Institute for Global Environmental Strategies

Mainstreaming transport co-benefits approach: a practical guide to evaluating transport projects

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Outline

- Overview
- Why quantify co-benefits?
- How to quantify – challenges and options
- Case study – Bangkok BRT
- Summary and way forward

"Traffic is not just a line of cars. It is a web of connections. **A real solution will look at relationships across the entire road network and all the other systems that are touched by it**: our supply chains, our environment, our companies, the way people and communities live and work."
IBM 2010 Commuter Pain Survey

The **transport co-benefits approach** aims to **reduce greenhouse gas emissions**, **prevent environmental pollution**, and **support sustainable development all at the same time**.

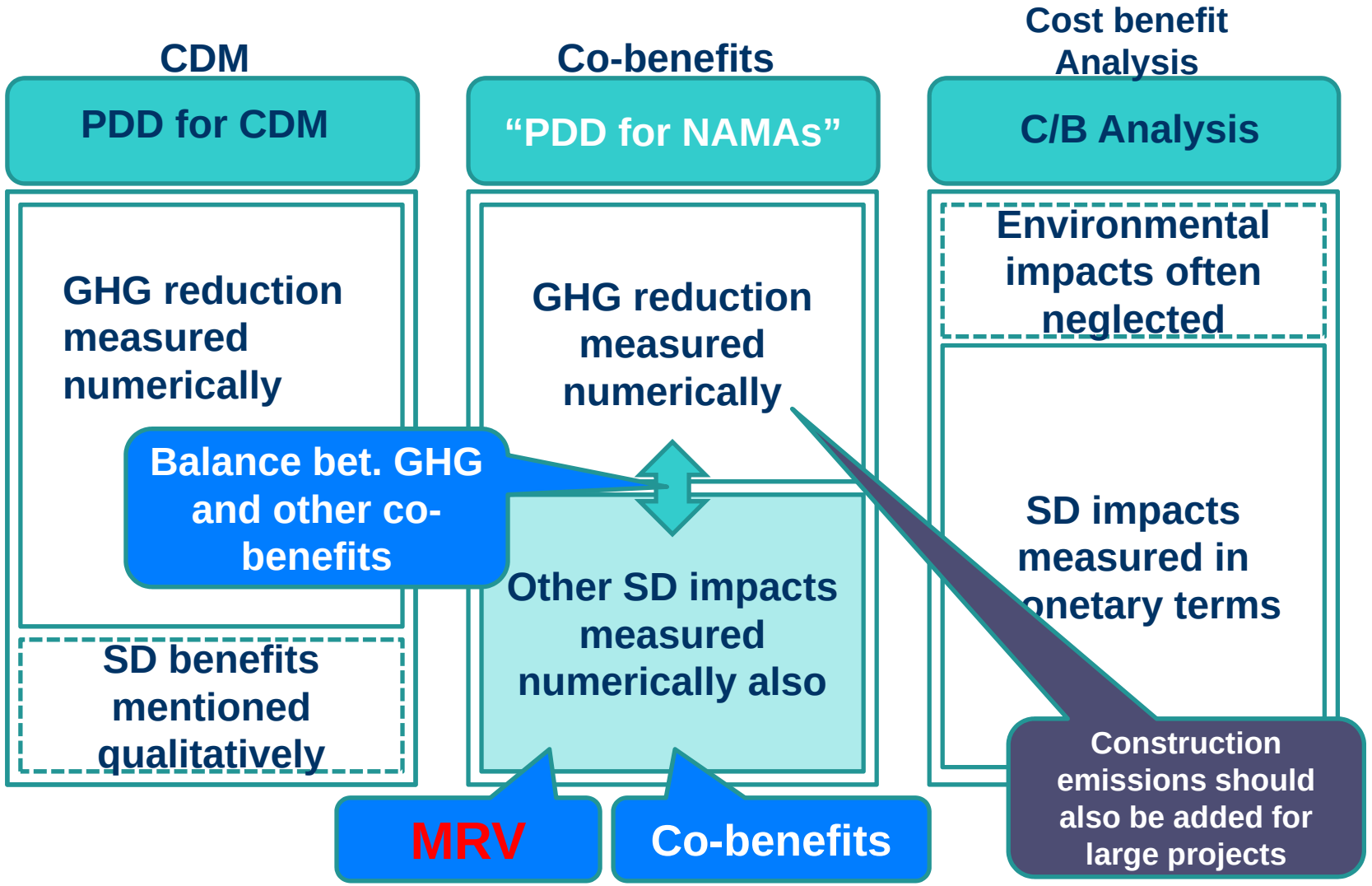

time savings
vehicle operating costs savings
road safety benefits
air quality improvement
GHG reductions

Why quantify co-benefits?

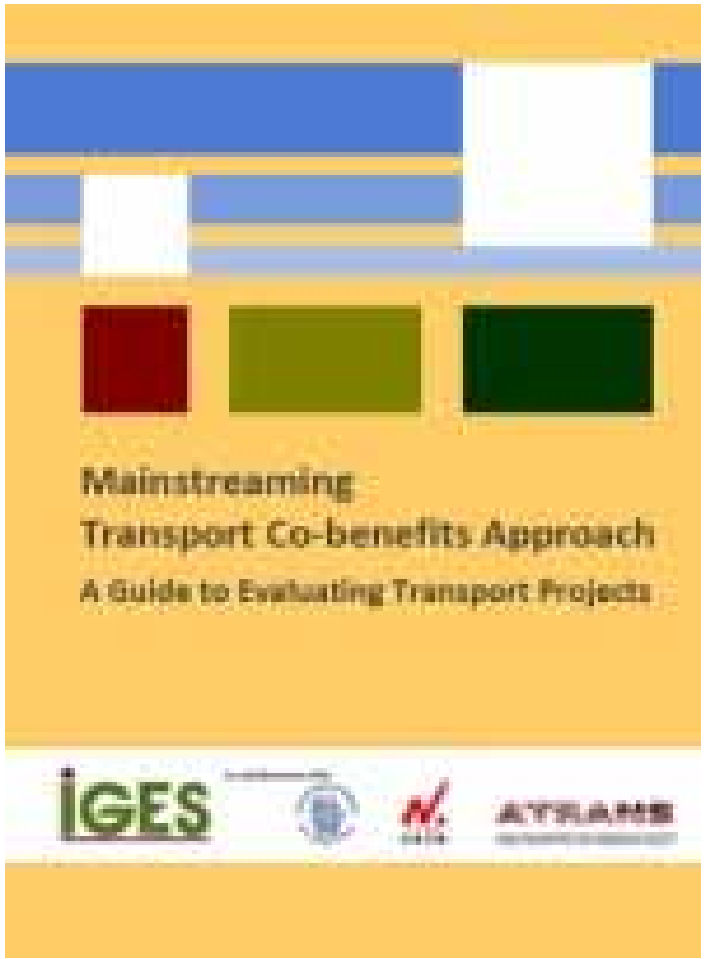
everyone appreciates the “co-benefits approach” but operationalizing the concept is perceived as hard work with less incentive

- the numbers serve as proof to influence **better decision-making** and **implementation**
- if it can be measured, it can be managed
- the ‘proof’ can **leverage financing**

Not a new tool, bringing in more benefits



Transport Co-benefits Guidelines



Available for download at:
http://www.cobenefit.org

Time savings

Benefit of travel time saving $BT = BT_o - BT_w$

Total Travel time cost (per year) $BT_i = \sum_j \sum_l \left(Q_{ijl} \times T_{ijl} \times \alpha_j \right) \times 365$

where,

BT: Benefit of travel time saving

BT_i: Total Travel time cost with/without project

Q_{ijl} : traffic volume for j vehicle type on link l, with/without project (vehicle/day)

T_{ijl} : average travel time for j vehicle type on link l, with/without project (minute)

α_j : value of time for j vehicle type (monetary unit/minute*vehicle)

i : $i = w$ with project, $i = O$ without project,

j : vehicle type

l : link

Unit value of time per vehicle type (in US $/vehicle-minute)

Vehicle type (j)	Japan	Thailand
Passenger car	0.44	0.061
Bus	4.10	0.031
Van	0.53	-
Small truck	0.52	-
Ordinary truck	0.70	0.031
Motorcycle	-	0.010

Note: Based on 2008 data and prices

Vehicle operating costs savings

Benefit of vehicle operating cost reduction $BR = BR_o - BR_w$

Total Travel time cost (per year) $BR_i = \sum_j \sum_l \left(Q_{ijl} \times L_l \times \beta_j \right) \times 365$

where,

BR: Benefit of vehicle operating cost reduction

BR_i: Total vehicle operating cost with/without project

Q_{ijl}: traffic volume for j vehicle type on link l, with/without project (vehicle/day)

L_l: Link length of link l (km)

β_j: value of vehicle operating cost for j vehicle type (monetary unit/minute*vehicle)

i: $i=w$ with project, $i=C$ without project,

j: vehicle type

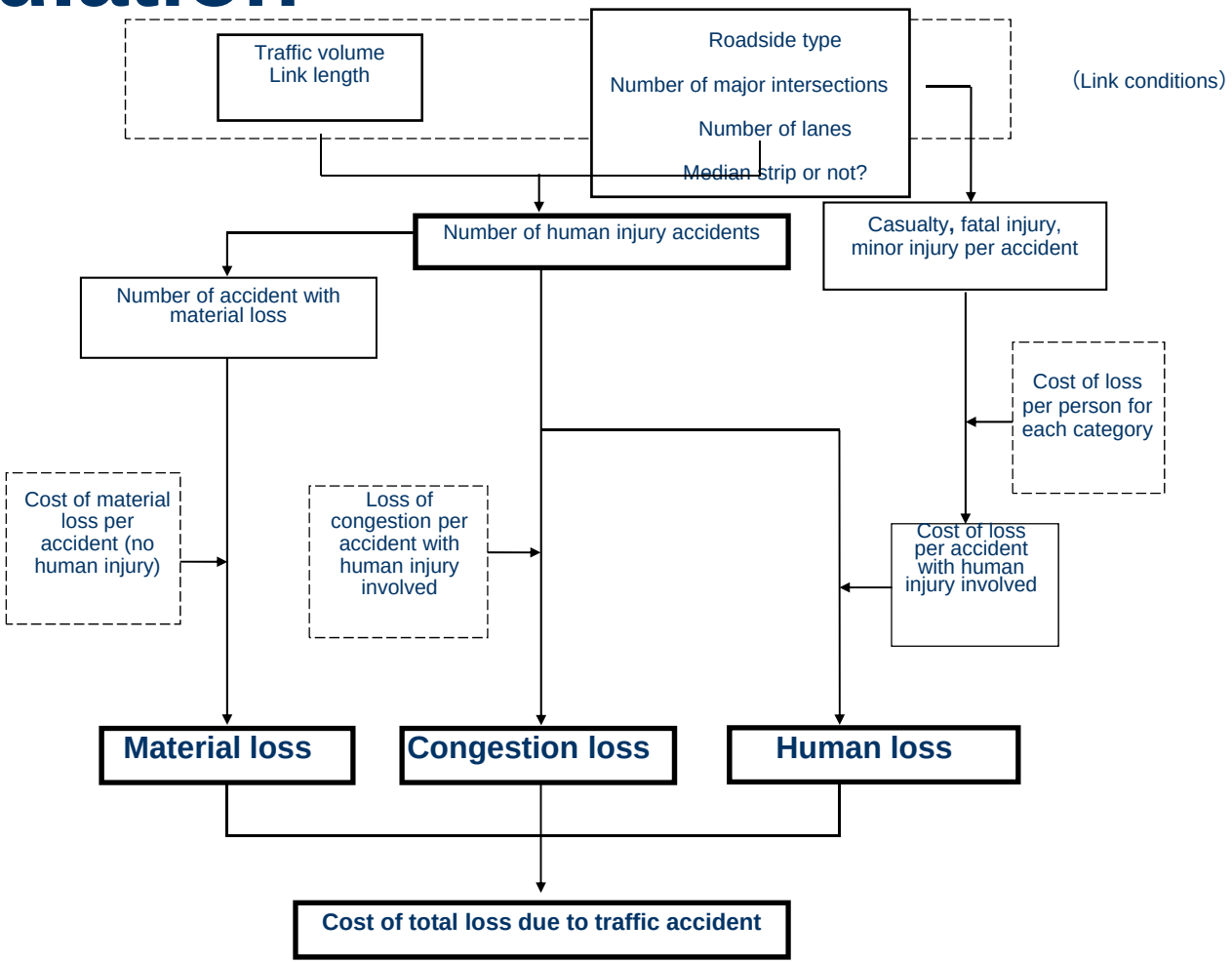
l: link

Ordinary road (DID) **(Unit : US $/vehicle・km)**

Speed (km/hour)	Passenger car	Bus	Ave. passenger car class (incl. bus)	Small truck	Ordinary truck
5	0.47	1.20	0.48	0.36	0.82
10	0.34	1.01	0.35	0.31	0.67
15	0.30	0.94	0.31	0.29	0.60
20	0.27	0.89	0.28	0.27	0.55
25	0.26	0.86	0.27	0.26	0.51
30	0.25	0.84	0.26	0.25	0.48
35	0.24	0.82	0.25	0.25	0.45
40	0.24	0.81	0.25	0.24	0.44
45	0.24	0.81	0.24	0.24	0.43
50	0.23	0.80	0.24	0.24	0.42
55	0.23	0.80	0.24	0.24	0.41
60	0.24	0.80	0.24	0.24	0.41

Note1) Prices in 2008
Note2) Unit cost between classes of speed in the table should be calculated by linear interpolation.
Note3) Values of 60km/h are used respectively, in the case of speeds beyond 60km/h

Framework of accident loss calculation



Estimation of emission reductions

Bottom up

$$ER_i = \Sigma(BE_{i,k} - PE_{i,k})$$

$$BE_{i,k} = \Sigma(Q_{BL,j,k} \times L_k \times EF_{i,j,VBL,k})$$

$$\mathbf{PE_{i,k} = \Sigma(Q_{PJ,j,k} \times L_k \times EF_{i,j,VPJ,k})}$$

Traffic volume

Emission factor

Top down

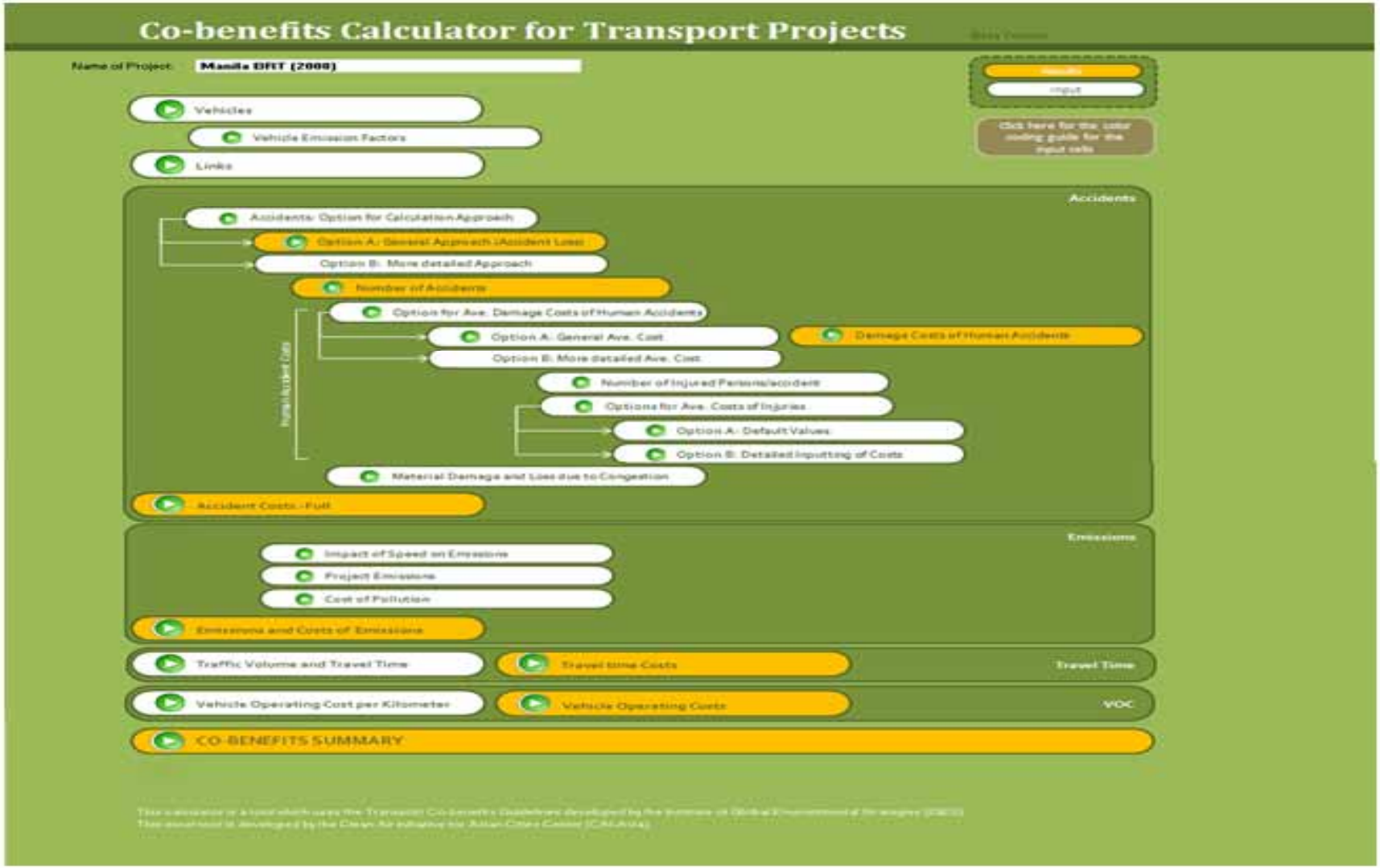
$$ER = \Sigma(BE - PE)$$

$$BE = \Sigma(FC_{BL,m} \times NCV_m \times Ef_m)$$

$$PE = \Sigma(FC_{PJ,m} \times NCV_m \times EF_m)$$

Amount of fuel

Transport Co-benefits Calculator



Case study: Bangkok BRT

	2006 Base case	2011 Without BRT scenario	2011 With BRT scenario	Difference between With and Without BRT scenarios
Time Cost (Baht/year)	467,088,340,223	372,519,518,162	369,352,291,793	-3,167,226,369
Operating Cost (Baht/year)	758,591,194,274	771,676,100,219	766,519,611,334	-5,156,488,885
Loss by Accident (Baht/year)*	143,215,180,809	138,838,420,713	137,465,291,897	-1,373,128,816

*Based on Japanese values

Emission reductions

	Pollutants	Emissions or emission reductions (t/day for CO_2, kg/day for others)	
Air pollutants	NOx	2006	
		2011 (Without BRT)	327,389
		2011 (With BRT)	325,930
		Reduction (Without –With BRT)	1,458
		Reduction rate ((Without –With BRT)/Without BRT)	0.45%
	CO	2006	
		2011 (Without BRT)	1,173,604
		2011 (With BRT)	1,160,929
		Reduction (Without –With BRT)	12,676
		Reduction rate ((Without –With BRT)/Without BRT)	1.08
	PM	2006	
		2011 (Without BRT)	13,858
		2011 (With BRT)	13,843
		Reduction (Without –With BRT)	15
		Reduction rate ((Without –With BRT)/Without BRT)	0.11%
Greenhouse gas	CO_2	2006	
		2011 (Without BRT)	67,327
		2011 (With BRT)	66,903
		Reduction (Without –With BRT)	424
		Reduction rate ((Without –With BRT)/Without BRT)	0.63%

Summary and way forward

o The **transport co-benefits guidelines and calculator** are easy-to-use tools to empower local transport practitioners in mainstreaming co-benefits approach in their planning and policy making processes

o Data is often not available but possible to start with initial 'default' values

o Data collection and management should be strengthened to access external financing and support

Thank you for your attention.

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