

## Method of Calculating Economic Impact

Using a Discounted Cost-Benefit Analysis.

IH 35W/ IH 820 Interchange

Based off of a cost benefit model developed by NCTCOG staff, the IH 35W/ IH820 Interchange project should have a net positive effect on the economy of \$40.2 million annually and create 437 jobs when completed. During construction there will be a net benefit to the economy of \$131 million and 713 jobs over each of the two years of the project. This project will have a long-term return on investment to the economy of 285%.

$$W_t = B_t - C_t$$

$$J = W_t / Y$$

$$B_t = (CO_2 * Z) + (Hours\ Saved * L) + (G_t * M) + (Gas\ Saved * P_G) + (Lives * \beta)$$

$$C_t = \frac{PV(1+r)^t * r}{(1+r)^t - 1}$$

$W_t$  = Net effect

$B_t$  = Benefits

$C_t$  = Costs

$G_t$  = Government Spending

$M$  = Multiplier

$r$  = Interest Rate

$t$  = time

$Y$  = Economic output per job.

$J$  = Total jobs created

$PV$  = Present Value

$P_G$  = Price of Gas

$\beta$  = Economic Value of a human life

$B_t$  = Benefits will use available data on benefits to core economic activities (excluding real estate). Consideration has been given to the economic benefit of hours saved and pollution reduction. The long term benefits are \$54,316,090.5 annually.

$\beta$  = Economic Value of a human life is set at \$6 million according to TIGER grant application.

$C_t$  = Costs are based on the total cost of the project ( $PV$ ) from all sources of \$250 million, of which \$175 million is from the TIGER program. These costs have been annualized to match benefits. The annual cost is \$14,102,621.

GasSaved = The total amount of gallons of gas saved as a result of the project. This project is predicted to save 5,742 gallons a day in fuel. This number is then multiplied by 250 to get the total saved.

$G_t$  = Government Spending is the actual amount of construction (excluding right-of-way and other land purchasing costs) that occurs in any given period. For the IH35W/ IH820 project it is assumed to be \$125 million during each of the two years of construction.

Hours Saved = Total hours saved for the region each year after completion of the project will be 2,095,500 hours according to NCTCOG. No numbers exist for congestion created by the construction. Traffic is assumed to be unaffected by construction. Traffic data is based on 250 business days a years.

$L$  = The cost of 1 hour spent in traffic. According to the Texas Transportation Institute, the cost of 1 hour is \$15.47 per hour for personal transportation and \$102.12 for freight traffic. NCTCOG Traffic studies have found that approximately 10% of all traffic is freight traffic. The combined numbers are \$24.14 per hour saved.

Lives = Number of traffic fatalities prevented as a result of roadway improvements. NCTCOG staff predicts that there will be a 26% fall in crashes or 15.9 fewer each year. This will save 1.3 lives over the life of the project.

$M$  = this is the multiplier applied to construction spending. It is a made up number assumed to be 1.5. The range provided by the Congressional Budget Office for infrastructure projects is 1.0 to 2.5 over the short term.

$CO_2$  = Carbon Dioxide reduced. NCTCOG model found a decrease of 55.3 tons per day. This was multiplied by 250 business days to get an annual total.

$P_G$  = Price of Gas is set at \$2.10 per gallon of unleaded to err conservatively.

$PV$  = Total cost of the project in today's dollars.

$r$  = The interest rate will have a significant effect on the outcome of the model. The lower the rate used the larger the benefits of the project. The model is set at 7% as required in TIGER grant application.

$t$  = Time is the number of years that will be used to price the project out over. The longer the period used, the larger the benefit of the project. The model is set at 30 years.

$Y$  = Economic output per job is the amount of Gross Domestic Product required to create one job. The White House Council of Economic Advisors set this at \$92,000.

$Z$  = the cost of 1 ton of Carbon Dioxide set at \$33. This number specified in the TIGER application.

TIGER Request	Hours Saved	CO2 (in tons/day)	Fuel Saved (in gallons)	Lives Saved	Cost of an Hour	Cost/Ton of CO2	Cost of Gallon of Fuel	Cost of Life Lost	Annual Cost
175,000,000	8,382	55.3	5,742	0.043	24.14	33	2.10	6,000,000	14,102,620.61

Net Benefits	Net Effect	Net Benefit of Hours Saved	Net Benefit of Pollution	Net Benefit of Fuel Saved	Net Benefit of Lives Saved
54,316,090.50	40,213,469.89	50,585,370.00	456,225.00	3,014,550.00	259,945.50

Years to Complete	Annual Short Run Construction Benefit	Jobs in Short Run	Jobs in Long Run	Total Short Run Jobs	Benefit to Cost Ratio	ROI (total economy)	Tax Revenue Replaced (25%)
2	187,500,000.00	1,019	371	2,038	2.70	169.60	42.40%

NCTCOG Presentation

[..\..\Roadway\\_Studies\TxDOT\\_Fort\\_Worth\DFW\\_Connector\\_\(Funnel\)\\_SH114\\_SH121\rtc2.ppt](..\..\Roadway_Studies\TxDOT_Fort_Worth\DFW_Connector_(Funnel)_SH114_SH121\rtc2.ppt)

TxDOT Fort Worth's website for DFW Connector Project

[ftp://ftp.dot.state.tx.us/pub/txdot-info/ftw/dfw\\_connector/fact\\_sheet.pdf](ftp://ftp.dot.state.tx.us/pub/txdot-info/ftw/dfw_connector/fact_sheet.pdf)

Texas Transportation Institute at Texas A&M Study on Traffic Congestion

[http://tti.tamu.edu/infofor/media/archive.htm?news\\_id=5206](http://tti.tamu.edu/infofor/media/archive.htm?news_id=5206)

Texas Commission on Environmental Quality funding methods

[http://www.ectausa.com/documents/07Wescott\\_001.pdf](http://www.ectausa.com/documents/07Wescott_001.pdf)