Changing Do-nothing Baselines for Transport Investments

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Abstract- *In the realm of conducting transport economic and environmental assessments, the option of "doing nothing," or "no project/investment," is considered as the baseline of the projects. Potential benefits of the project are always compared to a "do nothing" option before a decision is taken. However, this "do nothing" concept is a myth – "do something" is a reality, and considering this concept in baseline assessments could be a game changer for transport projects. In absence of a particular project or an investment, a suitable alternative would be found and implemented by the authorities. Thus, baselines need to be redefined and 'without project' scenario should not be just considered as 'no improvement' but, should ideally be considered as to what would 'most likely' happen if this project is not executed. By making this change in baseline, fundamentals of transport investment can be strengthened and this can lead to paradigm shift in transport. Considering BRT projects, assessment of transport expansion in the baseline was estimated and found to be a gamechanger in the economic analysis.*

Keywords - Baseline, BRT, Vehicle kilometers traveled, infrastructure, cost-benefit analysis

I. Introduction

"Government cannot experiment on the BRT project which is estimated to cost P10 billion[1]"
- President Aquino, President, Philippines

Transport agencies are required to justify the economic viability and cost effectiveness of a project alternative before the implementation of a project. All the benefits of the projects and its alternatives are generally compared with 'no build' / 'without project'/ 'doing nothing' scenario. This comparison of 'With project' and 'Without project or '**doing nothing'** forms the foundation of transport projects' economic and environmental assessments from past many decades. For example, World Bank (2005), Inter American Development Bank (2010) and Asian Development Bank (1997)all recommend realistic "do nothing" scenario against the which the proposed project impact is assessed.

However, people often confuse "do nothing" as no additional significant investment in the baseline. No city has managed to sustain "doing nothing" as the cornerstone of its policy making. We can examine the "do nothing" concept in simple terms: if the total ridership of a proposed Bus Rapid Transit project (BRT) is 10 million over 20 years, the baseline would be the same amount of trips (neglecting induced traffic) traveling in different modes without the project. However, the 'same passenger trips' in both with and without scenarios actually signify additional investment in expanding roadways. It is illogical to assume that the same amount of existing roads would accommodate such a drastic increase in traffic volume without subsequent expansion or addition of a suitable alternative. Thus, in practice the "do nothing scenario" actually implies "doing something"

[1]Sunstar Cebu,2012, "BRT hits roadblocks" - http://www.sunstar.com.ph/cebu/opinion/2012/12/04/barrita-brt-hits-roadblock-256684, accessed on 2-November-2013.

– increasing supply to sustain the projected traffic movement. Historically, we have been expanding roads to accommodate increasing traffic.

This paper tries to argue in favor of incorporating the measurement of additional infrastructure required in without project scenario during assessment of sustainable transport options. Incorporating this "supply increase" concept in the baseline has the potential to radically alter the project evaluation approach of sustainable urban transport options. Incorporating such a component in cost and benefits stream will automatically make many of public transport improvement projects feasible and their implementation faster. This aspect has been highlighted in the paper with examples from BRT system.

II. Transport Baseline in Projects

Constructing the transport baseline is probably the most critical task in the appraisal process as all project cost and benefits are compared with this baseline. In general, there exists three types of possible baseline counterfactuals.

1. 'Do Nothing': This scenario does not consider any improvement and investment in absence of proposed project which often results in a pro-bias towards projects as the baseline describes a deteriorating scenario where facility is unable to meet demand.

2. 'Do Minimum': This scenario considers minimum investment to keep the existing capacity operational for full length of analysis. This scenario does not envisage high comparable investments in absence of proposed project.

3. 'Do something else': This scenario envisages an alternative project in absence of proposed project.

Generally, all transport economic and environmental assessment guidelines propose comparison with 'do nothing' or 'do minimum'. It is hard to determine when exactly 'without project' was first used as a reference for project evaluation, but it is being used from early 1960's in transport sector when cost-benefit analysis gained prominence. 'Without project' was essentially used since there was a need for a standard datum against which project benefits can be compared with.

This paper tries to argue in favour of incorporating the measurement of **'most likely'** step in the baseline for evaluation of sustainable transport projects for a start.

Based on traditional investment patterns in developing cities, 'most likely' step would be infrastructure expansion and considering this additional infrastructure requirement in without project scenario could change the project evaluation dynamics. The cost of additional infrastructure prevented by the project is a benefit to sustainable transport investment. In the context of the challenges described, baseline aspect has been scoped in detail in this paper with many examples from BRT systems. BRT systems are considered as many methodologies and toolkits exist to determine economic and environmental feasibility of the projects. In this paper, BRT is considered as an example to illustrate that good public transport and non motorized transport projects would yield high benefits in terms of its impact on motorization and prevention of investments on additional road construction.

III. BRT System Benefits

Globally, more than 160 cities have adopted Bus Rapid Transit systems with over 300 bus corridors[2] and 2,000 BRT lane kilometres are already in operation. Increased demand for BRT in cities around the world is mainly due to high benefits generated by the system.

BRT benefits quantified can be generally categorized in three tiers -

1. Tier 1 - "generally quantified" such as Travel time savings and Fuel savings;
2. Tier 2- "sometimes quantified" such as emission reductions and road safety improvements and
3. Tier 3 - " acknowledged but often not quantified" such as noise reduction, land use impacts, health benefits, improvement in quality of life, improved economic opportunities, increased jobs, increased revenue, fuel security, etc.

In project implementation cycle, Tier 1 benefits (often called as direct benefits) are always quantified and compared against project costs during economic feasibility stage of the project. In case the project is being financed partly by development banks or through carbon finance mechanisms, quantification of CO2 savings becomes critical (tier 2). Methodologies in Tier 1 and Tier 2 for calculating fuel consumption and carbon emissions are not actually very different from each other as once fuel savings from a project are estimated, calculating CO2 emissions is a simple multiplication of carbon content of fuel. However, this aspect has been neglected with institutions and researchers struggling over the assumptions and boundary establishment in CO2 quantifications in projects thus making it complicated and difficult.

Benefits of the BRT projects are often due to mode shift and improved BRT buses in terms of occupancy and speed. By shifting the projected vehicular trips to more efficient buses and comparing it without any BRT project case, savings such as travel time, fuel and emissions are established. Due to the BRT system, many people change their origin or/and destination to use this better mode of transport and thus density (housing and employment) increases in the areas influenced by the project, thereby increasing land values, increasing employment opportunities , reducing emissions and generating health benefits.

However, in spite of many cities building or planning for BRT, doubts still persist on BRT and its cost effectiveness which often delays the implementation. For example,

1. Cebu BRT in Philippines was delayed by more than a year because the President of Philippines was not convinced of the high costs associated with the BRT.
2. New Delhi is struggling to implement an ambitious BRT system due to uncertainties on its advantages. By 2010, Delhi had only built 5.8 km out of planned 115 KM to be finished by 2010. Leading political parties have promised to scrap BRTS in local election manifestos and future of BRTS implementation in New Delhi is not clear.

Clearly, BRT benefits were not adequately established when compared with investments required for expanding roadways in without project scenario.

IV. Reduced Motorized Travel due to BRT

Let us consider four BRT projects in Asia - Ahmedabad & Pimpri in India, Cebu in Philippines and Guangzhou in China and quantify the magnitude of "without project" road expansion activities in

[2] Zottis Luísa (2013), " Over 300 BRT's and Busways around the world", TheCity Fix, http://thecityfix.com/blog/over-300-brts-around-the-world-bus-rapid-transit-number-luisa-zottis/, accessed on 2- November-2013

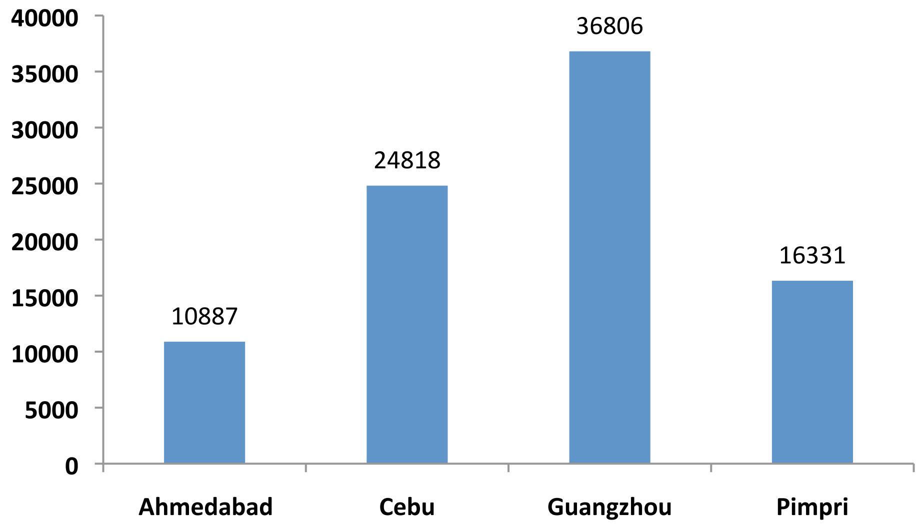
respective cities. Of the four BRTS considered, two systems are already in operation (Ahmedabad in 2009 and Guangzhou 2010) and two under implementation (Pimpri under construction and Cebu has just been approved). Both Ahmedabad and Guangzhou systems are considered as Best Practice case studies for rest of Asian developing cities.

Table 1 : BRT Length and Costs

BRT	Country	BRT (KM)	Financed	Cost Million USD
Ahmedabad	India	59.0	Indian Government	106
Cebu	Philippines	16.0	Co-funded by Climate Technology Fund	152
Guangzhou	China	23.0	Chinese Government	146
Pimpri	India	19.2	Co-funded by Global Environment Facility	147

Construction and maintenance cost of the systems vary from 1 to 5 million USD/km. The average daily ridership per kilometer of the projects vary from 10000 to 37000 and thus providing adequate range for estimating benefits of the BRT system.

Figure 1 : BRT Daily Ridership/kilometer



In case the BRT would not have been constructed (no project scenario), BRT riders would have been forced to use the existing modes throughout the twenty years of project lifecycle. Since the shift is from low occupancy vehicles to improved BRT buses with higher occupancy and travelling at higher speeds, the savings generated in time and fuel costs are primarily quantified. These projects have been analyzed using TEEMP methodologies by Clean Air Asia with partners for ADB (Guangzhou), World Bank (Ahmedabad, Pimpri) and French Development Agency (Cebu)[3].

Table 2 : BRT Modeshift, Trip length and Occupancy details at Starting Year

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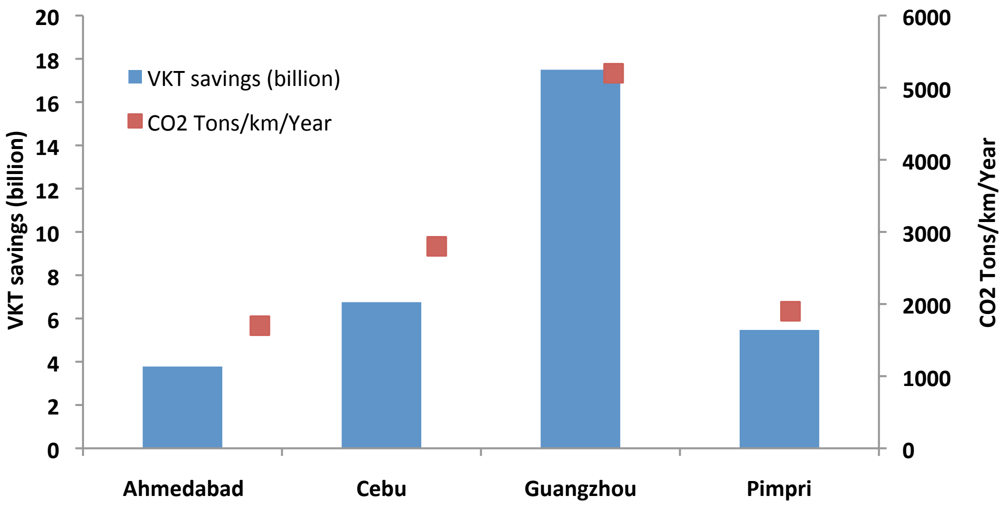
[3] for more details on individual projects and TEEMP suite of models, please refer to - Clean Air Asia, Transport Emissions Evaluation Model for Projects at http://cleanairinitiative.org/portal/projects/TEEMP. In this paper, methodology and actual project application is not explained in detail.

	BRT Starting Year											
	Ahmedabad			Cebu			Pimpri			Guangzhou		
	Mode Shift	Trip Length	Occupancy	Mode Shift	Trip Length	Occupancy	Mode Shift	Trip Length	Occupancy	Mode Shift	Trip Length	Occupancy
Cars	2%	11	1.1	14%	6	2	2%	6.4	1.42	20%	20	2
2-Wheeler	12%	5.6	1	18%	6	1	12%	6.4	1.09			
3-Wheeler	38%	5.3	3				38%	6.4	1.9			
Taxi				5%		2				7%	10	3
Normal bus	47%	12	28				47%	6.4	35	72%	12	45
Minibus				63%	6	16						
Cycling	1%						1%	6.4		2%	7	
BRT		8	45		6	40		6.4	45		12	54

The modal shift data provided above is for the first year and it does not consider the impact of future motorization in absence of the project. Mode shift data is based on transport modelling and ex-ante surveys in respective cities. It is interesting to note minor shift from non motorized transport to BRT systems. More accurate insights can be drawn in future by conducting surveys to capture ex-post trip behaviour.

Figure 2: BRT Vehicle Kilometer Travel and CO2 Emissions Savings

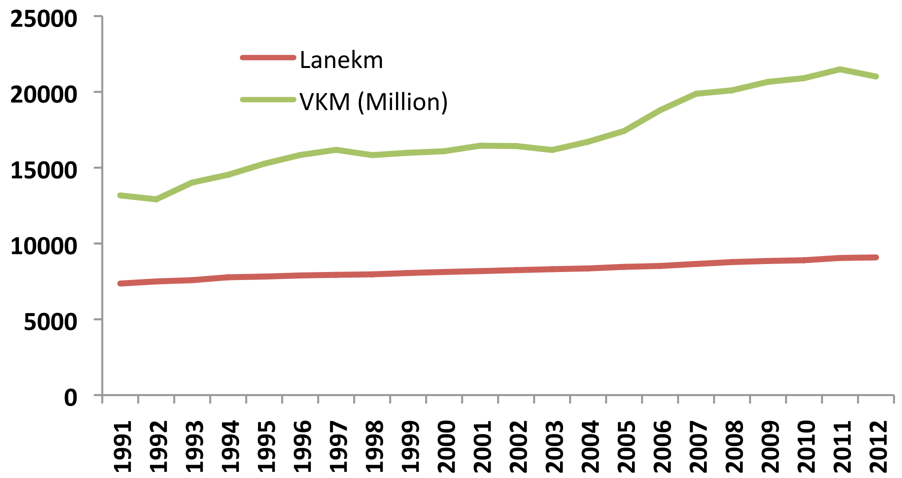


Avoided motorized vehicle travel due to these projects range from 4 to 17 billion vehicle kilometer travel for twenty years of project analysis . In the without project case i.e. city without effective and prioritized public transport system, this increase in traffic would lead to slowing of traffic speeds, congestion and this would subsequently force cities to widen roads to cater for increased traffic growth. In order to make most conservative calculation of this infrastructure requirement, Singapore has been considered as an example.

V. Road Expansion in Singapore

Singapore does not follow the traditional approach of increasing road space with increasing congestion. From 1991 to 2012, vehicles have increased by 2.7% annually while vehicle kilometer travel has increased by 2.2% and road supply (lane kilometers) have only increased by 1% as per the statistics of Land Transport Authority-Singapore[4]. Singapore has limited land supply, so road widening is only carried out when all other options fail. The major emphasis is on curbing travel demand by road pricing, controlling ownership, better and effective public transport facilities. In comparison for example in India from 2000 to 2010, vehicle travel has increased at 3.2% (WBCSD, 2004) while road kilometers have increased at 3.3%. Within a decade, India has expanded lane kilometers by 1 million km. IEA has documented that now countries like China, India and ASEAN are expanding roads(lane-km) at an annual speed of 350000,98000 and 54000 km every year (Dulac, 2013). Majority of developing cities in Asia are yet to adopt sustainable urban transport policies in letter and spirit. The current vision is more oriented towards improving speeds and not founded on avoid-shift-improve approach.

Figure3: Singapore Infrastructure Expansion with Growing Traffic Movement



To give an example, Philippines development plan-2011-2016 (NEDA, 2011) quotes speed improvement as a primary indicator in measuring success of Metro Manila's transport strategy. It quotes -

1. Decreased travel time from 2.17 min/km to 1.57 min/km in 2016
2. Increase in travel speed from 27.79Km/hour to 38.2 km/hour by 2016
3. Increased occupancy due to reduction of city buses - air-conditioned from 40 to 65, non-air-conditioned from 37 to 45.

In contrast, Singapore's Master plan 2013 targets

1. 8 in 10 households living within a 10 min walk from the MRT station
2. 85% of public transport journeys less than 20km completed within one hour
3. 75% of all journeys during peak hour undertaken on public transport

Thus, Singapore explains a conservative example of road expansion within a city. By considering Singapore's experience with road supply increase and translating this ratio on projected vehicle

[4] Singapore Land Transport: Statistics In Brief, http://www.lta.gov.sg/content/ltaweb/en/publications-and-research.html, Accessed 6-10-2013.

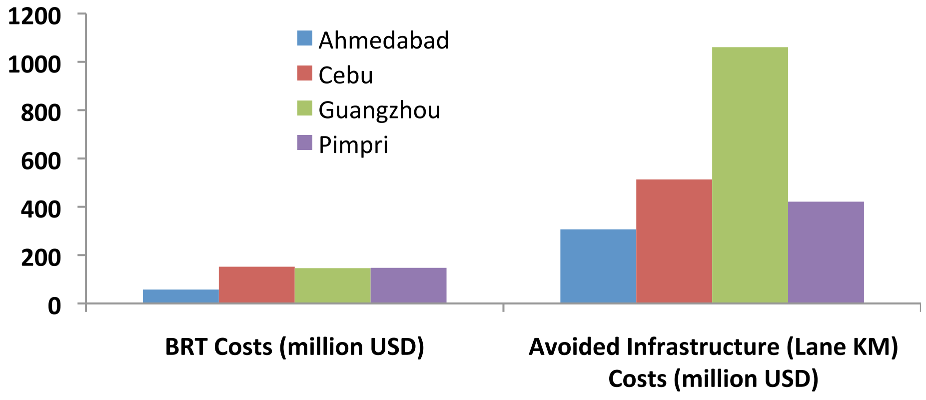
travel in project baseline for BRT/Metro would allow conservative computation of infrastructure increase in absence of BRT/Metro project.

VI. Avoided Road Infrastructure due to BRT Projects

In Singapore, each lane kilometer accommodates around 5600 VKT/day/Lane. This ratio is translated to above projects and the results show very high impact. For the entire BRT corridor length, each project helps prevent construction of 6 lane, 16 lane, 10 lane and 23 lanes for the twenty years of travel demand in Ahmedabad, Cebu, Pimpri and Guangzhou. On an average, avoided road space for a BRT is **2 square meters per rider.**

In terms of costs, all the BRT's turn out be cost effective as the alternate cost of road expansion in the without project scenario exceeds BRT construction cost with an assumption of 2 million USD/Lanekm for urban roads without even considering inflation. This cost can be considered as conservative as urban land is scarce and expensive and hence the roads which would be built would be either underground or elevated which may require 10 times more investment. Thus, considering only the costs (neglecting all the other benefits), BRT's are economically feasible when compared to building more roads. For example in Cebu study (Clean Air Asia, 2012) the costs of avoided infrastructure (500 M$) exceeded not only other benefits such as fuel savings (445 M$), Health Impact (100 M$), travel time savings (81 M$) and avoiding traffic fatalities (37 M$) but also the costs (150 M$)

Figure4: BRTS and Avoided Infrastructure Costs



Co-Benefits

In without project scenario due to road expansion, additional motor traffic is induced as public transport deteriorates and new roads with extra capacity attract more use of vehicles. This leads to a vicious cycle of motorization. Avoiding this vicious cycle of induced motorized travel by high penetration of BRT network would have exponential impacts on the quantification of co-benefits and these should not be missed out.

In terms of carbon emissions reductions in above projects, BRT projects save 1700 to 5200 tons/km/year. Recent report by ADB (Independent Evaluation Department, 2010) has estimated that in general, expressway projects increase CO2 emissions by one-fifth to one-half or more over their 20-year lifetime compared with business as usual because of effects on induced travel that overwhelm the short-term benefits of curbing low-efficiency congested traffic. Clearly, the carbon benefits of the BRT projects would multiply considering induced motorized travel increase in without BRT project scenario.

BRT also has significant impact on air quality. Based on the health assessment study in Cebu BRT it was found that Health benefits from the BRT due to pollution reduction could range from US$94 to US$137 million (Clean Air Asia,2012). In case the BRT is not constructed but roadways are expanded, then increased air pollution would magnify health related problems. Health Effects institute (Health Effects Institute,2010) has suggested a boundary of 300 to 500 meters from a highway or a major road is most highly affected by traffic emissions. Considering the high density of roads in urban areas and considering that outdoor air pollution is now considered carcinogenic, health impacts due to BRT construction would also multiply as it breaks vicious cycle of induced motorized traffic.

Wide roads promoting vehicle travel would make non motorized commute difficult in without project scenario and thereby leading to severe loss of mobility and accessibility. Further, loss of livability is directly connected with urban sprawl and this will lead to further motorization.

However, this hypothesis of reduced vehicle travel can be questioned from the perspective of induced motorized traffic generated by BRT systems in the "with project scenario". Considering that many people "shift" to BRT systems, the existing road space per motor vehicle may increase due to shift of few passengers and this may induce additional motorized traffic. Further, there can be a case that people may have more access to vehicles as their family members shift to BRT especially in households with single vehicle ownership. However, the impact of such "induced travel" in 'with BRT' scenario is negligible as shift is from private modes considered vary from 14% to 30%. Further, in many cases, the road space for private modes gets restricted due to construction of BRT systems and travel times often increase due to priority provided to public transport. Thus additional motor traffic induced by BRT is minimum.

Conclusion

"Without project" scenario should be ideally considered as to what would "most likely" happen if this project is not executed. Including a measurement of avoided road infrastructure in decision making has a potential to radically alter our perception of worthwhile urban transport projects. With growing requirements of transport financing, inclusion of this parameter would give a greater push to cost effective solutions. Currently no transport project assessments factor this component in economic and environmental assessment.

Acknowledgements

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