

TRIPLE BOTTOM LINE CALCULATOR



PRESENTED BY:

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BRA Director of Research
City of Boston
January 2012

IEDC 2012 Leadership Summit



Overview of Presentation

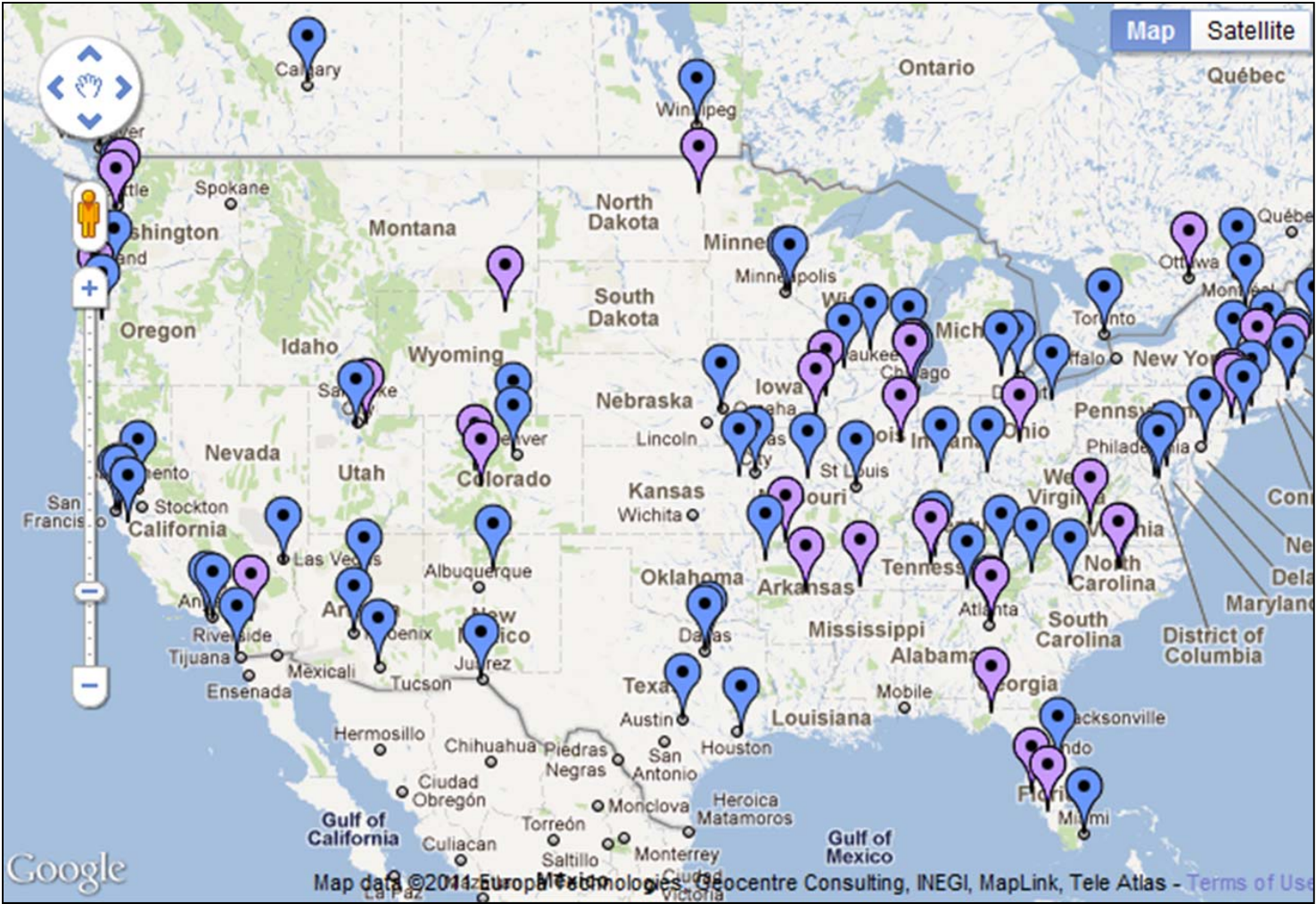
- Background and rationale of the project
- The development of the current *Triple Bottom Line Calculator*
- How the *Triple Bottom Line Calculator* works



TBL Calculator Project Background

- This project was funded by the Urban Sustainability Directors Network (USDN);
- USDN is a network of North American cities sustainability directors who exchange information, collaborate to enhance practice in the field and work together to advance the field of urban sustainability;
- The project was developed by a partnership between the cities of Boston, Calgary, and Atlanta, with consulting from HDR Decision Economics.

USDN's 110 members represent more than 47 million people



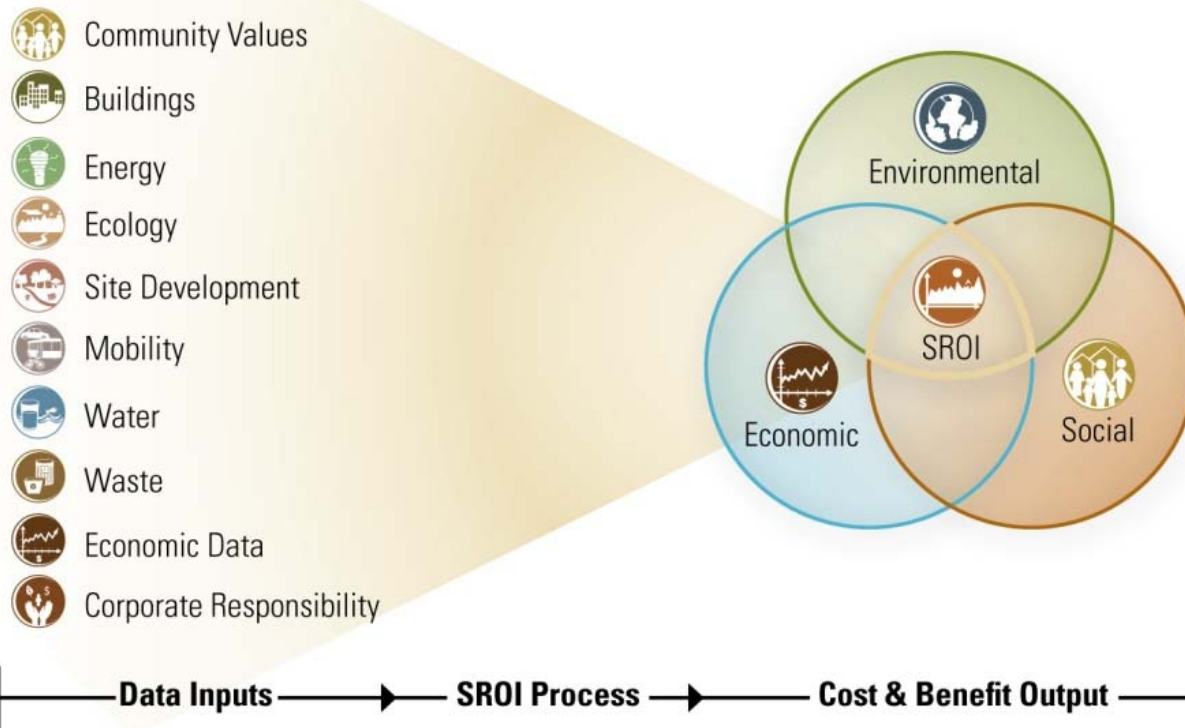
Core Members Associate Members



TBL Calculator Project's Purpose

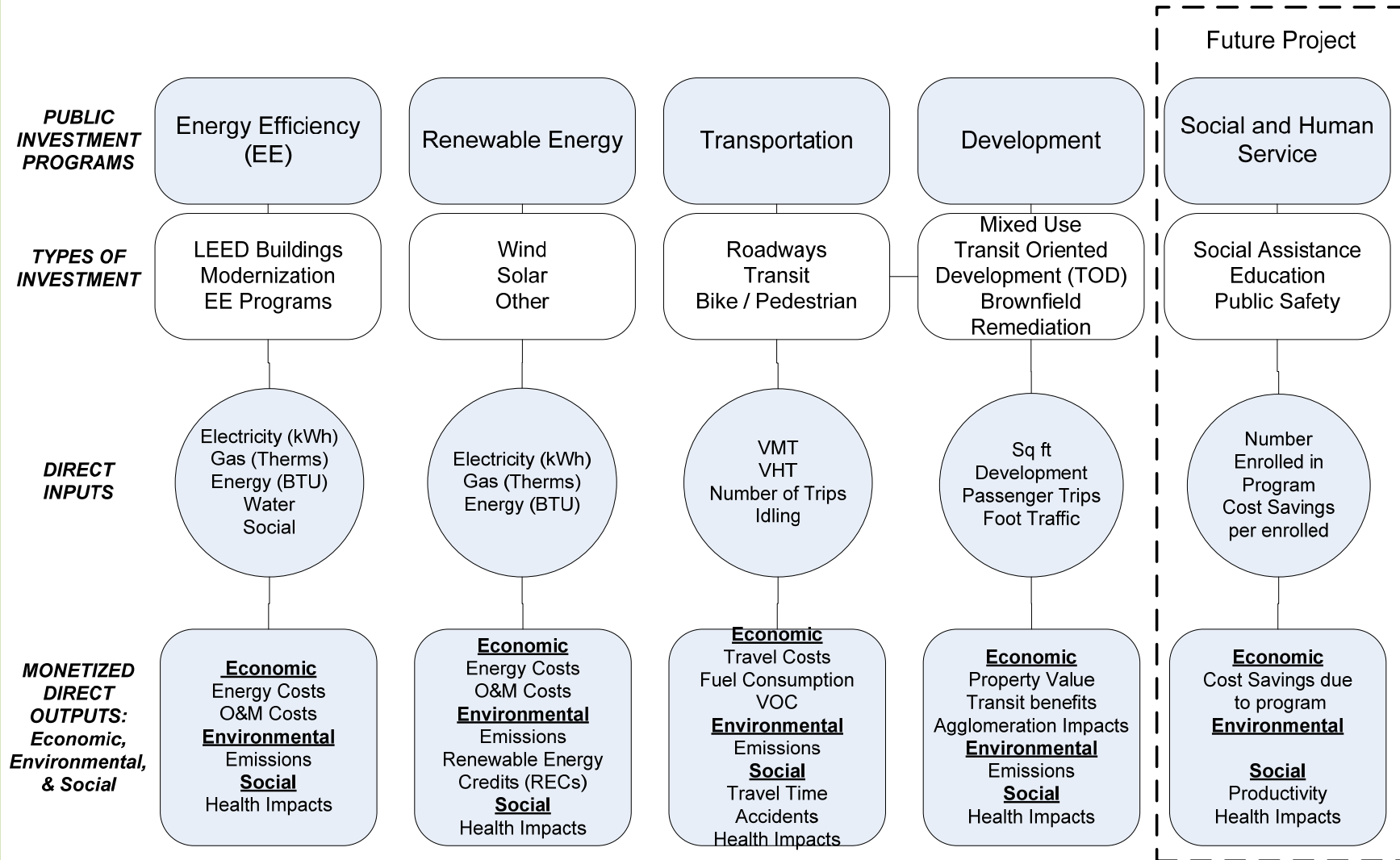
- The purpose of the model is to provide USDN members a tool to:
 - Help understand and be strategic about capital investments in their respective cities;
 - Calculate the impact of strategic investment;
 - Monetize the environmental and social benefits of capital investments.

SROI - Analytical Framework



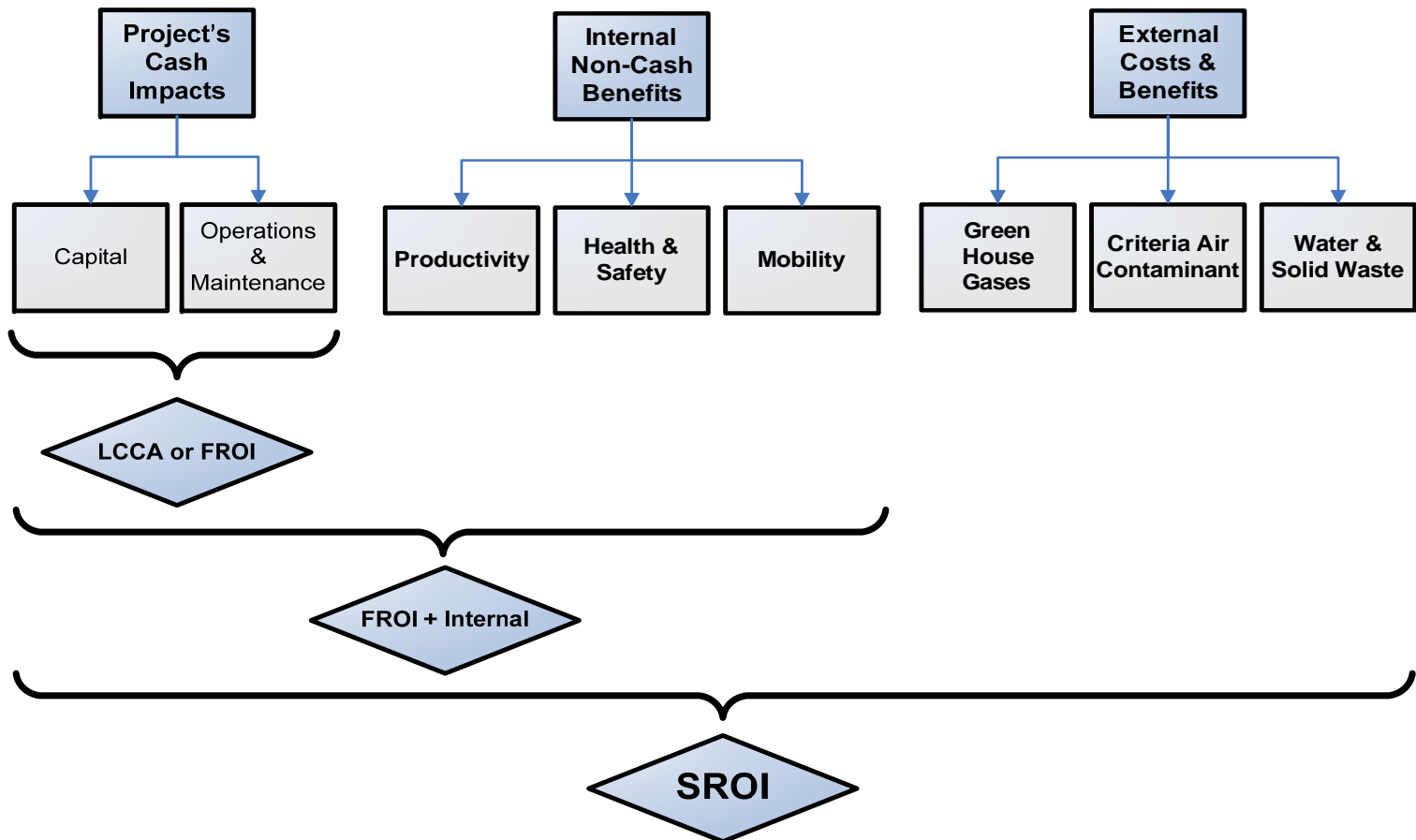
SROI determines the **full value** of a project by **assigning monetary values to all costs and benefits** - economic, social and environmental.

USDN Triple Bottom Line Model

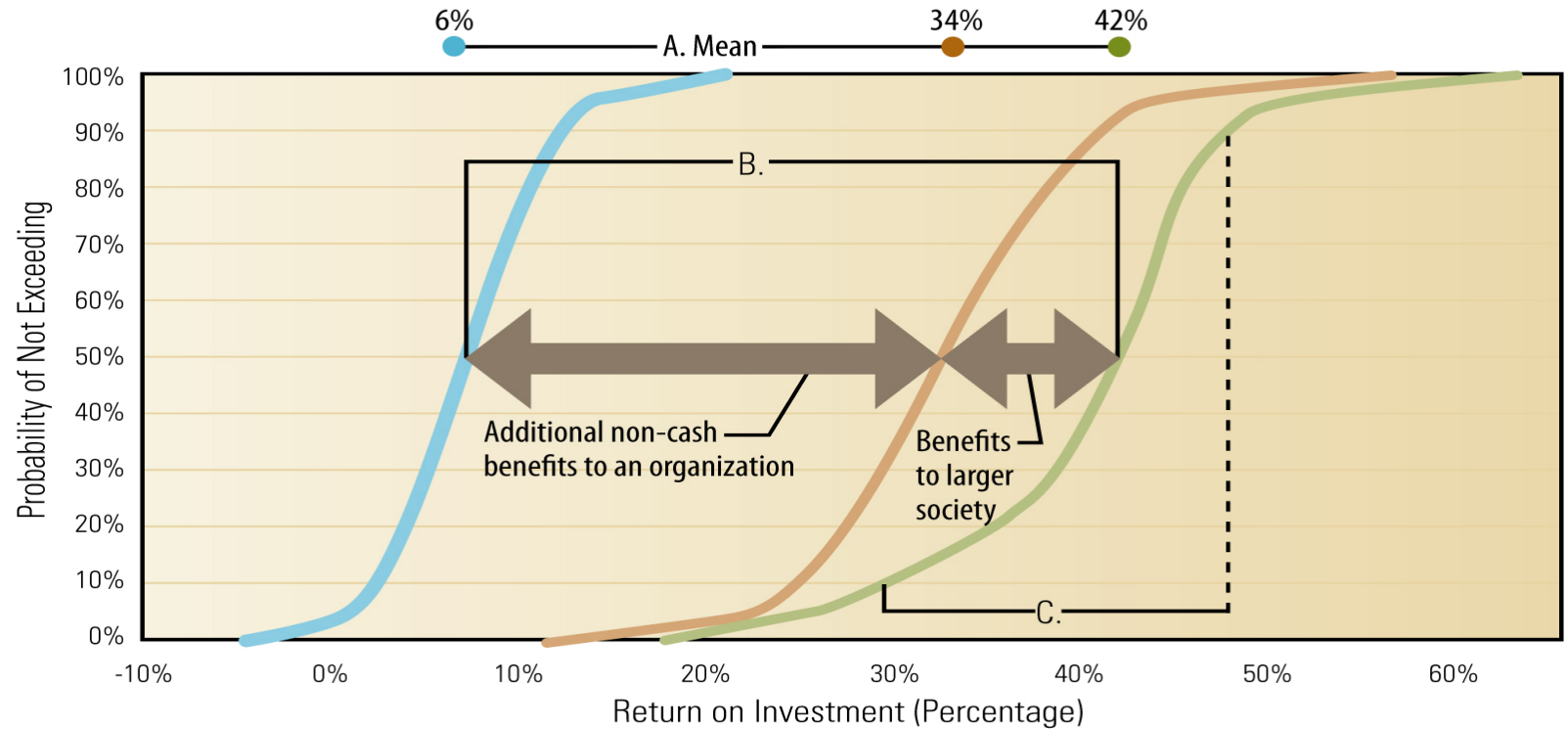


SROI vs. Traditional ROI

SROI adds to the traditional financial/economic analysis the monetized value of non-cash benefits.



Explanation of the S-Curve Diagram



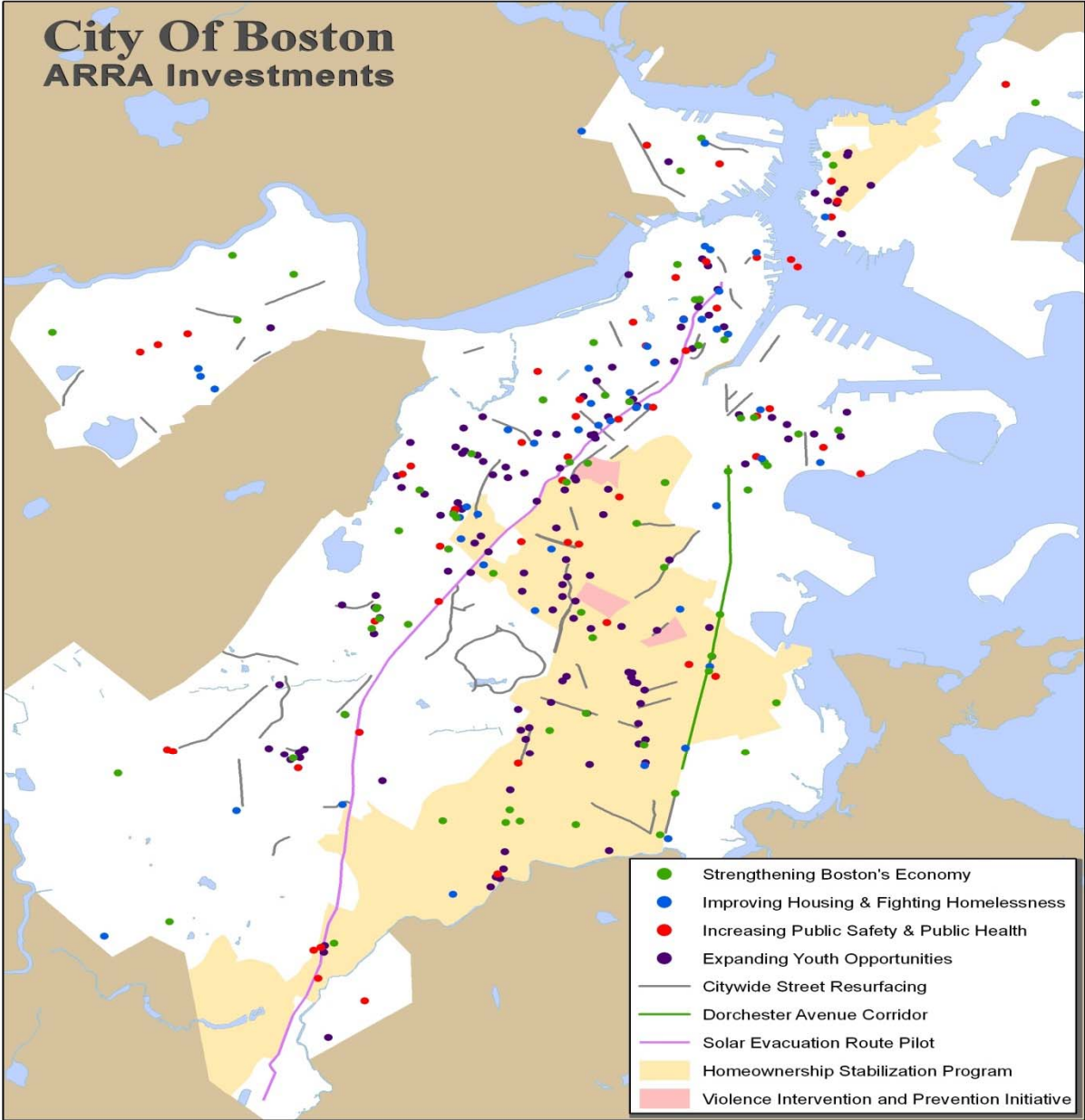
- Basic Financial Return on Investment
- Cash Plus Non-Cash Benefits Realized by an Organization
- Sustainable Return on Investment



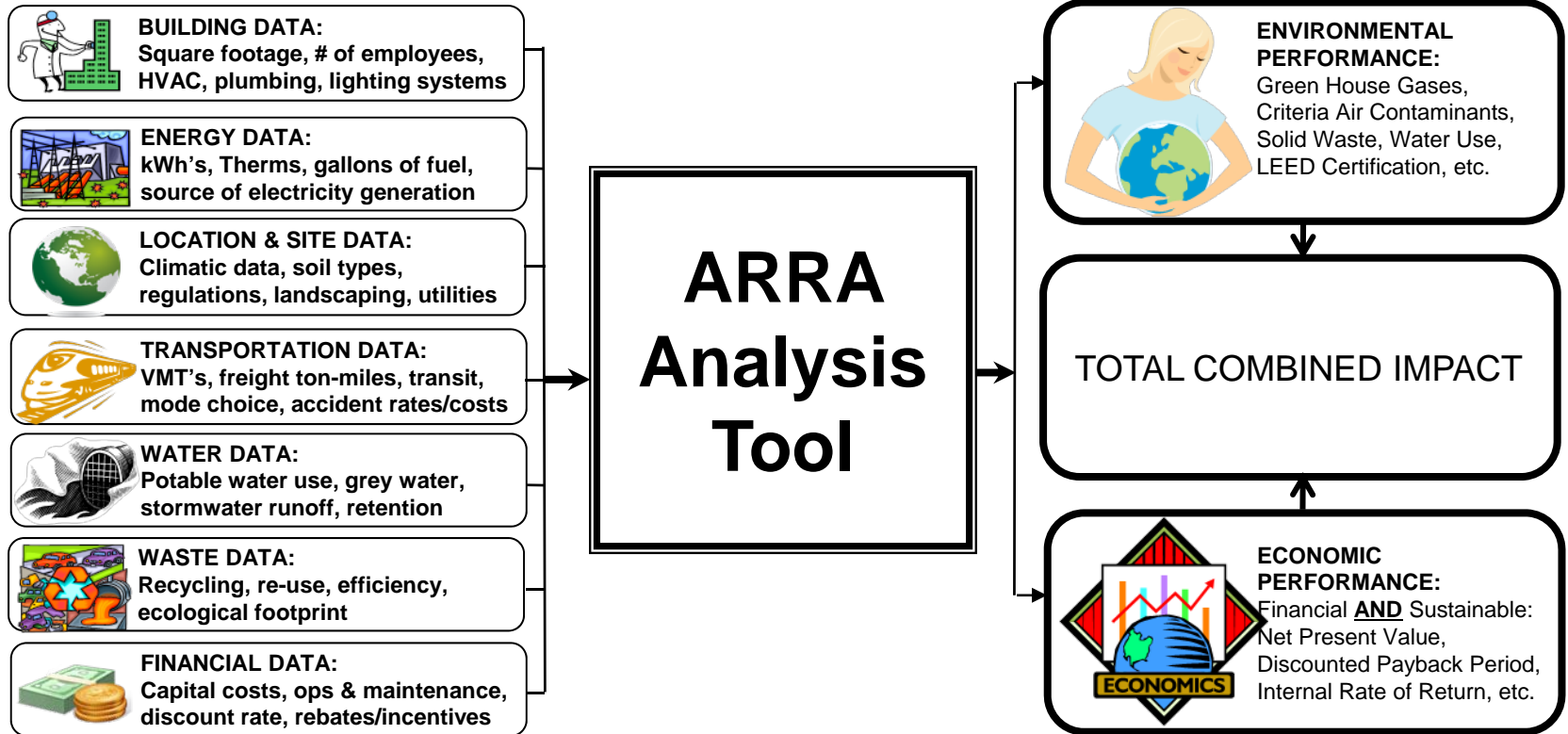
City of Boston's Goals for SROI

- A commitment from the city to fully track ARRA projects and measure their impact:
 - Money in, money out;
 - Job creation;
 - Economic impact.
- Provide model for how to assess ARRA projects and augment the city's efforts for transparency in the federal stimulus process.

ARRA In Boston Overview



Evaluating ARRA Projects



ARRA Funding by City Department

Department	Projects	Investment
Boston Fire Department	1	\$1,384,000
Boston Housing Authority	17	\$70,106,821
Boston Police Department	4	\$17,530,000
Boston Public Health Commission	1	\$602,290
Boston Public Schools	5	\$86,108,401
Boston Redevelopment Authority	2	\$27,620,000
Boston Transportation Department	5	\$43,062,524
Boston Youth Opportunity	1	\$249,980
Department of Neighborhood Development	6	\$26,934,151
Elderly Commission	2	\$347,211
Emergency Preparedness	1	\$1,259,820
Energy and Environmental Block Grant	11	\$7,503,020
Jobs and Community Services	2	\$4,400,000
Management Information Systems	1	\$1,900,000
Administration and Finance	1	20,000,000
TOTAL	60	\$309,008,218

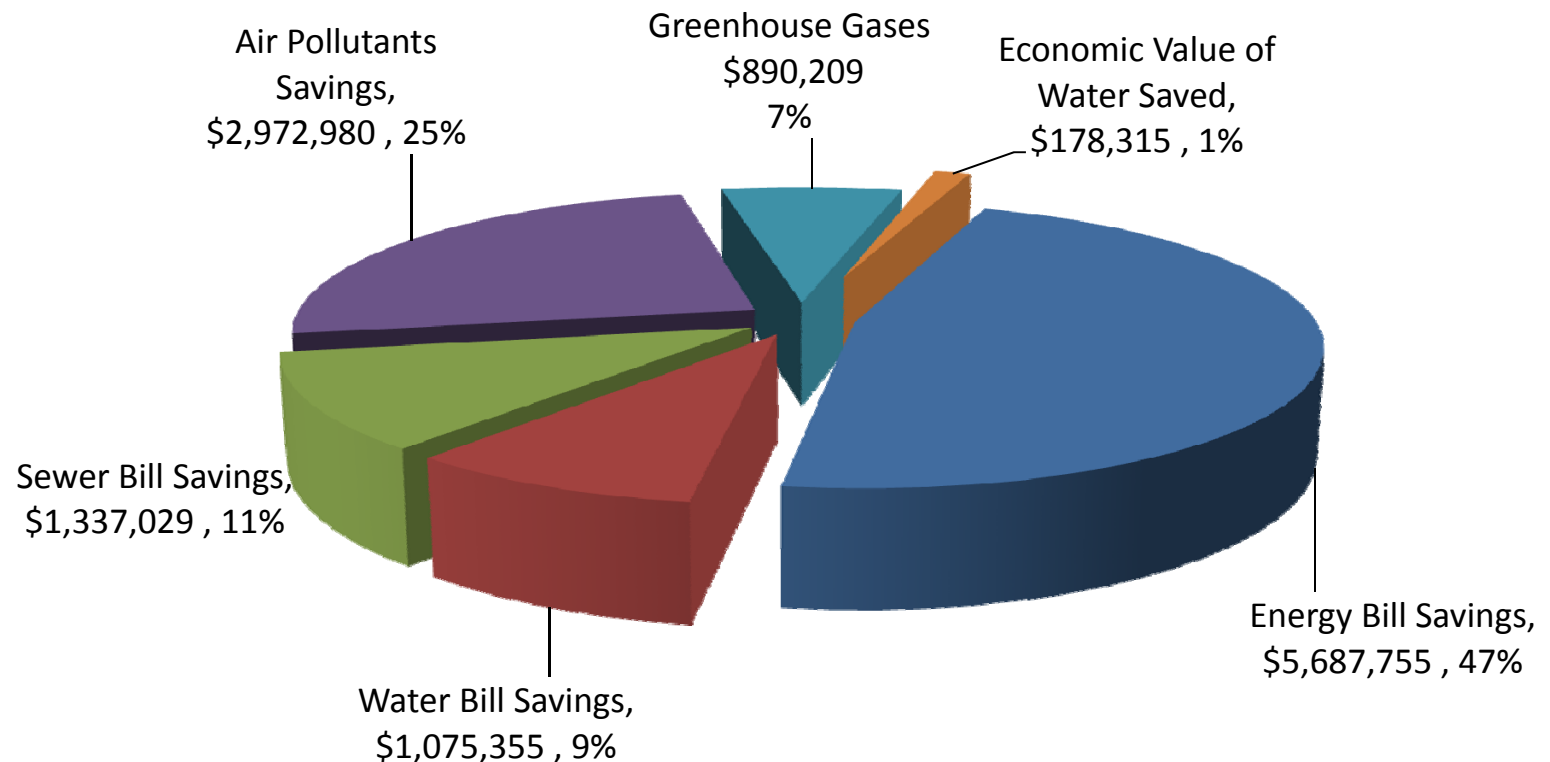


Sustainable Return on Investment (SROI)

Direct sustainability benefits are estimated to be substantial over time, with annual benefits in 2015 of:

- 34.4 million fewer kWh of electricity consumed;
- 277,000 reduction of therms of gas used;
- 23,750 HCF (hundreds of cubic feet) of water preserved;
- 25,150 fewer tons of greenhouse gas emissions (CO₂).

Annual Energy and Environmental Benefits and Cost Savings in 2015*



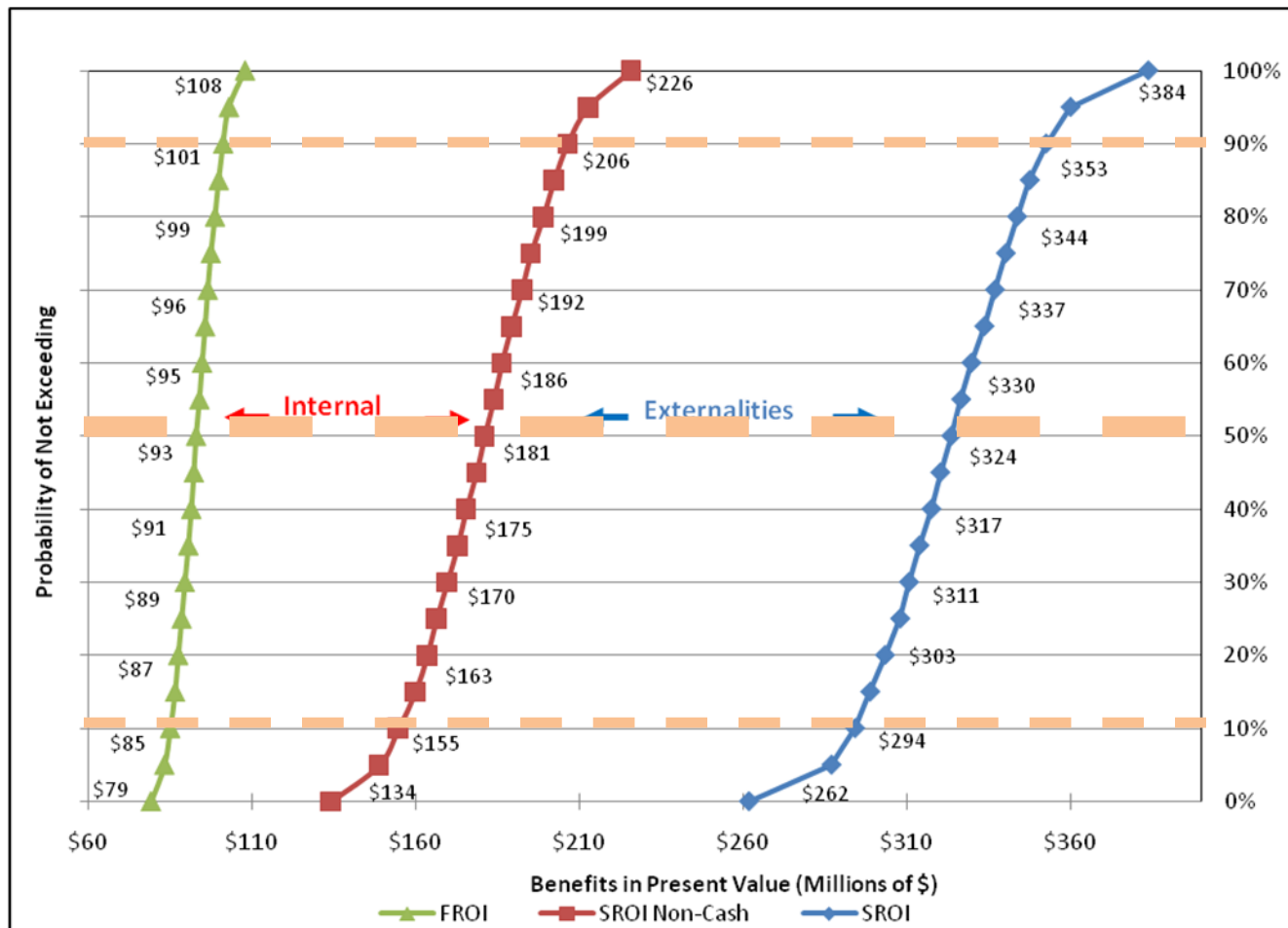
* A total of \$12 million in savings

Sustainable Return on Investment Results

Department	Net Present Value	Discounted Payback Period (Years)	Internal Rate of Return	Benefit-Cost Ratio
EE	\$ 52,394,089	4	35%	3.0
BTD & PW	\$ 111,398,447	4	38%	6.8
DND	\$ 1,114,915	13	10%	1.6
BHA	\$ 43,746,959	2	63%	9.2
TOTAL	\$ 208,654,409	5	38%	4.5

- The aggregate Net Present Value (NPV) is over \$208 million with a 4.5 discounted payback period of about 5 years
- Benefit-cost ratios are estimated to be greater than 1.0 for all departments evaluated, ranging from 1.6 to 9.2
- The total Internal Rate of Return (IRR) is estimated to be 38%

Risk Analysis of Boston's ARRA Investments and Sustainability Benefits



Economic Impact Results

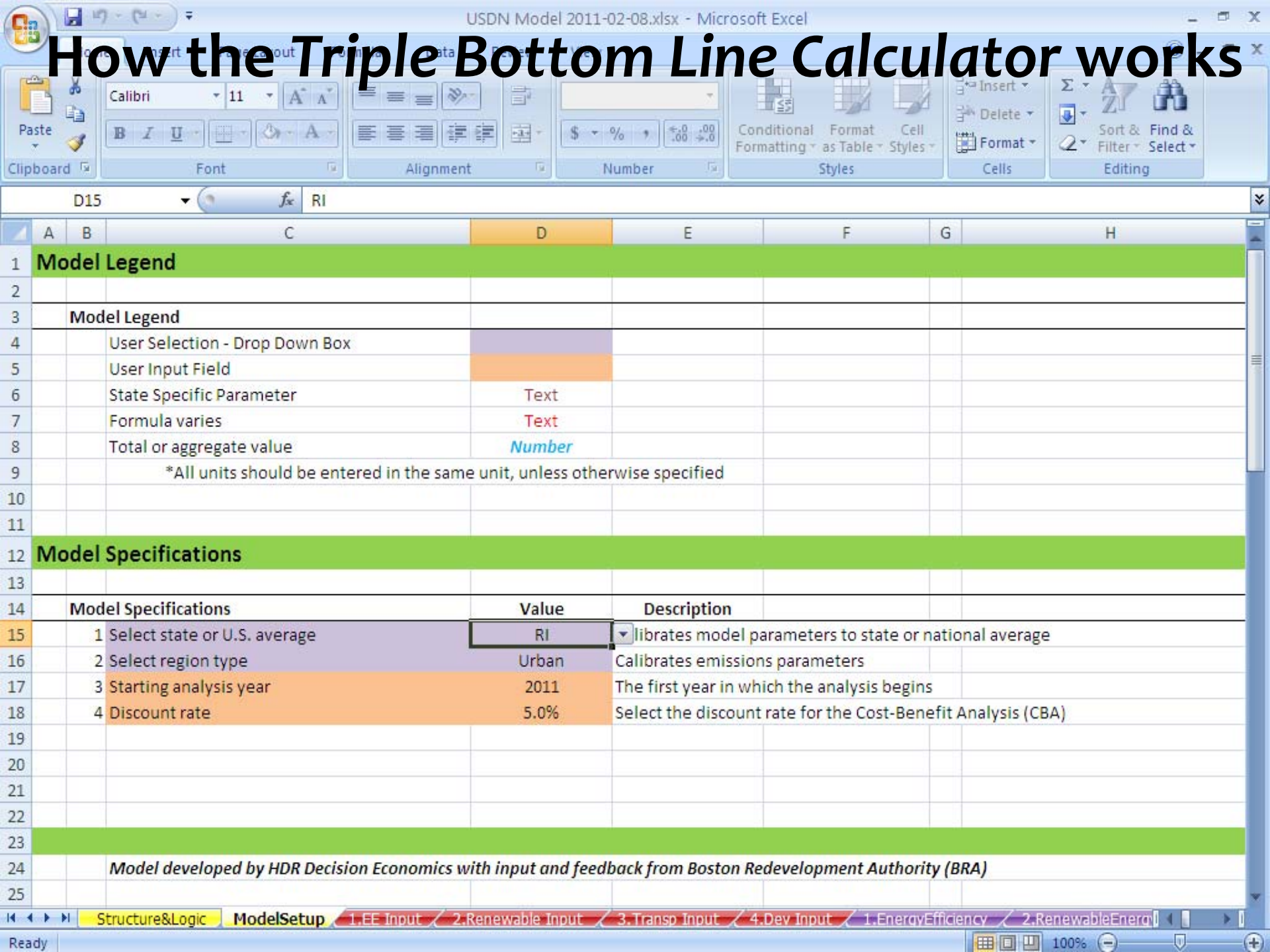
	Boston	Massachusetts
Over project span of 4 years:		
Total Jobs (Direct, Indirect, and Induced)	2,126	2,861
Gross State Product (2009 dollars)	\$ 174,253,457	\$ 245,947,611
Personal Income (2009 dollars)	\$ 66,111,927	\$ 199,150,693
Total Output (2009 dollars)	\$ 261,340,716	\$ 460,247,615
Personal Consumption Expenditures (2009 dollars)	\$ 39,043,480	\$ 115,863,657
Total State Tax Revenue over 4 years (2009 dollars)	\$ 3,439,645	\$ 10,334,019

The economic impact of the \$327.6 million investment¹ translates into:

- 2,126 direct, indirect and induced full-time equivalent (FTEs) jobs in Boston (includes 1,276 direct jobs);
- \$174.3 million increase in Gross State Product;
- \$66.1 million of total personal income statewide.

¹SROI analysis of the \$327.6 million investment includes \$241.2 million from ARRA funds and \$86.4 million from leveraged investments.

How the Triple Bottom Line Calculator works



Model Legend

Model Legend

User Selection - Drop Down Box	
User Input Field	
State Specific Parameter	Text
Formula varies	Text
Total or aggregate value	Number

*All units should be entered in the same unit, unless otherwise specified

Model Specifications

Model Specifications

Value	Description
RI	librates model parameters to state or national average
Urban	Calibrates emissions parameters
2011	The first year in which the analysis begins
5.0%	Select the discount rate for the Cost-Benefit Analysis (CBA)

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Model developed by HDR Decision Economics with input and feedback from Boston Redevelopment Authority (BRA)

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A B C D E F G H I J K

ENERGY EFFICIENCY & LEED INPUTS

(A) PROJECT INVESTMENT PERIOD

Project name	LEED Hospital Investments
Total Investment (\$)	\$ 3,100,000
Investment period (start)	2015
Investment period (end)	2015
Investment useful life (years)	25
Cost Parameter Adjustment Factor	
Use Incremental Cost Adj Factor	
Cost Information	Detailed
Use Custom Utility Rates	

Project will install LEED certified materials and energy efficient equipment in local hospital

(B2) DETAILED COST INFORMATION - FILL IN COST INFORMATION FOR EACH YEAR

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Capital costs					\$ 3,100,000					
O&M costs									\$ 35,000	

(C) ENERGY, ENVIRONMENTAL & WATER IMPACTS

Annual kWhs Savings (kWh)	250,000
Annual Therms Savings (therms)	23,000
Annual H2O Savings (gallons)	7,000
Electricity Consumer	Industrial

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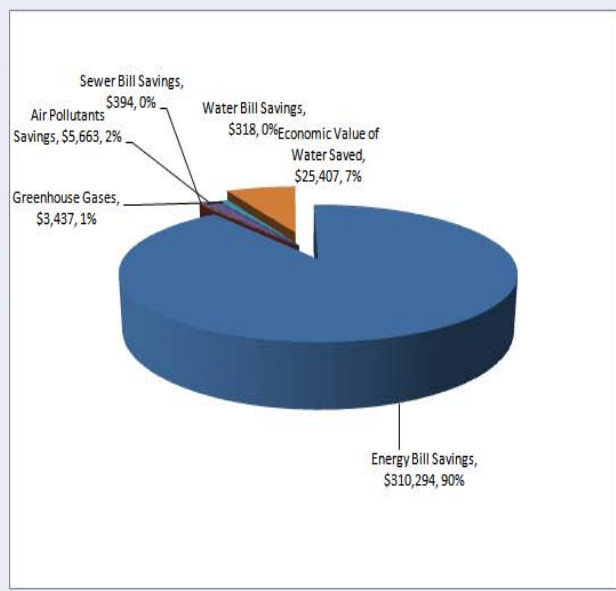
A1 Energy Efficiency & LEED

A B C D E F G H I J K L M N O P Q R S T U V W X

Energy Efficiency & LEED		
TBL Results 2020		
	Expected	Notes
Annual Value of Benefits	\$345,986	The total value of the benefits in the 10th year
<i>Electric Utility Savings</i>	\$16,900	Direct
<i>Gas Utility Savings</i>	\$293,394	Direct
<i>Water Utility Savings</i>	\$318	Direct
<i>Sewer Utility Savings</i>	\$394	Direct
<i>Total Green House Gas Savings</i>	\$8,151	Externality
<i>Total Criteria Air Contaminant Savings</i>	\$9,574	Externality
Net Present Value	\$1,673,451	PV Benefits - PV All Costs
Return on Investment	6%	Arithmetic Average Rate of Return on Capital Investment
Discounted Payback Period	2026	Time in years till positive discounted cash flow
Internal Rate of Return (%)	12%	Discount rate which would make NPV = 0
Benefit to Cost Ratio	1.66	PV Benefits / PV Costs

Utility Benefits 2020		
Energy Bill Savings	\$310,294	
Water Bill Savings	\$318	
Sewer Bill Savings	\$394	
Air Pollutants Savings	\$5,663	
Greenhouse Gases	\$3,437	
Economic Value of Water Saved	\$25,407	

Resource Savings 2020		
Water (gallons)	7,000	
Electricity (kWh)	250,000	
Energy (Therms)	23,000	
NOx (Tons)	0.24	
SO2 (Tons)	0.66	
PM (Tons)	-	
VOC (Tons)	-	
CO2 (Tons)	301	
CH4 (Tons)	0.02	
N2O (Tons)	0.00	
Hg (Tons)	0.00	



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RENEWABLE ENERGY INPUTS

(A) PROJECT INVESTMENT PERIOD

Project name	<i>Wind Turbine</i>
Total Investment (\$)	\$ 11,500,000
Investment period (start)	2012
Investment period (end)	2013
Investment useful life (years)	20
Project type	Wind
Cost information	Summary
Utility rates	Standard

Project will install three wind turbines

(B) BASIC COST INFORMATION - PROCEED TO TABLE B2 IF DETAILED COST INFORMATION AVAILABLE

Investment (in \$)	\$ 11,500,000
O&M costs (in \$)	\$ 75,000
O&M costs start year	2016
Frequency of O&M costs (years)	2

(C) ENERGY & ENVIRONMENTAL IMPACTS

Annual kWhs produced (kWh)	9,500,000
Annual Therms saved (therms)	
Cost per Renewable kWh (\$)	
Electricity Consumer	Industrial

(E) RENEWABLE TAX CREDITS

Tax Credit (\$ per MWh)	\$ 0.03
Annual Tax Credit	
Number of years for tax credit	5

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Renewable Energy																	
2	TBL Results 2020	Expected	Notes															
3	Annual Value of Benefits	\$772,644	The total value of the benefits in the 10th year															
4	<i>Electric Utility Savings</i>	\$642,200	Direct															
5	<i>Gas Utility Savings</i>	\$0	Direct															
6	<i>Total Green House Gas Savings</i>	\$124,228	Externality															
7	<i>Total Criteria Air Contaminant Savings</i>	\$130,159	Externality															
8	Net Present Value	-\$1,115,432	PV Benefits - PV All Costs															
9	Return on Investment	0%	Arithmetic Average Rate of Return on Capital Investment															
10	Discounted Payback Period	Doesn't Payback	Time in years till positive discounted cash flow															
11	Internal Rate of Return (%)	4%	Discount rate which would make NPV = 0															
12	Benefit to Cost Ratio	0.90	PV Benefits / PV Costs															
13																		
14																		
15	Benefits 2020																	
16	Electricity (kWh)	9,500,000																
17	Energy (Therms)	-																
18	NOx (Tons)	1.01																
19	SO2 (Tons)	0.26																
20	PM (Tons)	-																
21	VOC (Tons)	-																
22	CO2 (Tons)	4,582																
23	CH4 (Tons)	0.09																
24	N2O (Tons)	0.01																
25	Hg (Tons)	-																
26																		
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TRANSPORTATION INPUTS

(A) PROJECT INVESTMENT PERIOD

Project name	Add Bike & Ped Lanes
Total investment (\$)	\$ 21,500,000
Investment period (start)	2013
Investment period (end)	2015
Investment useful life (years)	20
Project Type	Pedestrian & Bicycle
Cost information	Detailed

Project will add bike and pedestrian lanes

(B2) DETAILED COST INFORMATION - FILL IN COST INFORMATION FOR EACH YEAR

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Capital costs			#####	#####	#####											
O&M costs										#####						#####

(C1) ROADWAY TRANSPORTATION DATA

Auto	
Annual reduction in auto VMT	312,000
Annual reduction in auto VHT	1,733
Truck	
Annual reduction in truck VMT	
Annual reduction in truck VHT	
General	
Average vehicle occupancy	1.10
Average speed (MPH)	25

(C2) PEDESTRIAN & BICYCLE TRANSPORTATION DATA

Pedestrian & Bicycle	
Number of new bicyclists	500
Number of new pedestrians	300
Average trip distance (miles)	1.5
Average reduction in delay per user (minutes)	0.5

(C3) TRANSIT TRANSPORTATION DATA

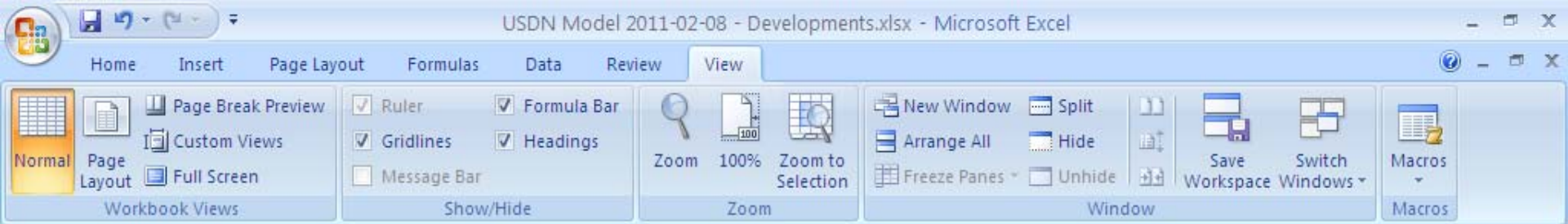
Transit	
Number of new transit riders	
Average trip distance (miles)	
Transit fare price per rider	
New riders diverted from auto (percent)	

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A3 Annual Value of Benefits

Transportation Results		
TBL Results 2020		
Annual Value of Benefits	Expected	Notes
Annual Value of Benefits	\$59,667,019	The total value of the benefits in the 10th year
Time savings	\$27,110	
Accidents	\$1,256,711	
Vehicle O&M savings	\$92,373	
Health benefits	\$97,792	
Pavement maintenance	\$312	
Congestion reduction	\$17,416	
Total Green House Gas Savings	\$17	Externality
Total Criteria Air Contaminant Savings	\$1,349,688	Externality
Net Present Value	\$9,872,918	PV Benefits - PV All Costs
Return on Investment	1%	Arithmetic Average Rate of Return on Capital Investment
Discounted Payback Period	2024	Time in years till positive discounted cash flow
Internal Rate of Return (%)	12%	Discount rate which would make NPV = 0
Benefit to Cost Ratio	1.43	PV Benefits / PV Costs

Transportation Benefits 2020		
NOX (Tons)	-	
CO2 (Tons)	0.61	
VOC (Tons)	669.91	
PM (Tons)	0.22	
SO2 (Tons)	0.03	
Fuel (gallons)	12,416	



B6 2013

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	DEVELOPMENT INPUTS															
2																
3	(A) PROJECT INVESTMENT PERIOD															
4	Project name	<i>Mixed Use Neighborhood Development</i>														
5	Total Investment (\$)	\$22,000,000														
6	Investment period (start)	2013														
7	Investment period (end)	2016														
8	Investment useful life (years)	30														
9	Cost information	Summary														
10																
11	(B) BASIC COST INFORMATION - PROCEED TO TABLE B2 IF DETAILED COST INFORMATION AVAILABLE															
12	Investment (in \$)	\$22,000,000														
13	O&M costs (in \$)	\$ 12,000														
14	O&M costs start year	2020														
15	Frequency of O&M costs (years)	6														
16																
17																
18																
19																
20																
21																
22	(C) DEVELOPMENT IMPACTS															
23	Retail sales															
24	Net new annual retail sales (in \$)	\$ 4,500,000														
25	Retail sales annual growth (percent)	1.0%														
26																
27	Health & walkability															
28	Increased foot traffic (annual visitors)	42,000														
29	Average walking (miles per visitor)	0.5														
30																
31	Real estate															
32	Property value premium (percent)	5.0%														
33	Property tax rate (percent)	6.3%														
34																
35	Economic impacts - retail															
36	Net new retail jobs	20														
37	Average wage per new retail job (\$/hour)	\$ 8.25														
38																
39	Economic impacts - office															
40	Net new office jobs	12														
41	Average wage per new office job (\$/hour)	15.75														
42																
43																

Project will create a mixed use neighborhood development with retail and office space

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1 **Developments Results**

2	TBL Results 2020	Expected	Notes
3	Annual Value of Benefits	\$944,769	The total value of the benefits in the 10th year
4			
5	Net Present Value	-\$967,923	PV Benefits - PV All Costs
6	Return on Investment	0%	Arithmetic Average Rate of Return on Capital Investment
7	Discounted Payback Period	Doesn't Payback	Time in years till positive discounted cash flow
8	Internal Rate of Return (%)	5%	Discount rate which would make NPV = 0
9	Benefit to Cost Ratio	0.95	PV Benefits / PV Costs

10
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12 **Benefits 2020**

13	Total retail sales	\$48,331,476	
14	Property value	\$36,667	
15	Property tax	\$161,207	
16	Wages	\$736,320	

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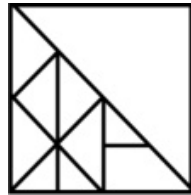


Applications and Next Steps

- This analysis tells us what these investment are likely to yield for our region in the coming years
- This type of analysis can also be used to evaluate potential investment decisions
- Future work will attempt to include the “social” benefits to complete the third bottom line



CITY OF BOSTON
Thomas M. Menino
Mayor



Boston
Redevelopment
Authority

HDR

USDN
URBAN SUSTAINABILITY
DIRECTORS NETWORK

For more information:

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