-BASED PUBLIC TRANSPORT FACILITIES IN DUBLIN CITY

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ABSTRACT:
The Quality Bus Network (QBN) is a low cost solution to provide public transport infrastructure with a high level of priority for public service vehicles on the existing road and street network in Dublin. The QBN is being provided in the short to medium term to enable the city to cope with the transport demand prior to the implementation of a high cost metro and light rail system. There is an annual investment of between €30m and €40m in the QBN infrastructure works.

To date the programme has been very successful with increases in the number of public transport users on the upgraded QBN routes ranging from 40% to 200%. There is also a significant increase in the modal share for buses together with a significant reduction in bus journey times.

The designs for the bus priority measures on the QBN take account of the needs of all road users. There have been significant safety benefits on the routes due to the provision of enhanced cycle, pedestrian and mobility impaired facilities as part of the overall route designs which also provide for accident remedial measures at existing ‘black spot’ locations.

INTRODUCTION

Dublin is the capital city of Ireland with a population in its catchments area of 1.5 million people. The population is expected to grow to 1.75 million by 2016. This has major implications for the provision of all types of infrastructure ranging from water treatment, education, health, etc to transportation.

In 1994 the Irish Government approved a transport strategy for Dublin. The strategy was known as the Dublin Transportation Initiative (DTI). This strategy had 3 critical objectives:
1. the production of a long-term Transportation Strategy to 2011 for the Dublin area.

2. the preparation of a medium term Investment and Implementation Programme up to 1999.

3. the putting in place of a continuous Transportation Planning Process.

The Dublin Transportation Office was set up in 1995 to deliver the continuous Transportation Planning Process and in 2000 it published its strategy for 2000-2016 entitled ‘A Platform for Change 2000-2016’

‘A Platform for Change’ is the blueprint for the future development of transport policies and infrastructure in the Dublin area up to 2016. It is the most comprehensive transportation strategy ever devised for Dublin and it also seeks to provide a strategic solution to current traffic problems. It is an integrated approach to deal with travel needs and land use development.

1.1.1 THE TRANSPORT INFRASTRUCTURE PROPOSALS TO 2016

The Platform for Change strategy was based on a vision for Dublin taking account of what type of city the people wanted. The Vision Statement for Dublin is:

- a city and region embracing the principles of sustainability
- a leading European City, proud of its heritage, and looking forward to the future
- the national capital, seat of government and centres of excellence
- a strong, dynamic and sustainable city
- a living city, on a human scale, accessible to all and providing a good quality of life for all its citizens.

‘A Platform for Change’ has two main elements which must be implemented for it to be successful:

- the provision of new transport infrastructure
- the implementation of demand management.

The overall objective is to reduce current and predicted levels of congestion to 1991 levels. It is clear that the provision of infrastructure and improved services alone will not accomplish this without the implementation of demand management measures.

The provision of new transport infrastructure and associated service improvements aims to increase the supply of facilities available through a substantial expansion in the public transport network, strategic road construction and traffic management measures.

The demand management initiative aims to reduce the growth in travel demand through the application of land use and other policies and the encouragement of a transfer of trips, especially at peak periods, from the private car to sustainable modes such as public transport, cycling and walking.

The public transport elements of the strategy aim to provide for approximately 300,000 trips in the morning peak hour of 2016 compared with 70,000 in 1999. To achieve this it will be necessary to create an integrated public transport network system with the following components:

- upgraded rapid transit suburban train network
- light rail network
- metro system
- expanded and upgraded bus network
- park and ride facilities
- integrated ticketing and real-time passenger information systems
- quality interchange facilities

Fig. 1 gives an overall view of the extent of the public transport proposals.
Public Transport Networks

There are also substantial upgrading and improvements to be carried out on the strategic road network with special emphasis being placed on the orbital routes bypassing the city, access for the port and airport and strategic links to the major growth centres of employment.

The traffic management measures incorporated in the strategy include the provision of:

- cycle routes and cycle facilities
- parking control and enforcement measures
- traffic management control systems with the emphasis on ITS
- pedestrian facilities
- traffic calming and accident reduction measures
- village improvement schemes.

The overall cost of the package of measures is €21 billion up to 2016. An essential part of the strategy is the need to address the short-term transportation needs of the city and region and the emphasis is on bus based public transport improvements particularly in the period up to 2006.

Table 1 shows the breakdown of capital costs of the infrastructure and service improvements elements of the Strategy for the periods 2000-2006 and 2007-2016.

2 The Quality Bus Network

Buses are the most flexible form of public transport. The bus is, consequently, the most extensive form of public transport in the Strategy in terms of route length and geographic coverage. Quality Bus Corridors and bus priority measures can be implemented relatively quickly and cheaply. They therefore provide the best means of dealing with the existing transportation deficit in the short term.
The role of the bus is likely to change quite substantially over time, particularly as the longer-term rail-based networks are put in place, in the long term the bus will increasingly be used to feed passengers to rail services as well as carry them directly to their ultimate destination. The bus will also be used to fill in gaps in the mesh of public transport routes where a rail-based system is uneconomic, impractical or not feasible and also to extend the reach of the rail network through the provision of feeder services.

The Quality Bus Network (QBN) consists of radial and orbital Quality Bus Corridors and additional bus priority measures. In general, the design of the network will offer clear advantage to public transport over private vehicles so as to ensure competitive and reliable door-to-door journey times. The target design speed for public transport services in the Quality Bus Network is 22kph. The total length of the QBN network is approximately 400km. See Fig.2.

![Figure 2 Quality Bus Network](image)

2.1.1.1 Source: “A Platform for Change”

**SCHEME DESIGNS**

There is no such thing as a prescriptive design for a Quality Bus Corridor. Every route and indeed every section of road presents a different set of circumstances in which bus priority has be to designed. Dublin has a large diversity of different road standards and on some roads it is not possible to provide a bus lane and maintain traffic flows.

However it is essential that each scheme follows procedures which will ensure that:
- all options are properly assessed with the needs of all road users taken into account;
- the various agencies involved in transport have input at the most opportune periods;
- public consultation is properly managed;
- detailed design is carried out to the correct specifications and standards;
- proper procurement procedures are followed;
- construction works are managed properly;
- monitoring of the scheme is carried out.

The design of the bus priority measures is part of an integrated transportation design approach for the routes taking account of the needs of all road users. Special emphasis is placed on the needs of pedestrians, cyclists, and other vulnerable road users. Remedial measures to reduce accidents are also incorporated in the design, together with the upgrading of the existing traffic control systems. Service characteristics, safe pedestrian access and high quality passenger waiting facilities are designed with an emphasis on meeting customer requirements.
Quality Bus Corridors are constructed so that buses are not delayed in traffic. This involves the use of traffic management measures such as with-flow and contra-flow bus lanes, one-way streets bus only roads, the use of selective bus detection technology and priority at traffic lights, bus gates and queue relocation. They have direct, high frequency services with extended working hours.

The Project Office has developed a Work Breakdown Structure (WBS) as a Project Management tool to ensure that all aspects of the design for the bus priority measures are taken into account.

The main WBS sections are set up as follows:

1. Concept Feasibility
   - Topographical surveys
   - Traffic surveys
   - Bus Information
   - Accident Information
   - Route Audit
   - Option Development & Assessment
   - Feasibility Report
   - Selection of preferred option at roundtable meeting with all agencies

2. Preliminary Design
   - Junction and route design
   - Traffic Modelling – TRIPS, SATURN, PARAMICS
   - Utility Information
   - Safety Audit Stage 1
   - Roundtable Meeting of all agencies

3. Statutory/Legal
   - Public Consultation process
   - Council Approval
   - Statutory Approval
   - Statutory Orders

4. Detailed Design
   - Instructions to Tenderers
   - Detailed Design Drawings
   - Bill of Quantities
   - Specifications and Standard Details
   - Preliminary Health & Safety Plan
   - Safety Audit Stage 2

5. Procurement
   - Tender Process
   - Recommend Contractor

6. Construction
   - Appoint Contractor
   - Appoint Resident Site Supervisory Staff
   - Arrange Payments of Certificates
   - Health & Safety Plan
   - Negotiate Final Contract Account
   - Safety Audit Stage 3

7. Commissioning
   - Launch Scheme
   - Confirm Bus Operators adherence to agreed speed frequency
   - Carry out Scheme Evaluation

A large amount of effort is being concentrated by the QBN Office on the design of bus priority measures on the main radial routes from the outer suburbs with special emphasis being placed on the conversion of the hard shoulders to bus lanes during the peak hours. There are major issues to be dealt with as part of these designs including:

   - the need for new legislation,
   - the reconstruction of the hard shoulders,
   - the safety of vulnerable road users,
   - meeting design standards for junctions and accesses on the routes
   - the overall monitoring and enforcement of the bus priority measures.

It is proposed to provide a high level of Intelligent Transport Systems to operate, monitor and enforce these bus lanes. The ITS systems will include the following:

   - Variable message signs to provide information and alter speed limits
   - Equipment to monitor congestion
   - CCTV to monitor speeds, enforcement, accidents etc
   - Speed cameras to enforce speed limits
   - Vehicle recognition systems to enforce correct vehicle usage of the bus lane.

Local bus priority measures and services will be provided as part of the QBN with particular reference to access for major residential, retail and employment centres.

The layouts of major residential, retail and employment developments in the future will allow direct and efficient access exclusively for buses with
these facilities incorporated as part of the planning conditions.

3 Scheme Evaluation

The evaluation of schemes forms an essential part of the monitoring of the schemes. This forms an essential part of the public perception of the benefits/disbenefits of the schemes based on improved bus journey times, increased passenger numbers, increased model share for buses and reduction in travel times.

The evaluation framework is set out in Table 2

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5 The Role of the Public Transport Providers

The main provider of bus-based public transport in Dublin is Dublin Bus. The Company operates a fleet of 1062 buses serving a population of 1.27 million. They currently operate a total of 150

(a) Table 2 QBC Evaluation Framework: Overview of Costs/Benefits

<table>
<thead>
<tr>
<th>QBC Route</th>
<th>Rest of Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefit</td>
<td>Cost</td>
</tr>
<tr>
<td>Benefit</td>
<td>Cost</td>
</tr>
</tbody>
</table>

1. Design etc. •
2. Construction •
3. Additional Bus Capital Costs • •
4. Time Savings/Loses Bus • •
   General Traffic • •
   Goods Vehicles • •
   Pedestrians •
5. Vehicle Oper. Costs Bus • •
   General Traffic • •
   Goods Vehicles • •
   Emissions ? ? ? ?
    Commercial ? ? ? ?
routes with approximately 500,000 customers per day. The company receives a subvention of 25% from the Government.

The QBCs comprise 20% of the Dublin Bus road network and approximately 50% of the total morning peak inbound passengers derive some benefit from travelling on the QBC network. Dublin Bus carries over 90% of bus passengers in the AM peak. Dublin Bus has carried out an analysis of the impact of the QBCs in relation to the number of passengers carried. The analysis set out in Table 3 shows an increase of 62% in the number of people carried on the QBCs routes after the QBCs became operational.

(1) Table 3 Impacts of QBCs
Source: Dublin Bus

<table>
<thead>
<tr>
<th></th>
<th>Pre QBC</th>
<th>Post QBC</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Buses</td>
<td>262</td>
<td>411</td>
<td>57</td>
</tr>
<tr>
<td>Peak Capacity</td>
<td>22,061</td>
<td>36,867</td>
<td>67</td>
</tr>
<tr>
<td>AM Hour Bus Trips</td>
<td>251</td>
<td>406</td>
<td>62</td>
</tr>
<tr>
<td>Peak Passengers</td>
<td>27,736</td>
<td>44,825</td>
<td>62</td>
</tr>
</tbody>
</table>

The current Dublin Bus commercial speed across the network is 14.6 kph at peak times. This compares with an European Union average of 17.3 kph. Dublin Bus estimates that this lower operating speed available in Dublin is equivalent to 20% of its operating fleet. They also estimate that congestion is costing the company about €50 million per annum.

As a company Dublin Bus is constantly seeking to improve efficiency and reduce operating costs. Major savings have been made in the reduction of staffing levels. In 1987 Dublin Bus operated a total of 820 buses with a staff ratio of 4.7 per bus. In 2003 the company operates 1062 buses with a staff ratio of 3 per bus.

The other major provider of bus-based public transport is Bus Eireann. This company operates the longer haul inter-urban routes which largely operate on the main radial routes in the city. They carry approximately 6% passengers in the morning peak on the radial routes.

THE BENEFITS OF THE QBCS

To date 9 Quality Bus Corridors have become operational. Major benefits are accruing to the commuters, the bus companies and the city.

Figures received from Dublin Bus show an increase in the annual number of passengers carried from 134 million in 1998 to 157 million in 2002. See Fig. 3 below. However, the majority of these additional passengers are on the QBCs. There is an overall increase of peak customer volumes of 38% on the QBCs with approximately 60% of these customers transferring from cars. Bus journey times have been cut by up to 40%.

5.2 Figure 3 Annual Number of passengers carried

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The Future

The Quality Bus Network provides a low-cost solution for the provision of public transport on the existing street network of Dublin for the immediate future. The experience gained by the staff currently involved in the design and implementation of bus priority measures is essential for the future proposals to ensure a co-ordinated standardised approach for all areas within the Dublin region.

The Government is committed to providing funding of €30-€40 million per annum for the next 3 years in order to put the necessary infrastructure in place to provide for priority for buses across the Dublin region. It is crucial that the Quality Bus Network is implemented to ensure that the bus system can provide the public transport service to meet the demands of the expanding city and region and enable it to maintain its competitiveness.

1.2 Table 4

Quality Bus Corridor Monitoring November 2002

1.3 Summary of AM Peak Comparative Bus and Car Journey Times

<table>
<thead>
<tr>
<th>Quality Bus Corridor</th>
<th>Bus Average Journey Time (mins)</th>
<th>Car Average Journey Time (mins)</th>
<th>% Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stillorgan</td>
<td>32:55</td>
<td>65:43</td>
<td>99.64 %</td>
</tr>
<tr>
<td>Finglas</td>
<td>13:48</td>
<td>23:45</td>
<td>72.10%</td>
</tr>
<tr>
<td>Tallaght</td>
<td>50:07</td>
<td>73:33</td>
<td>46.67%</td>
</tr>
<tr>
<td>Swords</td>
<td>29:16</td>
<td>40:42</td>
<td>39.07%</td>
</tr>
<tr>
<td>North Clondalkin</td>
<td>8:44</td>
<td>11:57</td>
<td>36.83%</td>
</tr>
<tr>
<td>Malahide</td>
<td>27:11</td>
<td>35:35</td>
<td>30.90%</td>
</tr>
<tr>
<td>Lucan</td>
<td>32:36</td>
<td>35:35</td>
<td>8.18%</td>
</tr>
<tr>
<td>Rathfarnham</td>
<td>34:55</td>
<td>36:22</td>
<td>4.15%</td>
</tr>
<tr>
<td>Blanchardstown</td>
<td>26:22</td>
<td>23:10</td>
<td>(12.14%)</td>
</tr>
</tbody>
</table>

Source: Dublin Transportation Office