Change Analysis 1

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Version: DevTreks 2.1.4

A. Introduction

This reference explains how to start to collect, measure, and analyze incremental economic and technological change data (**1***). DevTreks believes that all incremental change data, from the return on investment of alternative climate change technologies to the net returns from potential new medical technologies, has a story to tell and lessons to teach. Those lessons can only be learned when data about incremental change is collected, measured, aggregated, analyzed, explained, and saved in online knowledge banks. Full, uniform, and accurate analyses of the incremental technological and economic change of medical technologies, public infrastructure investments, educational performance, conservation practice effectiveness, and widget production, should be one or two links away for everyone. If a business owner, lender, doctor, patient, teacher, government official, or citizen, needs to make a decision involving incremental technological and economic change, they should have ready access to the best data available. This reference introduces another DevTreks way to build these knowledge banks.

B. Data URLs

This reference supplements the *Life Cycle Analysis* (LCA) 1, *Benefit Cost Analysis* (NPV) 1, *Monitoring and Evaluation Analysis 2* (M&E), *Resource Stock Analysis*, and *Price Analysis 1*, references. This reference documents how the Change 1 Analyzers in those references work.

Representative Change By Analyses, run for Version 2.1.4, can be found at the following URLs and in many of the Analysis tutorials.

https://www.devtreks.org/buildtreks/preview/commercial/investmentgroup/Public Infrastructure Analysis Example/275505677/none

http://localhost:5000/buildtreks/preview/commercial/investmentgroup/Public Infrastructure Analysis Example/275505677/none

https://www.devtreks.org/buildtreks/preview/commercial/outcomegroup/National Park Recreation Outcomes/33/none

http://localhost:5000/buildtreks/preview/commercial/outcomegroup/Earned Value Management Examples/38/none

Change 1 Analyses

The *Change 1 Analyses* use the Totals calculations generated by LCA, NPV, Resource Stock, and M&E, Totals Analyzers to measure incremental changes in aggregated elements. A Totals Analysis is automatically run prior to running the Change Analysis. A *Change by Year Analysis* measures incremental changes between aggregated elements that have different Years. A *Change by Id Analysis* measures incremental changes between elements that have different Ids. A *Change by AlternativeType Analysis* measures incremental changes between aggregated elements that have different AlternativeTypes. Changes are analyzed in ascending order (Id = 1,2,3; Year = 2000, 2001, 2002; AlternativeType = A, B, C). The first member of the sequence will be used as a "Base" element to make comparisons. The next to last member of the sequence will be used as an "x-1" (x minus one) element to make comparisons. Gaps in the sequence, such as a missing Year, will be ignored.

The *Aggregate Using* property of analyzers is only available in Budget and Investment Analyzers. In those Analyzers this property only aggregates Operations, Components, Outcomes, Inputs, and Outputs. All of the remaining Change Analyzers aggregate elements, using a Year, AlternativeType, or Id.

The results of the analyses are displayed using the following properties:

Total: A *Change by Year or AlternativeType Analysis* sums all of the LCA elements that have the same Year or AlternativeType, respectively. All element Ids are unique, so a *Change by Id Analysis* sums the elements in one and only one base element. The other two analyses can sum multiple base elements.

Base Change: (Total x) – (Total base) (with Total base equal to the first Total in the sequence being analyzed).

Base Percent Change: (Change base) / (Total base)) * 100

Amount Change: (Total x) – (Total x-1) (with the first calculation subtracting zero and "x-1" being "x minus one", the Total from the previous element).

Percent Change: (Amount Change x) / (Total x-1)) * 100

Some economic evaluations refer to the "base" and "x-1" change elements as "comparators". That is, the current alternative is always beings "compared" to those two aggregated elements.

Any element that can't find a base or x-1 element to make a comparison will have zeros for base and x-1 Properties. For example, the first element in a sequence of elements being compared (**Operation 2009**, Operation 2010, Operation 2011) will have the base and x-1 Properties set to zero. The second element in a sequence of elements being compared (Operation 2009, **Operation 2010**, Operation 2011) will have numeric base Properties (the base is Operation 2009), and the x-1 Properties set to zero. The remaining elements in a sequence of elements being compared (Operation 2009, Operation 2010, **Operation 2011**) will have numeric base and x-1 Properties (the base is Operation 2009 and the x-1 is Operation 2010). Section D explains that Budgets use Label-dependent antecedent, rather than strictly sibling, elements to make these sequential comparisons.

Most Change Analyses only require that children of the current element being used to run calculations have their Year or AlternativeType properties set correctly, the remaining descendants use Labels to make comparisons. Budget Group Change Analysis is an exception, both the children Budgets and grandchildren Time Periods need to have their Year or AlternativeType properties set correctly.

1. **Change By Year Analysis**

Amount Change and Percent Change properties measure changes between the current year and the year before the current year. Base Change and Base Percent Change properties measure changes between the current year and the first year encountered in the series being analyzed.

The following Input series analysis compares a 2011 Input with a 2010 Input and a base 2007 Input. The 2007 Input is the first Input in the series, hence the “base”. The calculations, which are representative of all change calculations, are:

6 (CAP Amount Change) = 248.3 (2011 CAP Total) - 242.3 (2010 CAP Total)
2.48 (CAP Percent Change) = (6 (CAP Amount Change) / 242.3 (2010 CAP Total)) * 100
13 (CAP Base Change) = 248.3 (2011 CAP Total) - 235.3 (2007 CAP Total)
5.52 (CAP Base Percent Change) = (13 (CAP Base Change) / 235.3 (2007 CAP Total)) * 100

Input Series: NPS 2010, Concrete Waste Factor 10 Percent

Date : 01/10/2010 ; Observations: 1; Alternative : D

OC	0.00	0.00	0.00	0.00	0.00	
AOH	0.00	0.00	0.00	0.00	0.00	
CAP	242.30	2.00	0.83	7.00	2.97	
LCC	242.30	2.00	0.83	7.00	2.97	
Unit	0.24	0.00	0.83	0.01	2.97	
EAA	0.00	0.00	0.00	0.00	0.00	
SubBOrC Name	**SubBOrC Amount**	**SubBOrC Unit**	**SubBOrC Price**	**SubBOrC Total**	**SubBOrC Unit Total**	**SubBOrC Label**
Material	1.000	each	242.30	242.30	0.24	mater01

This subcost derives from ...

Input Series: NPS 2011, Concrete Waste Factor 10 Percent

Date : 01/10/2011 ; Observations: 1; Alternative : E

OC	0.00	0.00	0.00	0.00	0.00	
AOH	0.00	0.00	0.00	0.00	0.00	
CAP	248.30	6.00	2.48	13.00	5.52	
LCC	248.30	6.00	2.48	13.00	5.52	
Unit	0.25	0.01	2.48	0.01	5.52	
EAA	0.00	0.00	0.00	0.00	0.00	
SubBOrC Name	**SubBOrC Amount**	**SubBOrC Unit**	**SubBOrC Price**	**SubBOrC Total**	**SubBOrC Unit Total**	**SubBOrC Label**
Material	1.000	each	248.30	248.30	0.25	mater01

The following Operation analysis compares a 2010 aggregated Operation with a 2009 aggregated Operation and base 2008 Operation. The 2008 Operation is the first Operation in the series, hence the "base". Note that both the 2009 and 2010 Operations start with totals summed from 3 Operations (observations = 3). The 3 observations were aggregated because each Operation in the summation had the same year. The calculations are:

-56.40 (CAP Amount Change) = 18,728.85 (2010 CAP Total) – 18,785.25 (2009 CAP Total)
-0.30 (CAP Percent Change) = (-56.40 (CAP Amount Change) / 18,785.25 (2009 CAP Total)) * 100
13,798.85 (CAP Base Change) = 18,728.85 (2010 CAP Total) – 4,930 (2008 CAP Total)
279.896 (CAP Base Percent Change) = (13,798.85 (CAP Base Change) / 4,930 (2008 CAP Total)) * 100

2009 Trailhead Improvement 01(Amount: 1.000; Date: 12/31/2009 12:00:00 AM

Cost or B Type	Total	Amount Change	Percent Change	Base Change	Base Percent Change	
Date : 12/31/2009 12:00:00 AM ; Observations: 3						
OC	0.000	0.000	0.000	0.000	0.000	
AOH	0.000	0.000	0.000	0.000	0.000	
CAP	18785.250	13855.250	281.040	13855.250	281.040	
LCC	18785.250	13855.250	281.040	13855.250	281.040	
Unit	18.785	13.855	281.040	13.855	281.040	
EAA	0.000	0.000	0.000	0.000	0.000	
SubBOrC Name	**SubBOrC Amount**	**SubBOrC Unit**	**SubBOrC Price**	**SubBOrC Total**	**SubBOrC Unit Total**	**SubBOrC Label**
Material	690.000	SF	58.65	6744.75	6.74	mater01
NPS Cost Estimate Example.						
Labor	690.000	SF	104.70	12040.50	12.04	labor01
NPS Cost Estimate Example.						
Operation						

2010 Trailhead Improvement 01(Amount: 1.000; Date: 12/31/2010 12:00:00 AM

Cost or B Type	Total	Amount Change	Percent Change	Base Change	Base Percent Change	
Date : 12/31/2010 12:00:00 AM ; Observations: 3						
OC	0.000	0.000	0.000	0.000	0.000	
AOH	0.000	0.000	0.000	0.000	0.000	
CAP	18728.850	-56.400	-0.300	13798.850	279.896	

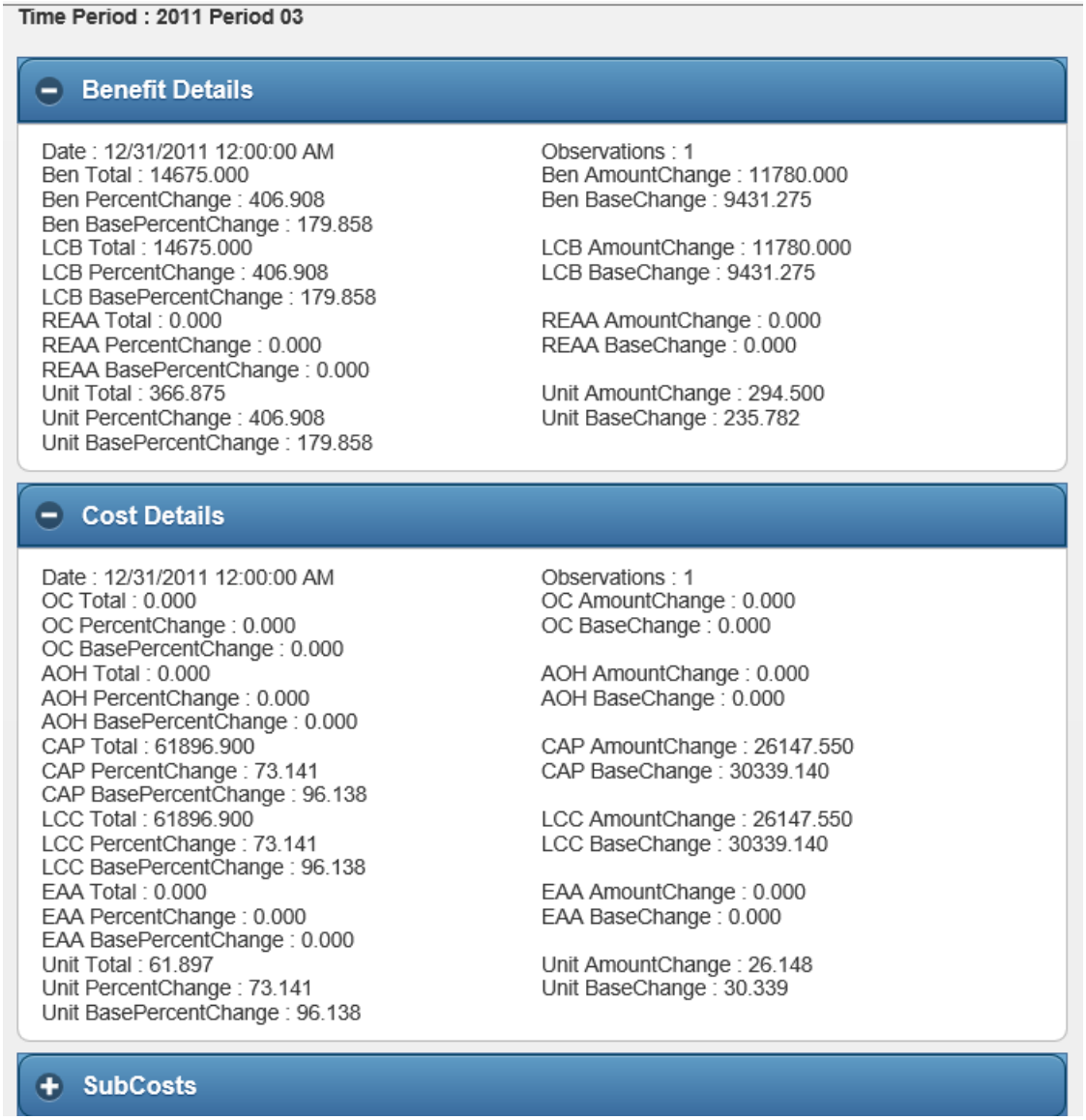
The following Capital Budget analysis compares a 2011 Time Period with a 2010 Time Period and a base 2009 Time Period. The 2009 Time Period is the first period in the series, hence the "base". The number of observations in each Time Period is 1 because each of the three Time Periods in the budget had a distinct year. The calculations are:

11,780.00 (Benefit Amount Change) = 14,675.00 (2011 Benefit Total) – 2,895.00 (2010 Benefit Total)

406.91 (Benefit Percent Change) = (11,780.00 (Benefit Amount Change) / 2,895.00 (2010 Benefit Total)) * 100

9,431.28 (Benefit Base Change) = 14,675.00 (2011 Benefit Total) – 5,243.73 (2009 Benefit Total)

179.86 (Benefit Base Percent Change) = (9,431.28 (Benefit Base Change) / 5,243.73 (2009 Benefit Total)) * 100



2. Change By Id Analysis

Amount Change and Percent Change properties measure changes between the current Id and the Id before the current Id. Base Change and Base Percent Change properties measure changes between the current Id and the first Id encountered in the series being analyzed.

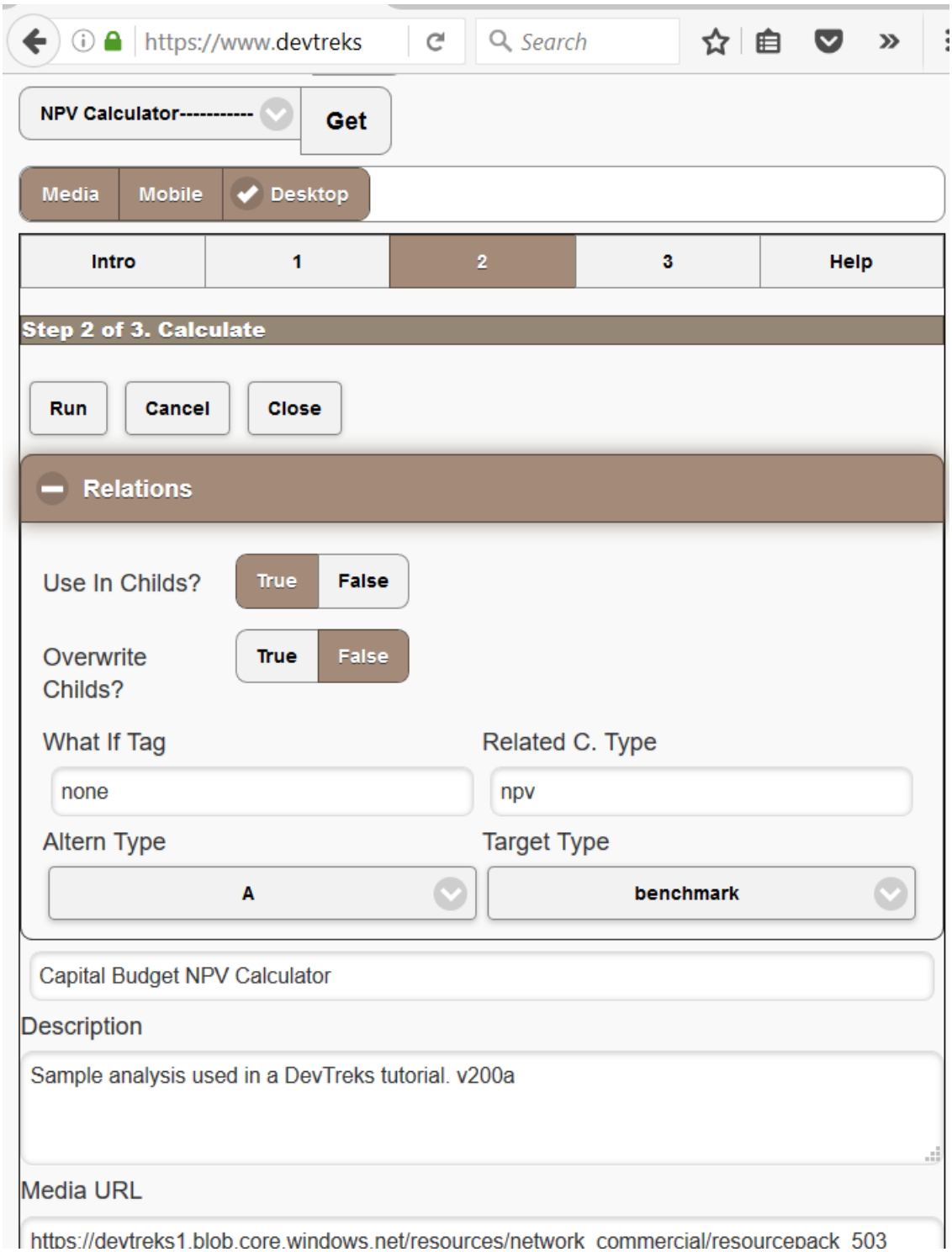
DevTreks recommends using this analysis to evaluate the accuracy of scientific data. All "observations" will be displayed which makes it easier to spot outliers, such as data entry errors. The following is an example:

Outcome Group : ME2 Food Consumed ; OC122					
Outcome	All	Alt. 0	Alt. 1	Alt. 2	Alt. 3
Name		2013 BM Food Consumed	2013 Act Food Consumed	2014 BM Food Consumed	2014 Act Food Consumed
Date		12/31/2013	12/31/2013	12/31/2014	12/31/2014
Label		OC122	OC122	OC122	OC122
Alternative		A	B	A	B
Indicator 1		Q1 Food Consumed	Q1 Food Consumed	Q1 Food Consumed	Q1 Food Consumed
Change Type		none	none	none	none
Observations		4	4	4	4
Date		03/15/2013	03/15/2013	03/15/2014	03/15/2014
Label		OC122	OC122	OC122	OC122
Total Unit		dollar cost	dollar cost	dollar cost	dollar cost
Total		6,772,000.000	8,001,000.000	7,211,000.000	7,116,000.000
Total Amount Change		0.00	0.00	-790,000.00	-95,000.00
Total Percent Change		0.00	0.00	-9.87	-1.32
Total Base Change		0.00	1,229,000.00	439,000.00	344,000.00
Total Base Percent Change		0.00	18.15	6.48	5.08
Q1 Unit		tons	tons	tons	tons

3. Change By AlternativeType Analysis

Amount Change and Percent Change properties measure changes between the current AlternativeType (C) and the AlternativeType before the current AlternativeType (B). Base Change and Base Percent Change properties measure changes between the current AlternativeType (C) and the first AlternativeType encountered in the series being analyzed (A).

The AlternativeType property can be set in Inputs and Outputs using LCA and NPV calculators (see the *Life Cycle Analysis 1* and *Net Present Value 1* references). The property can be set in all remaining base elements using NPV calculators The following image shows that the Alternative Type property can be set using Step 2 of NPV calculators (so that NPV analyses can be synchronized with other analyses):


https://www.devtreks
Search
NPV Calculator----------
Get
Media
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Desktop
Intro
1
2
3
Help
Step 2 of 3. Calculate
Run
Cancel
Close
Relations
Use In Childs?
True
False
Overwrite Childs?
True
False
What If Tag
none
Related C. Type
npv
Altern Type
A
Target Type
benchmark
Capital Budget NPV Calculator
Description
Sample analysis used in a DevTreks tutorial. v200a
Media URL
https://devtreks1.blob.core.windows.net/resources/network_commercial/resourcepack_503

The following Component analysis compares an aggregated Alternative C Component, with an aggregated Alternative B Component, and a base Alternative A Component (not shown). Note that Alternative B has been summed from 2 Components (observations = 2, each with AlternativeType = B) and Alternative C has been summed from 3 Components (observations = 3, each with AlternativeType = C). The AlternativeType properties were set using the base NPV calculator that must be run before other analyzers can be run. In this case, they were set using the Component elements. The calculations are:

26,147.55 (CAP Amount Change) = 61,896.9 (Alternative C CAP Total) – 35,749.35 (Alternative B CAP Total)
73.14 (CAP Percent Change) = 26,147.55 (CAP Amount Change) / 35,749.35 (Alternative B CAP Total)) * 100
30,339.14 (CAP Base Change) = 61,896.9 (Alternative C CAP Total) – 31,557.76 (Alternative A CAP Total)
96.14 (CAP Base Percent Change) = (30,339.14 (CAP Base Change) / 31,557.76 (Alternative A CAP Total)) * 100

Date : 12/31/2010 12:00:00 AM ; Observations: 2; Alternative : B						
OC	0.000	0.000	0.000	0.000	0.000	
AOH	0.000	0.000	0.000	0.000	0.000	
CAP	35749.350	4191.590	13.282	4191.590	13.282	
LCC	35749.350	4191.590	13.282	4191.590	13.282	
Unit	35.749	4.192	13.282	4.192	13.282	
EAA	0.000	0.000	0.000	0.000	0.000	
SubBOrC Name	**SubBOrC Amount**	**SubBOrC Unit**	**SubBOrC Price**	**SubBOrC Total**	**SubBOrC Unit Total**	**SubBOrC Label**
Material	8179.000	Allow	938.54	15574.10	15.57	mater01
NPS Cost Estimate Example.						
Labor	10177.000	SF	447.54	19484.00	19.48	labor01
NPS Cost Estimate Example.						
Equipment	2075.000	SF	13.30	691.25	0.69	equip01
NPS Cost Estimate Example.						
Component						
2011 Example 05 Slab on Grade(Amount: 1.000; Date: 12/31/2011 12:00:00 AM						
Cost or B Type	Total	Amount Change	Percent Change	Base Change	Base Percent Change	
Date : 12/31/2011 12:00:00 AM ; Observations: 3; Alternative : C						
OC	0.000	0.000	0.000	0.000	0.000	
AOH	0.000	0.000	0.000	0.000	0.000	
CAP	61896.900	26147.550	73.141	30339.140	96.138	

The following LCA Capital Budget analysis compares an Alternative C Capital Budget, with an Alternative B Capital Budget (not shown), and a base Alternative A Capital Budget (not shown). Note that the observations = 1 because only one Time Period in the budget had an AlternativeType = C. The AlternativeType properties were set using the base NPV calculator that must be run before other analyzers can be run. In this case, they were set using the Time Period elements of the budget. The calculations are:

725.00 (BEN Amount Change) = 14,675.00 (Alternative C BEN Total) – 13,950.00 (Alternative B BEN Total)

5.19 (BEN Percent Change) = 725.00 (BEN Amount Change) / 13,950.00 (Alternative B BEN Total)) * 100

9,431.27 (BEN Base Change) = 14,675.00 (Alternative C BEN Total) – 5,243.73 (Alternative A BEN Total)

179.85 (BEN Base Percent Change) = (9,431.27 (BEN Base Change) / 5,243.73 (Alternative A BEN Total)) * 100

Time Period : 2011 Period 03									
Cost or B Type	Total	Amount Change	Percent Change	Base Change	Base Percent Change				
Date : 12/31/2011 12:00:00 AM ; Observations : 1; Alternative : C									
Ben	14675.000	725.000	5.197	9431.275	179.858				
LCB	14675.000	725.000	5.197	9431.275	179.858				
Unit	366.875	18.125	5.197	235.782	179.858				
REAA	0.000	0.000	0.000	0.000	0.000				
Date : 12/31/2011 12:00:00 AM ; Observations: 1; Alternative : C									
OC	0.000	0.000	0.000	0.000	0.000				
AOH	0.000	0.000	0.000	0.000	0.000				
CAP	61896.900	26147.550	73.141	30339.140	96.138				
LCC	61896.900	26147.550	73.141	30339.140	96.138				
Unit	61.897	26.148	73.141	30.339	96.138				
EAA	0.000	0.000	0.000	0.000	0.000				
Benefits									
Willingness To Pay	12.000	visitor	375.00	1175.00	29.38	wtp01			
These calculations derive from ...									
Habitat Alteration Potential	23.000	TE species count equivs	0.00	0.00	0.00	habitat01			
These calculations derive from ...									
Nature	23.000	person	1650.00	11650.00	291.25	educate01			

The following Output M&E analysis compares an Alternative C Output Series, with an Alternative B Output Series (partially shown), and a base Alternative A Output Series (not shown). The number of observations being compared derive from the number of M&E Indicators being aggregated, not the number of aggregated base elements. The Indicators are aggregated based on their Label property. The Alternative Type properties were set using the base M&E calculator that defines the Indicators that will be analyzed. M&E Indicators can be defined for

every base element in an analysis. In this example, each base element had two separate types of M&E Indicators, distinguished by their O123A and O123B labels. The calculations are:

0.14 (TOTAL1 Amount Change) = 0.046 (Alternative C TOTAL1 Total) – 0.185 (Alternative B TOTAL1 Total)
-75.14 (TOTAL1 Percent Change) = 0.14 (TOTAL1 Amount Change) / 0.185 (Alternative B TOTAL1 Total)) * 100
-0.08 (TOTAL1 Base Change) = 0.046 (Alternative C TOTAL1 Total) – 0.13 (Alternative A TOTAL1 Total)
-64.6 (TOTAL1 Base Percent Change) = (-0.08 (TOTAL1 Base Change) / 0.13 (Alternative A TOTAL1 Total)) * 100
The displayed numbers are rounded, while the calculated numbers are not.

Name	2012 Number of children examined for malnutrition, Project 01	2012 Number of children examined for malnutrition, Project 02	2012 Number of children examined for malnutrition, Project 03
Label	O123	O123	O123
Alternative	A	B	C
Indicator 1	Benchmark malnourished children examined	Benchmark malnourished children examined	Benchmark malnourished children examined
Change Type	none	none	none
Observations	5	5	5
Date	01/15/2012	01/15/2012	01/15/2012
Label	0123A	0123A	0123A
Total Unit	percent children	percent children	percent children
Total	0.130	0.185	0.046
Total Amount Change	0.00	0.00	-0.14
Total Percent Change	0.00	0.00	-75.17
Total Base Change	0.00	0.06	-0.08
Total Base Percent Change	0.00	42.33	-64.66
Q1 Unit	children	children	children
Q1	3,100.000	4,100.000	4,600.000
Q1 Amount Change	0.00	0.00	500.00
Q1 Percent Change	0.00	0.00	12.20
Q1 Base Change	0.00	1,000.00	1,500.00
Q1 Base Percent Change	0.00	32.26	48.39
Q2 Unit	children population	children population	children population
Q2	230,200.000	230,000.000	500,400.000
Q2 Amount Change	0.00	0.00	270,400.00
Q2 Percent Change	0.00	0.00	117.57

4. Budget Change Analysis

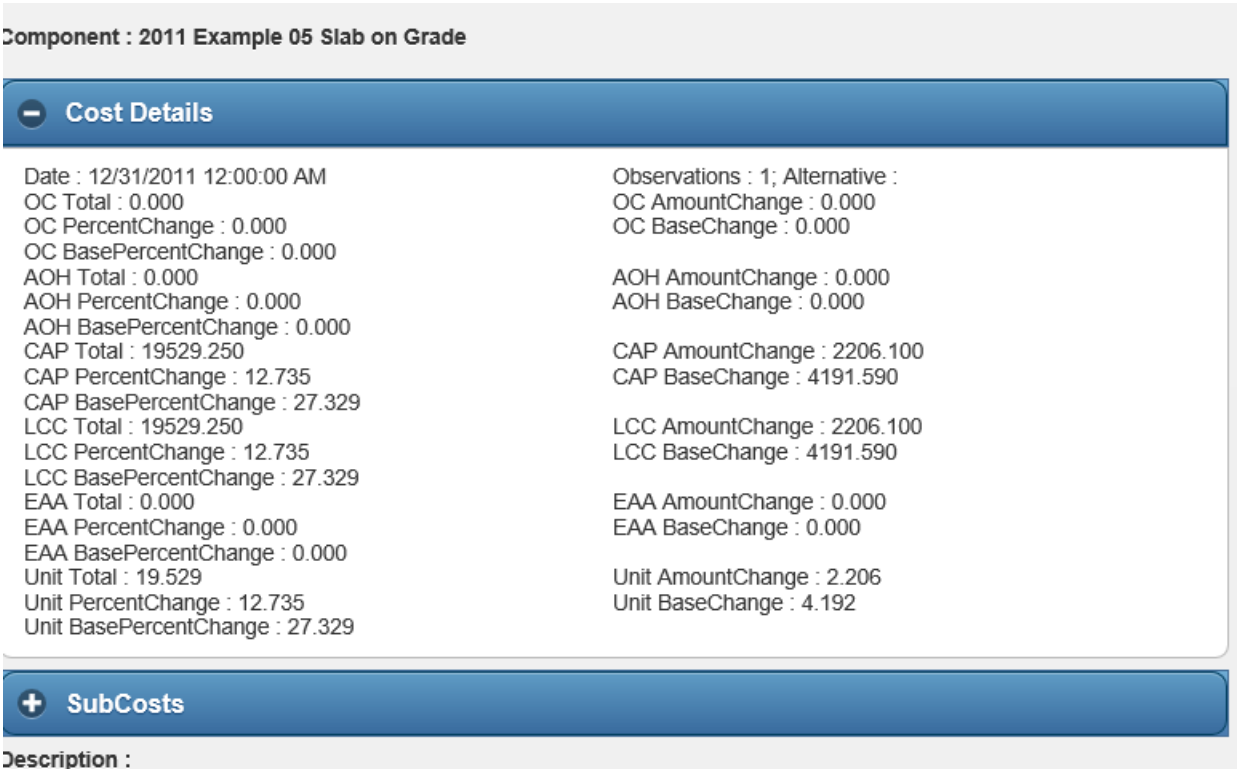
Most *Change Analysis* compare sequential sibling elements –Component B to Component A, Outcome 3 to Outcome 2, Input 2009 to Input 2008. Budgets only compare sibling elements that are children of the node being used to carry out the analyses. For example, an analysis completed for a Budget will compare the children sibling Time Periods. However, the grandchildren Operations and Outcomes that are compared will be from the respective Time Periods being compared which are antecedent, rather than sibling, comparisons.

For example, a *Change by Year Analysis* run for a Budget with three children Time Periods (2010, 2011, 2012) will compare Year 2012's Outcomes and Operations with the sibling Year 2011's Outcomes and Operations. Year 2011 is in the correct sequential order to be the "x-1" comparator. Year 2010 is in the correct sequential order to be the "base" comparator. *The Outcomes and Operations base and x-1 comparisons for Years 2010, 2011, and 2012 are made using the same Labels, not Years, AlternativeTypes, or Ids.* An Operation in Year 2012 with a Label A1010 will be compared to an x-1 Operation with the same label from Year 2011 and a base Operation with the same label in Year 2010. If the *Aggregate Using* property is set to *None* and if more than one Operation has Label A1010, comparisons will look for the next Operation in the sequence that has that Label. If the *Aggregate Using* property is set to Labels, Groups, or Types, Operations will be aggregated before being compared.

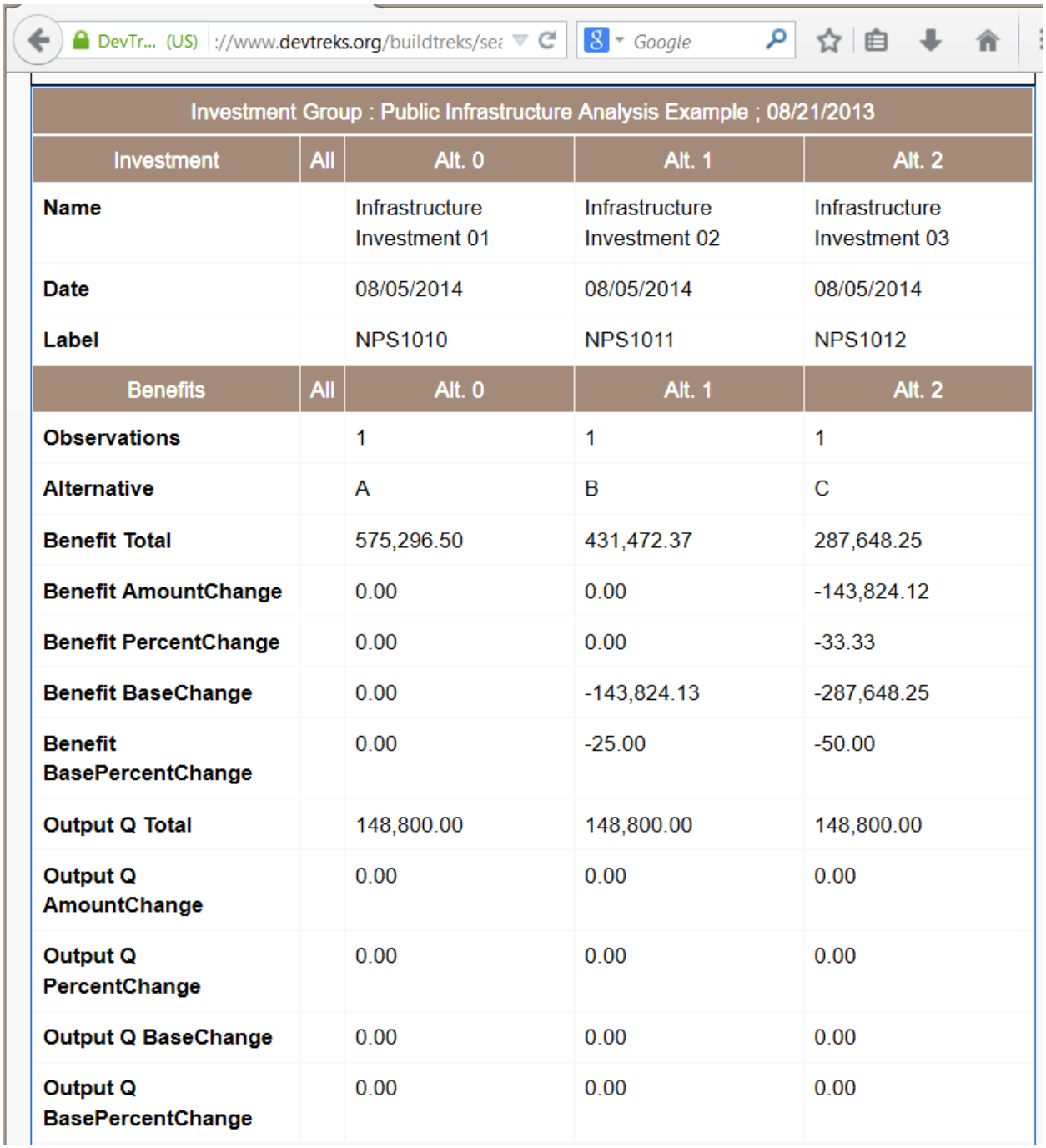
The following image comes from the same Capital Budget analysis as used in the *Change by Year* analysis. It compares a 2011 Time Period's Component with a 2010 Time Period's Component and a base 2009 Time Period's Component. The 2011 Time Period's Component was able to find the corresponding 2010 and 2009 Components because they all used the same WBS Label. Each comparison had one observation because one Component in each Time Period had the same Label. The calculations are:

2206.10 (LCC Amount Change) = 19,529.25 (2011 LCC Total) – 17,323.15 (2010 LCC Total)
12.74 (LCC Percent Change) = 2206.10 (LCC Amount Change) / 17,323.15 (2010 LCC Total)) * 100
4,191.59 (LCC Base Change) = 19,529.25 (2011 LCC Total) – 15,337.66 (2010 LCC Total)

27.33 (LCC Base Percent Change) = (4,191.59 (LCC Base Change) / 15,337.66 (2010 LCC Total)) * 100



A *Change by AlternativeType Analysis* run for a Budget Group with three children Budgets (A, B, C) will compare Budget C's Time Periods, Outcomes and Operations with the sibling Budget B's Time Periods, Outcomes and Operations. Budget B is in the correct sequential order to be the "x-1" comparator. Budget A is in the correct sequential order to be the "base" comparator. *The Time Periods, Outcomes and Operations comparisons are made using the same Labels, not Years, AlternativeTypes, or Ids.* A Time Period in Budget C with a Label of TP03 will be compared with an x-1 Time Period in Budget B with a Label of TP03.



Investment Group : Public Infrastructure Analysis Example ; 08/21/2013				
Investment	All	Alt. 0	Alt. 1	Alt. 2
Name		Infrastructure Investment 01	Infrastructure Investment 02	Infrastructure Investment 03
Date		08/05/2014	08/05/2014	08/05/2014
Label		NPS1010	NPS1011	NPS1012
Benefits	**All**	**Alt. 0**	**Alt. 1**	**Alt. 2**
Observations		1	1	1
Alternative		A	B	C
Benefit Total		575,296.50	431,472.37	287,648.25
Benefit AmountChange		0.00	0.00	-143,824.12
Benefit PercentChange		0.00	0.00	-33.33
Benefit BaseChange		0.00	-143,824.13	-287,648.25
Benefit BasePercentChange		0.00	-25.00	-50.00
Output Q Total		148,800.00	148,800.00	148,800.00
Output Q AmountChange		0.00	0.00	0.00
Output Q PercentChange		0.00	0.00	0.00
Output Q BaseChange		0.00	0.00	0.00
Output Q BasePercentChange		0.00	0.00	0.00

The take home message is that data conventions play particularly important roles in Budget Change Analyses. Children elements of the element being used to carry out calculations must have the correct Year or AlternativeTypes (Ids will be correct by default). Analyses run at a

Budget Group level must also have Time Periods with the correct Year or AlternativeTypes and WBS Label. Grandchildren and great grandchildren elements that are being compared must use the same WBS Label.

c. Knowledge Bank Standards

All incremental economic and technical change data should be entered into online knowledge banks (i.e. production servers as contrasted to development servers) that can be used to analyze incremental differences. That structured evidence must be passed down to future generations. These knowledge banks aggregate and analyze all of the data in a network. Future references will discuss how these knowledge banks will evolve (i.e. semantic data, forecasts) to support future decision making needs. The flexibility offered by DevTreks in documenting incremental change means that networks need to develop "rules" explaining the "standards" that should be followed by clubs in their network. The "standards" make it possible to build knowledge banks.

Summary

Clubs using DevTreks can start to carry out the basic analysis of economic and technical change. Clubs can solicit help understanding incremental change better and share structured evidence explaining the changes. Networks can build knowledge banks that explain incremental changes and pass that knowledge down to future generations. The result may be farmers that get higher returns, patients that get treated less expensively, farmworkers who get paid fairly, conservationists who conserve natural resources more efficiently, governments that contract less wastefully, and people who improve their lives and livelihoods.

Footnotes

1. Some economists believe that technological change is the most important factor causing economic growth. These analysts have been trying to measure incremental economic and technological change data, with varying degrees of success, for decades. They have developed a large number of techniques for measuring change. The Performance and

Social Performance Analysis tutorials introduced basic tools for carrying alternative incremental analysis techniques (i.e. Incremental Cost Effectiveness Ratios).

References

References for NPV, LCA, M&E, and Resource Stock analysis can be found in their respective tutorials.

References Note

We try to use references that are open access or that do not charge fees.

Improvements, Errors, and New Features

Please notify DevTreks (devtrekkers@gmail.com) if you find errors in these references. Also please let us know about suggested improvements or recommended new features.

Video tutorials explaining this reference can be found at:

https://www.devtreks.org/commontreks/preview/commons/resourcepack/Change Analysis 1/507/none

This topic is also covered in several videos in the NPV, LCA, M&E, and Resource Stock Analysis tutorials.