

To West Yorkshire Combined Authority
From Steer Davies Gleave
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Project WY Stated Preference Research

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Illustrative Application of Values in Economic Appraisal

Summary

1. Stated Preference research has been conducted with over 1,000 bus users across West Yorkshire to value six key themes in the West Yorkshire Bus Strategy. The output of this research is a value per passenger for each theme (measured in pence for fare paying passengers and minutes for concessionary passengers). These values have been applied in an economic appraisal to illustrate the potential benefits over a twenty-year period.
2. This showed that delivery of the Bus Strategy could lead to a potential economic benefit of £455m PV and a potential revenue uplift of £138m PV over a twenty-year period. This assumes that the themes would be introduced in financial year 2020/21 and would be implemented across all bus services in West Yorkshire. This calculation does not take account of the cost or practicality of deploying the bus strategy.
3. The values derived within the Stated Preference research represent the benefit of each Bus Strategy theme relative to average current conditions. Therefore, care is advised in the application of these values at a more disaggregate level, particularly for example at an individual bus service level – where current experience of the themes may not correspond with West Yorkshire wide experience (on a higher quality bus corridor, for example).
4. The sensitivity testing undertaken demonstrates the uncertainty within the valuations, particularly significant within the appraisal application for concessionary pass holders. It is not advised that the results of the sensitivity tests are used save as illustration of this uncertainty.

Introduction

5. Steer Davies Gleave was commissioned to undertake Stated Preference research on behalf of the West Yorkshire Combined Authority (WYCA) to value aspects of the West Yorkshire Bus Strategy. The research provided a value per passenger for six key themes in the Strategy, measured in pence per trip for fare paying passengers and minutes per trip for concessionary pass holders.
6. This note provides an indicative example of how the values could be applied in an economic appraisal. This is a high-level, illustrative, calculation of the benefits which could be achieved assuming the Strategy themes are introduced and available to all West Yorkshire bus passengers.

Methodology

Demand

7. West Yorkshire bus usage and the demand split between fare paying and concessionary passengers is taken from Department for Transport bus statistics for 2015/16 (Table 1). In the model, it is assumed for simplicity that all themes are introduced in 2020/21 and that bus demand does not change between 2015/16 and 2020/21; in effect this assumes also that fares remain constant in RPI real terms.

Table 1: Bus passenger demand in West Yorkshire

	2015/16 (million journeys)	Split
Fare Payers	107.4	70%
Concessions	46.1	30%
Total Passengers	153.5	100%

Source: DfT bus statistics tables BUS0109a and BUS0823¹

Appraisal assumptions

- The appraisal has been constructed in line with DfT’s latest online transport appraisal guidance (WebTAG) including the July 2016 TAG data book².

Appraisal Price Base

- Fare paying passenger benefits are expressed in RPI real terms (consistent with evidence that passengers would change their travel behaviour if fares change in RPI real terms). Future year RPI growth is taken from the TAG data book.
- The benefits for concessionary passengers are expressed in minutes. Values of time (measured in £ per hour) are used to convert these benefits into monetised benefits. The model uses the ‘other journey purpose’ values of time (that is ‘other’ than business or commute) given in WebTAG Table A1.3.2. WebTAG provides values of time in resource costs, perceived costs and market costs. For appraisal purposes, market costs are used.
- The model converts all benefits into GDP Deflator real 2010 prices, as required by WebTAG.

Other Appraisal Assumptions

- The appraisal benefits start in 2020/21, assuming the themes would be introduced in this financial year. The benefits are calculated over a twenty-year period.
- The current year for the appraisal model is 2016/17, and discounting has been applied at a rate of 3.5% per year for twenty years, (as required by WebTAG).
- The model has been set up to represent three tranches of passenger demand, which can be used to control when benefits are received. We have assumed that a third of bus passengers start receiving benefits in Year 1, a third of passengers start receiving benefits in Year 2 and a third of passengers start receiving benefits in Year 3.
- Benefits are also ramped up over a three-year period (80%/90%/100%). For example, passengers who started receiving benefits in Year 2 will receive 80% of benefits in Year 2, 90% in Year 3 and 100% in Year 4 onwards.

Themes

- The Stated Preference research derived values for themes based on two packages:
 - Journey package
 - Network package

¹ <https://www.gov.uk/government/collections/bus-statistics>

² <https://www.gov.uk/government/publications/webtag-tag-data-book-july-2016>

17. The Willingness to Pay values for each theme are shown in Table 2. The z-ratio (which indicates the strength of the relationship observed in the data) for the Network package was not ‘statistically significant’ for both fare payers and concessionary passengers. Therefore, these themes have not been included in the appraisal.

Table 2: Willingness to Pay values (2017 prices and values)

Theme	Package	Fare Payers (£ per passenger)	Concessionary Passengers (minutes per passenger)
Information	Journey	£0.06	2.3
Ticketing	Journey	£0.07	1.3
Journey Experience	Journey	£0.06	2.2
Personal Safety	Journey	£0.07	2.5
Bus Network	Network	<£0.01 (0.7p)	2.3
Visual Appearance	Network	<£0.01(0.4p)	1.9
Total (Journey Package only)		£0.26	8.3
% of Average One-way Fare/Journey time		13%	35%

Source: WY Stated Preference Research Final Report March 2017, Table 4.1.

18. For the appraisal, a prudent approach has been taken in representing the extent to which bus passengers benefit from the themes. A benefit reduction factor has been applied to all tranches of passengers, based on the certainty of the Willingness to Pay values.
19. The benefit reduction factor reduces the applied willingness to pay values to the value of the lower end of their 95% confidence range. This is, roughly, the estimate in Table 1 minus two standard errors. For fare payers, the benefits are reduced by 12% and for concessions, with a lower z ratio/higher standard error, the benefits are reduced by 66%.

Elasticities

20. In addition to benefitting current demand, it is assumed that new passengers will be attracted to West Yorkshire bus services as they will receive a better bus service for the same fare (in real terms). To calculate the change in demand, we have used elasticities from the TRL ‘Black Book’³. These elasticities are shown below.

Table 3: Elasticity Values

Change in Bus Demand with respect to:	Elasticity
Fare	-0.43
Time	-0.38

Revenues

21. As discussed above, delivery of the Bus Strategy themes would attract new demand, which would lead to a revenue uplift. The total additional revenue over the twenty-year period has been calculated as £138.2m in 2010 GDP deflator real present values. This revenue was calculated using the average one-way bus fare derived in the Stated Preference survey.

³ The Black Book: The demand for public transport: a practical guide, TRL Ltd, 2004, Table 7.28.

Table 4: Additional revenue from fare paying passengers

2010 Prices (£millions)	Revenue
2020/21 (Year 1)	£49.2
2021/22 (Year 2)	£46.0
2022/23 (Year 3)	£42.9
Total Present Value (over twenty-years)	£138.2

Benefits

22. The benefits for fare payers and concessions are calculated as follows:

- A change in demand factor is derived by calculating the proportionate equivalent change in fare or journey time (for concessionary passengers) raised to the power of the elasticity.⁴
- The change in demand factor is multiplied by existing demand to calculate the change in demand.
- Existing passenger benefits are calculated by multiplying the Willingness to Pay values by existing demand.
- New passenger benefits are calculated by multiplying half of the Willingness to Pay values (based on the rule of a half) by new demand.
- Total passenger benefits are the sum of existing passenger benefits and new passenger benefits.
- Concessionary passenger benefits are converted into monetary values using values of time.

Economic Benefits

23. This indicative appraisal suggests that delivery of the Bus Strategy themes would lead to an economic benefit of £455m PV over a twenty-year period, assuming that the themes are available to all bus passengers in West Yorkshire.

Table 5: Total Passenger Benefits by theme

2010 Prices (£millions)	Theme				Total
	Information	Ticketing	Journey Experience	Personal Safety	
2020/21 (Year 1)	£40.1	£36.8	£39.4	£45.5	£161.7
2021/22 (Year 2)	£37.6	£34.5	£36.9	£42.6	£151.7
2022/23 (Year 3)	£35.2	£32.2	£34.6	£39.9	£141.8
Total Present Value (over 20 years)	£112.9	£103.4	£110.9	£128.0	£455.2

Sensitivity tests

24. As discussed above, the Central Case reduces the applied willingness to pay values to the value of the lower end of their 95% confidence range (or by two standard errors).

25. Two sensitivity tests have been undertaken to see what the benefits would be if:

- The Willingness to Pay values were not reduced.
- The Willingness to Pay values were reduced by one standard error (instead of two).

26. The results are shown below. If the values are not reduced or are reduced by one standard error, then the benefits and revenue are higher than in the central case, as expected.

⁴ For example: $(\text{fare}/(\text{fare}+\text{benefit_value}))^{\text{fare_elasticity}}$

Table 6: Benefits and Revenue for central case and sensitivity tests (over twenty-year period)

2010 Prices £M Scenario	WTP values reduction		Benefits			Revenue
	Fare payers	Concessions	Fare payers	Concessions	Total Benefits	
Central Case (Values reduced by two standard errors)	12%	66%	£285.2	£170.0	£455.2	£138.2
Values reduced by one standard error	6%	33%	£304.5	£344.9	£649.4	£147.0
Values not reduced	No reduction	No reduction	£323.9	£525.7	£849.6	£155.9

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