



Assessing the Business Case ROI for Intercity Passenger Rail Corridor Investments

VOLUME 3: ROI Tool Information and Instructions



AMERICAN
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OF STATE HIGHWAY AND
TRANSPORTATION OFFICIALS

AASHTO

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Preface

This document describes the Business Case ROI Tool, which calculates a societal return on investment for intercity passenger rail investments as viewed from the perspectives of local, state/regional, and federal public agencies. It is the third volume in the series: *Framework for Assessing the Business Case ROI for Intercity Passenger Rail Corridor Investments*. It is intended for use alongside *Volume 1: Guide for Decision-Makers* and *Volume 2: Methodology*.

It has three sections: (1) a summary of the tool and its intended implementation, taken from Chapter 6 of *Volume 1: Guide for Decision-Makers*, (2) a description of the tool elements and case studies that illustrate the interpretation of results, taken from Section D of *Volume 2: Methodology*, and (3) user instructions, taken from the instruction sheet in the *ROI spreadsheet workbook*.

The tool and associated documentation were developed by Glen Weisbrod and Ira Hirschman of EBP, and Simon Tan of the Mineta Transportation Institute (MTI). Please refer to the Acknowledgements page of *Volume 1: Guide for Decision-Makers* to see a list of all parties who provided input, review and oversight for this project.

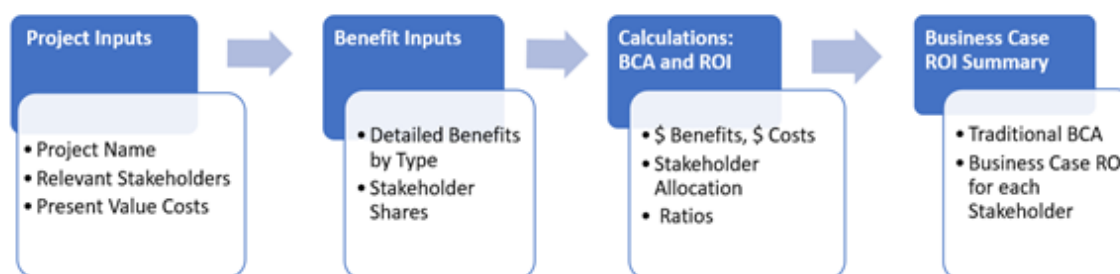
1. ROI Tool Summary and Intended Use

From Chapter 6 of Volume 1: Guide for Decision Makers

The ROI Tool calculates the societal ROI (return on investment) associated with HS&IPR (high speed and intercity passenger rail) projects. Stakeholders are typically recognized to be federal government, each state served by HS&IPR, each city served by it, and private sector developers and operators.

Overview of the ROI Calculator Tool. The ROI Calculator is an Excel workbook file that provides a straightforward means of progressing through key decision points to arrive at ROI measures that compare the value of benefits to costs for each stakeholder. It is important to note that the tool provides for this comparison in a computational sense but is not prescriptive as to how investment costs should or will ultimately be borne by federal, state, local, or private sector stakeholders. Decisions about investment funding responsibilities are matters of policy and are arrived at by negotiated processes. Instead, the scenarios discussed below apply alternative assumptions about the assignment of benefit and investment responsibilities, as they represent an essential element to any ROI metric in which benefits are mathematically related to project investment costs. The assignments among stakeholders are made *only* for purposes of illustrating the tool's operation. The ROI Calculator has four elements summarized below:

Elements of the High-Speed and Intercity Passenger Rail ROI Calculator Tool



The ROI Calculator generates a traditional benefit/cost ratio and a business case ROI reflecting all relevant business case factors. These results are shown for the overall project, based on the total project cost and total benefits. Results are also calculated separately *for each stakeholder*, showing their benefit share assuming it allocated based just on *user benefits* and again assuming it is allocated based on all relevant business case factors.

Illustrative Examples of Business Case ROI Calculations and Results. It can be useful to consider three examples to illustrate how the allocation of benefits among stakeholders can differ in different contexts:

- (1) Three State Project - A scenario where the context is a rail line spanning three adjacent states, creating commonly recognized benefits that do not overlap among states. In this scenario there are no unaccounted benefits, no public-private partnerships, and no federal involvement.
- (2) Federal/Local Sharing - A scenario where there are both federal and local organizations involved, with distinctly different (non-overlapping) benefits recognized by each level of government. In this scenario there is no public-private partnership and no state involvement. The federal

jurisdiction would be the primary driver of the project, but it would occur in a corridor with a targeted local economic development strategy for a specific area.

- (3) Overlapping Benefits with Value Capture - A scenario where federal, state, and local governments are all involved, along with private operators and developers. Each party recognizes some of the benefits, with significant overlap. Value capture is represented in a public-private partnership.

These three scenario examples illustrate how there can be significant variation in terms of (a) which groups of stakeholders are involved in decision-making and funding for a HS&IPR project, and (b) whether benefits of different types are vested jointly by multiple stakeholders or are the exclusive concern of a single stakeholder. In other words, the benefit allocations can reflect whether particular categories of benefit are claimed by multiple stakeholders and whether those benefits are “nested” (i.e., whether they overlap) within the overall total.

An example of a nested or overlap benefit would be user benefits/travel time savings. With this example, 100% of the benefits may be relevant to the Federal stakeholder, while individual states comprising the corridor may also recognize a share of user benefits based on allocation variables such as trip origins within the state. The ROI calculator provides a way to allocate overlapping benefits among parties in a way that avoids double-counting or otherwise over-estimating ROI.

These three examples further demonstrate that different ROI results can emerge depending on (1) how investment costs are distributed among the stakeholders; and (2) whether overlap benefits are considered from the individual stakeholder perspective.

As seen in the examples, the tool first calculates an overall ROI ratio from a traditional standpoint, where stakeholders are not considered, and no overlapping benefits arise. This results in a single, consolidated ROI measure. The tool then calculates individual stakeholder ratios using alternative *illustrative* assumptions about the distribution of investment levels among stakeholders, as follows:

- One set of stakeholder-based ROI ratios corresponds to a case where investment levels are allocated based on the overall share of benefits including overlap benefits. In this case, each stakeholder’s ratio is the same, by definition, since the numerator and the denominator are both distributed among stakeholders using the same percentages. Because of overlapping benefits and a more inclusive set of benefits, the stakeholder ratios are higher than the traditional global ROI ratio when overlaps benefits are not considered.
- A second set of ROI ratios is also calculated in the examples, where investment levels are allocated based only on user benefits (a common approach often used in multijurisdictional funding formulas). In this case, ratios differ by stakeholder. Ratios are again larger than the single traditional ROI measure when benefit overlaps are not considered.

This is an important result, as ROI will depend ultimately not only on benefits but the consensus allocation of investment costs among stakeholders.

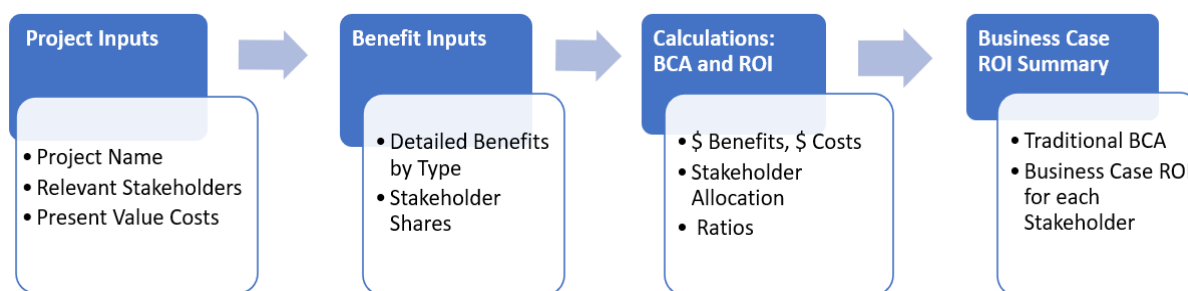
Typical inputs and ROI results are presented in *Appendix D*. The variations in results among scenarios demonstrates how key factors can enhance and expand ROI to build a more nuanced and robust business case for a particular HS&IPR project. It can help with efforts to achieve greater public support, particularly cases where recognition of local benefits of a rail project can translate into stronger public support from state and local stakeholders.

2. ROI Tool Elements and Illustrative Case Studies

From Section D of Volume 2: Methodology

To accompany this Guidance document, an Excel-based tool has been developed which allows HS&IPR analysts at all levels to calculate a rate of return from multiple stakeholder perspectives, resulting in a Business Case ROI for project stakeholders. Specifically, the tool 1) identifies project stakeholders at various jurisdictional levels and from public versus P3 perspectives; 2) provides “quick reference” guidance for estimating and monetizing the benefits (keyed to and described in greater depth in Appendix C) and for allocating those benefits to the defined stakeholders; 3) calculates ratios of benefits to costs for each stakeholder group; and 4) summarizes these results from both a traditional BCA perspective (where stakeholder differences are not observed) and from a stakeholder-based Business Case ROI perspective.

Overview of the Tool. The figure below shows the logic flow of the ROI tool, as well as key operations and functions at each worksheet/stage of the model.



The following worksheets comprise the model. For each operational worksheet, a screenshot is included below.

- **Sheet 1: Intro + User Guide** – This sheet provides an overview of the tool and instructions for its use. The user guidance provides sufficient detail for users to execute the tool, including where key project and benefit inputs are entered, where stakeholders are designated, where stakeholder benefits allocations are entered, and where ROI calculations are made.
- **Sheet 2: Project Inputs (Input 1)** – This sheet provides for entry of the discounted present value (PV) of project costs, as well as a stakeholder list which is carried through the remainder of the tool using built-in macros.

A	B	C	D	I	J
Project Inputs					
Basic facts about the project can be entered here. A Total Project Cost and list of Stakeholders is required.					
The button on the right will take the input on this sheet and rebuild the tables in the subsequent sheets. From there, individual benefit values can be allocated among the various stakeholders.					
Regenerate Allocation Sheets					
Project Name		Total Project Cost			
Rail Project X		\$ 12,000,000,000		(PV of capital cost, annual O&M, and periodic rehab)	
Project Description		Stakeholder List			
Rail Project X Description		Federal			
		State 1			
		State 2			
		State 3			
		Local 1			
		Local 2			
		Public Agency			
		P3 Project Developers			
<div> <div>Intro and User Guide</div> <div>Project Inputs</div> <div>Benefit Input and Allocation</div> <div>ROI C</div> </div>					

- Sheet 3: Benefit Input and Allocation (Input 2)** – This sheet breaks major benefit categories into disaggregated individual metrics. The sheet provides "quick reference" guidance on methods and sources for the valuation of each metric. It also provides "quick reference" guidance for allocation of benefits to stakeholders. Present value of benefits are entered directly in this sheet, and allocation of stakeholder percentages are also entered directly here. A partial view of this sheet is shown below.

It is important to note that the row total of allocation percentages for any given benefit metric may often be greater than 100 percent. As described in greater detail in the Guide for Decision Makers, this is a deliberate and fundamental feature of the tool – it provides for what are essentially overlap of benefits; for example, where locales are nested within states and states nested within the federal stakeholder lens. This feature allows for ROI results that are specific to different stakeholder groups. Different benefit categories will have different allocations.

At the same time, no individual stakeholder may receive more than 100 percent of a given row allocation total; features are built into the tool to warn users when this input error is encountered.

Assessing the Business Case ROI for Intercity Passenger Rail Corridor Investment: ROI Tool

Rail Project X - Benefit Input and Allocation																
Breakdown of Benefit Types into submetrics, approaches to valuation, and Stakeholder allocation																
Benefit Category	Benefit Type	Economic Value Measure	Valuation Approach	Source of Valuation (see	Stakeholder Allocation Basis	Total PV to be Allocated	Federal	State 1	State 2	State 3	Local 1	Local 2	Public Agency	P3 Project Developers		
LOCAL LAND IMPACTS	Time Savings	\$ value passenger hours saved by existing rail users	Average hourly value of travel time - intercity rail travelers	DOT, FAA guidance	reduction in annual passenger hours, by stakeholder trip origins	\$ 537,000,000	46%	27%	6%	41%	74%	74%	18%	13%		
		\$ value passenger hours saved by car users shifting to rail	Average hourly value of travel time - intercity highway travelers		\$ 3,000,000,000	80%	45%	68%	69%	66%	48%	79%	72%			
		\$ value passenger hours saved by intercity bus users shifting to rail	Average hourly value of time - intercity bus travelers		\$ 50,000,000	42%	93%	5%	73%	16%	70%	59%	48%			
		\$ value person hours reduced for air travelers shifting to rail	Average hourly value of time - air travelers		\$ 200,000,000	71%	52%	60%	96%	4%	64%	81%	6%			
		\$ value passenger hours saved by remaining car users	Average hourly value of travel time - intercity highway travelers		\$ 500,000,000	8%	35%	24%	99%	58%	83%	37%	74%			
		\$ value passenger hours saved by remaining bus users	Average hourly value of time - intercity bus travelers		\$ 500,000,000	83%	20%	10%	86%	68%	84%	20%	48%			
		\$ value passenger hours saved for remaining air travelers, including propagated delay	Average hourly value of time - air travelers		\$ 500,000,000	3%	18%	86%	88%	36%	2%	97%	0%			
		Total Time Savings Benefits					\$ 5,287,000,000	62%	38%	53%	73%	61%	54%	65%	55%	
	Cost Savings	reduced auto vehicle operating costs from reduced VMT - auto to rail mode shift	VOC per mile for light duty vehicles	DOT, FAA guidance	reduction in annual VMT, by stakeholder trip origin	\$ 100,000,000	81%	42%	25%	40%	33%	11%	79%	65%		
		reduced air travel costs - air to rail mode shift	average commercial air fare		reduction in annual air passenger trips, by stakeholder trip origin	\$ 300,000,000	8%	31%	61%	94%	49%	97%	85%	68%		
		reduced bus travel costs - bus to rail mode shift	average intercity bus fare		reduction in annual bus passenger trips, by stakeholder trip origin	\$ 25,000,000	30%	44%	80%	82%	4%	53%	36%	18%		
Intro and User Guide		Project Inputs	Benefit Input and Allocation	ROI Calculations	ROI Summary											

- Sheet 4: ROI Calculations** – Based on the allocations in the prior worksheet, stakeholder shares are aggregated and summarized in this sheet. (If desired, it is also possible to overwrite these aggregate shares.) Based on these allocations, ROI ratios are then calculated for the project overall using traditional methods as well as by stakeholders, using a Business Case approach. To highlight important differences in results under different stakeholder allocation assumptions, the ROI is calculated in two alternative ways: one based on total benefits, and another based only on user benefits.

	A	B	C	D	E	F	G	H	I	J	K	
1	Rail Project X - ROI Calculations											
2	Total Benefit values calculated from the prior sheets. ROI ratios are calculated for the project overall using traditional methods, as well as by stakeholders, using a Business Case approach. Costs are allocated to stakeholders in two alternative ways: based on total benefits and based only on user benefits.											
3												
4		Benefit	Total Benefit (PV)	Federal	State 1	State 2	State 3	Local 1	Local 2	Public Agency	P3 Project Developers	
8		Induced Travel	\$ 200,000,000	43%	38%	75%	10%	15%	60%	72%	97%	
9		Environmental (Emissions)	\$ 248,000,000	53%	52%	62%	62%	31%	70%	71%	49%	
10		Safety	\$ 35,000,000	29%	73%	72%	40%	61%	50%	71%	51%	
11		Regional Integration	\$ 1,500,000,000	5%	90%	5%	72%	62%	25%	60%	81%	
12		Intermodal Transfer	\$ 2,000,000	32%	10%	63%	58%	49%	44%	43%	52%	
13		Equity	\$ 10,000,000	40%	45%	81%	65%	66%	5%	14%	9%	
14		Resilience (Redundancy)	\$ 20,000,000	73%	98%	66%	51%	91%	34%	64%	65%	
15		Sustainable Economic Future	\$ 1,000,000	33%	6%	9%	11%	47%	3%	21%	77%	
16		Local Land Value	\$ 10,000,000	23%	49%	56%	90%	13%	86%	40%	67%	
17		Local Land Development	\$ 10,000,000	51%	45%	80%	68%	92%	30%	58%	4%	
18		Revenue	\$ 1,000,000,000	52%	83%	67%	43%	17%	69%	93%	63%	
19		Life Cycle Cost Savings	\$ 1,000,000,000	74%	92%	75%	88%	15%	65%	86%	48%	
20		Total	\$ 9,948,000,000	\$ 3,600,658,791	\$ 5,087,141,731	\$ 5,797,910,456	\$ 4,852,505,280	\$ 5,303,247,766	\$ 6,630,948,562	\$ 6,133,865,352	\$ 6,287,651,174	
21												
22		Total Stakeholder-based benefits	\$ 43,693,929,112									
23												
24		Traditional Benefit Cost Ratio	0.83									
25												
26		Cost share based on Stakeholder-based benefits	0.082406386	0.11642674	0.132693731	0.111056739	0.121372645	0.151759036	0.140382554	0.143902169		
27		Allocated Costs based on Stakeholder-based benefits	988876632.7	1397120882	1592324766	1332680868	1456471745	1821108432	1684590645	1726826029		
28		Benefit Cost Ratio based on Stakeholder-based benefits	3.641160759	3.641160759	3.641160759	3.641160759	3.641160759	3.641160759	3.641160759	3.641160759		
29												
30		Cost share based on User Benefits only	0.042980831	0.036698717	0.083345827	0.046200579	0.080018802	0.096160025	0.065979179	0.077691286		
31		Allocated Costs based on User Benefits only	515769970.8	440384603.3	1000149926	554406947.6	960225628.5	1153920296	791750147.6	932295431.3		
32		Benefit Cost Ratio based on User Benefits only	6.981133053	11.55158853	5.797041327	8.752605466	5.522918373	5.746452842	7.747223503	6.744268998		
33												
34												

- **Sheet 5: ROI Summary** – This sheet summarizes the Business Case ROI in the format of a printable (in landscape) page.

Rail Project X - ROI Summary									
Rail Project X Description									
Traditional Benefit Cost Ratio	0.83								
	Federal	State 1	State 2	State 3	Local 1	Local 2	Public Agency	P3 Project Developers	
Stakeholder Allocated Benefits	\$ 5,520,079,116	\$ 4,325,640,756	\$ 5,434,837,996	\$ 5,091,327,891	\$ 4,947,722,794	\$ 5,576,224,620	\$ 4,894,827,451	\$ 5,925,623,666	
Benefit Cost Ratio (costs allocated by total stakeholder benefits)	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	
Benefit Cost Ratio (costs allocated by user benefits only)	5.57	5.23	5.58	6.05	6.36	6.95	7.68	5.90	
Benefit Cost Ratio (optional alternative cost allocation process)									

- **Sheet 6: Present Value Calculator (optional sheet)** - As an added option, the tool includes a discretionary sheet that may be used to calculate the 50 year Present Value of annual cost and benefit streams. This tool is useful when a Present Value has not been estimated but an annual target year value is available. The sheet permits gradual phasing in of benefits as a project ramps up, and permits different discount rates to be applied to individual benefit categories.

Illustrative Case Study Scenarios

As noted in the Guide for Decision Makers (p. 14-15), three scenarios were introduced to illustrate how different configurations of stakeholders with varying stakeholder interests can result in different ROI results. The three scenarios, each of which are public sector or P3 projects, are:

1. **Three State Project:** A HS&IPR line encompasses three adjacent states, and where benefits do not overlap among the states. No federal or private sector participation in the development or financing of the project is assumed.
2. **Federal/Local Sharing Project:** There are both federal and local jurisdictions involved, with distinct benefits recognized by each stakeholder entity in different proportions. While local stakeholders have some interest in more general benefit categories such as user benefits and safety improvements, the local stakeholder interest is heavily weighted toward economic develop benefits, which are not directly relevant to federal decision making.
3. **Overlapping Benefits with Value Capture:** This is a scenario where federal, state, and local jurisdictions are all involved in funding, and all levels have varying levels of interest across the board in most benefit categories, including economic development and value capture.

Note that inputs used in these scenarios are not derived from any specific HS&IPR project or previous studies of proposed rail projects. However, while hypothetical, they are indicative of the general magnitude of relative benefits seen in some prior high-speed rail studies.

Example 1: Three State Project. In this hypothetical case, there is a \$10 billion project for a rail line running through three states. Most but not all benefits accrue to these three states, which is why the total of benefits across all three states (sum of the state column totals) is less than the total benefits shown in the first column of numbers.

Some of the benefit allocation percentages vary by states, as use of the rail line, user cost savings, environmental impacts, and economic development (regional integration) impacts have different distributions among the states.

In the final accounting, each state's share of cost is allocated consistent with its share of total benefits, so all three states end up with the same ROI. These state ROI numbers are smaller than the Global ROI because there are some benefits occurring to parties outside of the three states.

Case Study 1: Three State Project - ROI Calculations

Total Benefit values calculated from the prior sheets. ROI ratios are calculated for the project overall using traditional methods, as well as by stakeholders, using a Business Case approach. Costs are allocated in two alternative ways: based on total benefits and based only on user benefits.

Benefit	Total Benefit (PV)	State 1	State 2	State 3
Time Savings	\$ 5,287,000,000	31%	31%	31%
Cost Savings	\$ 850,000,000	30%	30%	30%
Reliability Savings	\$ 200,000,000	37%	27%	37%
Induced Travel	\$ 200,000,000	33%	33%	33%
Environmental (Emissions)	\$ 380,000,000	22%	22%	22%
Safety	\$ 35,000,000	33%	33%	33%
Regional Integration	\$ 1,500,000,000	40%	30%	30%
Intermodal Transfer	\$ 2,000,000	40%	20%	40%
Equity	\$ 10,000,000	33%	33%	33%
Resilience (Redundancy)	\$ 20,000,000	33%	33%	33%
Sustainable Economic Future	\$ 1,000,000	33%	33%	33%
Local Land Value	\$ 10,000,000	33%	33%	33%
Local Land Development	\$ 10,000,000	33%	33%	33%
Revenue	\$ 1,500,000,000	33%	33%	33%
Life Cycle Cost Savings	\$ 1,000,000,000	33%	33%	33%
Total	\$ 11,005,000,000	\$ 3,598,490,000	\$ 3,428,090,000	\$ 3,448,490,000
Total Stakeholder-based benefits \$ 10,475,070,000				

Case Study 1: Three State Project - ROI Summary				
<i>Example case study with three state stakeholders only</i>				
Global ROI	1.10			
	State 1	State 2	State 3	
Stakeholder Allocated Benefits	\$ 3,598,490,000	\$ 3,428,090,000	\$ 3,448,490,000	
Stakeholder ROI (with costs allocated by total stakeholder benefits)	1.05	1.05	1.05	
Stakeholder ROI (with costs allocated by user benefits only)	1.08	1.04	1.03	

Example 2: Federal/Local Sharing Project. In this example, there is a \$10 billion project that is supported by the federal government and three localities (city or metropolitan areas). The federal government's definition of benefits encompasses essentially all of the travel-related (time, cost, safety) benefits, some (but not all) of the environmental and equity benefits, and none of the local land development benefits. On the other hand, the localities definition of benefits includes land development and value gains occurring within each of their own areas as well as much of the resilience, economic sustainability, and equity effects. Also, the localities in this example only value travel savings for their own residents.

Taken together, each party values some benefits that are not recognized by the others. However, some benefits are valued by both parties, creating an overlap of benefit coverage. While that overlap is natural and reasonable, those benefits can only be counted once for the total of all benefits. For this reason, the benefits recognized by all stakeholders (column totals) sum to a number larger than the total of all benefits (represented by the first column of numbers below). Ultimately, the ROI seen by various individual stakeholders appear larger than the Global ROI because these stakeholders share costs yet both recognize some common benefits as well as benefits not recognized by others.

Case Study 2: Federal/Local Sharing - ROI Calculations						
<i>Total Benefit values calculated from the prior sheets. ROI ratios are calculated for the project overall using traditional methods, as well as by stakeholders, using a Business Case approach. Costs are allocated in two alternative ways: based on total benefits and based only on user benefits.</i>						
Benefit	Total Benefit (PV)	Federal	Local 1	Local 2	Local 3	
Time Savings	\$ 5,287,000,000	97%		18%	18%	18%
Cost Savings	\$ 850,000,000	100%		20%	20%	20%
Reliability Savings	\$ 200,000,000	100%		20%	20%	20%
Induced Travel	\$ 200,000,000	100%		20%	20%	20%
Environmental (Emissions)	\$ 380,000,000	50%		9%	9%	9%
Safety	\$ 35,000,000	100%		20%	20%	20%
Regional Integration	\$ 1,500,000,000	100%		40%	40%	40%
Intermodal Transfer	\$ 2,000,000	100%		20%	20%	20%
Equity	\$ 10,000,000	60%		33%	33%	33%
Resilience (Redundancy)	\$ 20,000,000	80%		33%	33%	33%
Sustainable Economic Future	\$ 1,000,000	80%		25%	25%	25%
Local Land Value	\$ 10,000,000	0%		33%	33%	33%
Local Land Development	\$ 10,000,000	0%		33%	33%	33%
Revenue	\$ 1,500,000,000	30%		33%	33%	33%
Life Cycle Cost Savings	\$ 1,000,000,000	32%		22%	22%	10%
Total	\$ 11,005,000,000	\$ 8,906,300,000	\$ 2,574,450,000	\$ 2,574,450,000	\$ 2,459,450,000	
Total Stakeholder-based benefits	\$ 16,514,650,000					

Case Study 2: Federal/Local Sharing - ROI Summary					
<i>Example case study with Federal and 3 local stakeholders only</i>					
Global ROI	1.10				
Stakeholder Allocated Benefits		Federal	Local 1	Local 2	Local 3
		\$ 8,906,300,000	\$ 2,574,450,000	\$ 2,574,450,000	\$ 2,459,450,000
Stakeholder ROI (with costs allocated by total stakeholder benefits)	1.65	1.65	1.65	1.65	1.65
Stakeholder ROI (with costs allocated by user benefits only)	1.40	2.14	2.14	2.14	2.04

Example 3: Overlapping Benefits and Value Capture. This example includes elements of both prior examples, with again a \$10 billion project and but this time including both (a) a split of state-level benefits among contiguous states as in example 1 plus (b) federal and local agencies that have varying definitions of recognized benefits that are different from each other and the states, as in example 2.

With this expanded scenario, the ROI calculation distributes costs among all parties in proportion to the benefit that are applicable for them, including some benefits that are common among multiple parties and some benefits that are applicable to some parties but not others. The result is that each party perceives benefits exceeding their allocated costs and each sees a rate of return that is significantly higher than the global ROI. This result is not erroneous or incorrect; rather it shows the value of viewing projects with a positive global ROI by allocating costs among parties and allowing each party to view benefits relevant to itself.

Case Study 3: Overlapping Benefits with Value Capture - ROI Calculations										
<i>Total Benefit values calculated from the prior sheets. ROI ratios are calculated for the project overall using traditional methods, as well as by stakeholders, using a Business Case approach. Costs are allocated in two alternative ways: based on total benefits and based only on user benefits.</i>										
Benefit	Total Benefit (PV)	Federal	State 1	State 2	State 3	Local 1	Local 2	Public Agency	P3 Project Developers	
Time Savings	\$ 5,287,000,000	97%	30%	26%	40%	18%	28%	10%	0%	
Cost Savings	\$ 850,000,000	93%	30%	23%	40%	14%	20%	10%	0%	
Reliability Savings	\$ 200,000,000	85%	35%	20%	30%	15%	30%	10%	0%	
Induced Travel	\$ 200,000,000	90%	40%	30%	20%	30%	30%	10%	0%	
Environmental (Emissions)	\$ 380,000,000	40%	13%	15%	12%	9%	9%	2%	0%	
Safety	\$ 35,000,000	100%	30%	25%	45%	30%	30%	0%	0%	
Regional Integration	\$ 1,500,000,000	40%	30%	40%	30%	50%	50%	0%	0%	
Intermodal Transfer	\$ 2,000,000	100%	30%	25%	45%	30%	30%	10%	0%	
Equity	\$ 10,000,000	50%	30%	20%	20%	30%	25%	0%	0%	
Resilience (Redundancy)	\$ 20,000,000	100%	30%	25%	45%	40%	40%	0%	0%	
Sustainable Economic Future	\$ 1,000,000	90%	50%	30%	10%	30%	30%	17%	0%	
Local Land Value	\$ 10,000,000	10%	30%	20%	30%	50%	50%	50%	0%	
Local Land Development	\$ 10,000,000	10%	30%	20%	30%	50%	50%	50%	30%	
Revenue	\$ 1,500,000,000	10%	10%	10%	10%	30%	30%	20%	50%	
Life Cycle Cost Savings	\$ 1,000,000,000	10%	10%	10%	10%	30%	25%	80%	0%	
Total	\$ 11,005,000,000	7353903775	2770035249	2617556213	3332400000	2737800000	3271049641	1772689622	753000000	
Total Stakeholder-based benefits	\$ 24,608,434,500									

Case Study 3: Overlapping Benefits with Value Capture - ROI Summary										
<i>Project X Description</i>										
Global ROI	1.10									
		Federal	State 1	State 2	State 3	Local 1	Local 2	Public Agency	P3 Project Developers	
Stakeholder Allocated Benefits		\$ 7,353,903,775	\$ 2,770,035,249	\$ 2,617,556,213	\$ 3,332,400,000	\$ 2,737,800,000	\$ 3,271,049,641	\$ 1,772,689,622	\$ 753,000,000	
Stakeholder ROI (with costs allocated by total stakeholder benefits)		2.46	2.46	2.46	2.46	2.46	2.46	2.46	2.46	
Stakeholder ROI (with costs allocated by user benefits only)		1.88	2.24	2.49	2.10	3.76	3.00	4.37	NA	

3. ROI Tool User Instructions

From the ROI Spreadsheet Workbook

Key Model Features. Broadens the set of economic benefits beyond conventional BCA and ROI approaches.

- Considers benefits from multiple stakeholder perspectives.
- Provides quick reference guidance how to estimate and monetize benefits, and to allocate benefits to stakeholders.
- Provides a flexible approach to estimating ROI metrics from different stakeholder perspectives and based on different methods of allocating stakeholder benefits and cost/funding shares.

Description of Worksheets

Project Inputs: Present value of costs and a stakeholder list are entered in this sheet.

Benefit Input and Allocation: This sheet breaks major benefit categories into highly disaggregated individual metrics. The sheet provides "quick reference" guidance on methods and sources for valuation. It also provides "quick reference" guidance for allocation of benefits to stakeholders. Methodologies for estimating benefits are described in detail in Appendix C of the User Guidance document. Note: there is no need to fill in data for every individual benefit. No single stakeholder should be allocated more than 100 percent of benefits; restrictions are in place to warn users when this occurs.

ROI Calculations: Based on the allocations in the prior worksheet, stakeholder shares are summarized in this sheet. ROI ratios are calculated for the project overall using traditional methods, as well as by stakeholders, using a Business Case approach. Costs are allocated to stakeholders in two alternative ways: based on total benefits and based only on user benefits. Details of allocation of benefits and costs are provided under alternative cost allocation scenarios

ROI Summary: Benefits and costs are summarized in a printable form.

PV Calculator: This worksheet is an optional calculator in which an outyear and a near term annual benefit are input, and a discounted presented value of a stream of benefits or costs will be calculated, as an alternative to Present Value inputs in the input sheets. That worksheet allows for variable discount rates, for benefits whose future value should be more heavily weighted, from a sustainability standpoint

User Input Instructions and Logic Flow

Step 1: Be sure macros are enabled.

Step 2: In "Project Inputs", enter a total Present Value of project cost and a list of stakeholders to consider.

Step 3: Click the "Regenerate Allocation Sheets" button to propagate the set of stakeholders to the other sheets.

Step 4: Go to "Benefit Input and Allocation" and enter total Present Value for each economic value measure within each benefit type. For each measure, allocate the value among the stakeholders with

percentages. The total rows will be calculated and carried over to the "ROI Calculations" sheet automatically.

Note: The user has the option to use the PV Calculator worksheet to calculate the Present Value of individual benefit and cost line items. This tool may be used when total Present Value of a given cost or benefit type is not available from prior analysis, but an annual value for a given target year or several selected years (e.g. first year of operation, cost by year of construction, etc.) is available. This worksheet also allows for application of different discount rates for selected benefit streams that have a greater future orientation, such as carbon emissions, whose costs tend to rise in future years as the environmental impacts are more acute, or where intergenerational equity is sought. Values calculated in that worksheet will be uploaded to the Benefit Input and Allocation worksheet when that option is invoked.

Step 5: ROI calculations will automatically be made and summarized in the "ROI Summary" sheet. In which an outyear and a near term annual benefit are input, and a discounted present value of a stream of benefits will be calculated, as an alternative to inputs currently provided as described above.

Interpretation of Results

The ROI is measured in the model as a ratio of discounted present value benefits and costs. Other measures of return such as a Net Present Value or Economic Internal Rate of Return may be estimated based on the outputs, external to this model.