

The Real Cost of Highway Development- Who has got the numbers right?

Professor Amal S. Kumarage



Amal S. Kumarage (PhD) is a Chartered Civil Engineer and Senior Professor in the Department of Transport & Logistics Management at the University of Moratuwa. He is also the former Chairman, National Transport Commission and the current International Vice President of the global body of the Chartered Institute of Logistics & Transport (CILT). He has been the Team Leader of Feasibility Studies for several expressway studies including the Southern Highway, Extension to the Southern Highway and the proposed Northern Expressway and has conducted over 30 major transport studies of national importance. He is also widely consulted on transport and highway planning work in South and Central Asia.

The article is written to provide a professional insight to the continuing debate on the cost and benefit of highway development in Sri Lanka. The allegation and the defense both seem to be misleading the public on the actual facts. Since this issue has become the focus of political and public discussion today, I have decided to share with the public to the best of the information that is available to me, the results of a rigorous analysis of road construction costs in recent years.

This analysis is based on three approaches. First it compares costs of local road projects internationally for similar constructions especially in other developing and in particular Asian countries. Secondly it compares the increase in costs for similar projects in Sri Lanka over time and thirdly it compares between different types of contracts awards- especially focusing on a new strategy of dispensing with competitive bidding.

This analysis has arrived at the following conclusions:

- The strategy of developing highways in a post war economy is judicious and timely. Sri Lanka had fallen behind in having modern a transport network and the choice of rapid road development as a catalyst to economic development has to be commended.
- Highways when properly planned should deliver benefits much greater than the cost of construction. This is how highways contribute towards economic growth.
- Incurring a higher cost for construction of a highway and/or poor planning that leads to inadequate benefits will however make a highway a burden to the economy.
- It is found that the cost of constructing a km of expressway has increased 2-3 fold over a period of 5-6 years. This is far higher than the rate of inflation for road construction.
- While the costs at the beginning of this period are comparable with international costs, the current costs in Sri Lanka are substantially higher.
- The cost of reconstructing existing national roads in 2005 appears also to match global norms while in most instances the current costs for foreign funded projects are also comparable to global rates. Thus not all roads projects can be considered as being over-priced.

- An exception to above is where road construction contracts are awarded without competitive bidding. In this case it has been mathematically proven that contract costs are higher by 55%.
- Award of contracts without competitive bidding has reached a peak in 2014 with projects reportedly worth Rs 333 billion awarded over the last 12 months alone. The loss arising from this alone is estimated at Rs 200.5 billion.
- It is also noteworthy that all these projects have been funded with Chinese sources and awarded to Chinese contractors. Moreover, this approach is spreading with contracts worth Rs 110 billion funded with borrowings from local banks were also awarded on the same basis this year to local contractors.
- The continuation of the portions of the Southern and Northern Expressway that have not been awarded yet, if awarded in the same manner will lead to a further loss of an estimated Rs 160.8 billion.

The discussion and basis of reaching the above conclusions is given below.

Why Road Building is important?

It is irrefutable that roads are important for development. Modern economies are built on reliable and fast connections between ports, airports, cities and different industries. Convenient personal transport is also becoming an important feature of social contentment. Easy access to work and school, as well as to hospitals, shops, to visit relatives and friends and for recreation are important quality of life features. Sri Lanka has followed many other countries by prioritizing road development as a foundation for economic prosperity.

However road development is a double edged sword. While the correct road connecting the right places will bring multiple economic and social dividends, a poorly planned and/or poorly designed, or poorly constructed road or one that cost hugely more is likely to become an economic burden. Thus instead of benefiting road users, such projects become a financial burden requiring loan repayment and upkeep over many years, for an infrastructure that has little or no direct benefit to people or the country.

Why Examining Road Construction Cost is Important?

There are many examples from around the world where roads, expressways, interchanges, bridges, tunnels etc constructed without due feasibility study, or planning are now wasting away without adequate traffic and sometimes even found to have been abandoned. In some cases they carry only traffic that has diverted from another road. In other cases, there is traffic that serves people in other parts of the country or in some cases other countries, but do not benefit the local people who had to bear the costs and are still awaiting benefits to their local economies that are not integrated to these roads. There are too many 'failed' road projects the world over for anyone to assume that any road even if it carries a full load of traffic is an economic success. Success or failure can be judged on the basis of the scale of cost of the investment to its return and also on the equity principle if people who bore the cost are the ones getting the benefits.

These types of mistakes often stem from a preoccupation with building 'instant' roads and a blatant disregard for accepted processes of highway construction backed by scientific planning, evaluation,

design and procurement management. However, such misguided approaches and mistakes do not take away the importance and the need for continuing investment in mobility as a catalyst for economic and social development. In any development effort some margin should be kept for making such mistakes.

History of Lanka's Expressways

The first concept for this was mooted just after the 1988-89 JVP uprising by then President Ranasinghe Premadasa who proposed an 'alternate trunk road network' to develop the country's hinterland areas. The pre-feasibility studies for several of these highways were done in the early 1990s. However it was left to the subsequent Government of President Kumaratunga to move this forward. ADB financing was approved for one section of the Southern Highway in November 1999 and the RDA started land acquisition in August 2000 with clearing work starting thereafter. Approval of funding from Japan's JBIC was also obtained in March 2001 for the balance section. However in August 2001 a group of 49 villagers filed a petition in the Appeal Court seeking reasonable compensation citing the very low rates prevailing at that time. This action delayed the project till a new compensation system was developed with ADB funding and the project was allowed to proceed to construction only in 2005 with one part as four lane and the balance as a two lane highway. The initial cost estimate for the 126 km from Kottawa to Matara was US Dollars (USD) 349 million, at a unit cost of USD 2.8 million per km. The Government of President Mahinda Rajapaksha, had the highway re-designed as a fully four lane expressway of 96 km up to Galle and had it completed in 2011 at a cost of USD 741 million or USD 7.7 million per km, the increase being partly due to the redesign and in some cases re-construction. The subsequent section up to Matara – a length of 35 km was completed in 2014 at a cost of 180 million USD or 5.1 million USD per km. Similarly, an expressway to the airport was planned in the late 1980s and the current road trace finalized in the late 1990s but could not be implemented due to the inability to obtain favourable financing terms. The construction of the Katunayake Expressway started with funding from China in 2009. The planning for the Outer Circular Road also dates back to the 1990s and funding from Japan was secured in 2007. Since then the current government has accelerated the expressway construction program having completed a total of 167 km with a further 101 km under construction a commendable progress to date.

The largest investment for road construction for a country having an economy similar to Sri Lanka?

The reported cost of Sri Lanka's expressway program to date is as follows:

Cost of Construction of Expressways in Sri Lanka (mn USD)					
		Period	km	USD mn	USD mn per km
Southern Expressway	Kottawa-K'gahahetekma (Japan/JBIC)	2001/11	67	463	7
	K'gahahetekma - Pinnaduwa (ADB)	2000/11	29	277	9
	Pinnaduwa- Godagama (China/Exim)	2011/2014	35	152	4
	Godagama-Beliatte (China/Exim)	2014/	30	795	26
Katunayake Expressway	Peliyagoda-Katunayake	2009/13	26	385	15
Outer Circular Highway	Kottawa-Kaduwela (JICA)	2009/14	11	212	19
	Kaduwela- Kadawatha (JICA)	2012/15	9	379	43
	Kadawatha- Kerawalapitiya (China)	2013/	9	666	72
Northern Expressway	Stage 1 Enderamulla-Ambepussa	2014/	53	1000	19
TOTAL Completed			168	1488.5	
TOTAL Under Construction			101	2840.0	

It is clear that per km cost of the expressway program has steeply increased from 7 million USD for the Southern Expressway financed by Japan/ADB to 72 million USD per km for a recently awarded project for a section of the Outer Circular Highway awarded to the Metallurgical Corporation of China. Many have compared this and erroneously concluded it to be a 10-fold increase in cost. With the section from Matara to Beliatte¹ and Stage 1 of the Northern Expressway² awarded most recently, the total investment would reach 4,328 million USD, possibly the largest investments in the world for road construction for a country having a similar economy. This underlines the government's commitment to continuing with road construction as a primary backbone of development- possibly even as the cost of neglecting other sectors.

Comparing Road Construction Cost – Sorting Oranges from the Apples!

The comparison of per km cost can be misleading and should be done carefully. No two roads or the conditions where and when those roads are built will be the same. In order to understand these variations the World Bank commissioned a study of over 430 road projects from 65 developing countries including Sri Lanka to determine the reason for price variations. A more recent study by the University of Oxford using cost from 3,000 road construction projects from 99 developing countries has also been concluded. As is known to all engineers, both studies found that construction costs vary with the terrain, soil and climatic conditions, design standards, construction type, structures, labour and material costs, land costs etc. While it is not possible to discuss the details of all these findings, the averages that were arrived in these two studies are reproduced below:

Average Global Road Construction Cost (mn USD per km) in Developing Countries				
	World Bank		University of Oxford	
	Medium	High	Medium	High
New Expressway 4 lane			2.8	7.8
New Highway 4 lane	2.8	4.0	2.2	4.6
New Highway 2 lane	1.3	1.9	0.8	2.0
New Road 1 lane	0.9	1.2	0.1	0.2

Even the 'high' averages of the above global expressway construction costs, are significantly lower than the cost of expressway construction in Sri Lanka. Expressway construction costs can sometime become 'high' as they are heavily influenced by the frequency and type of interchanges and other structures, especially tunneling. Even allowing for such variations, and allowing for inflation in material and fuel costs, the Katunayake Expressway at 15 million USD per km, the Outer Circular Highway at 19 to 72million USD per km³ and the proposed Northern Expressway at 19 million USD, appears to be 2-3 times higher when compared to the construction cost of a 4-lane expressway obtained in a range of developing countries which at current global prices should be between USD 7-10 million/km. The

¹ <http://www.news.lk/news/business/item/4599-kottawa-to-hambantota-expressway-to-link-major-economic-centres>

² <http://www.sundaytimes.lk/130630/news/northern-expressway-work-to-begin-next-year-50737.html>

³ The recent most estimate by RDA is Rs 86.6 billion for the Section between Kadawatha and Kerawelapitiya.

extension of the Southern Highway to Beliatta at Rs 26 million USD per km⁴ confirms this conclusion since it is more than 3-4 times compared to the first section from Kottawa to Kurundugaha-hetekma. More alarming is the difference between the recently concluded Galle-Matara section and the recently awarded extension to Beliatta which have a difference of 6-7 times.

Is this due to Cost Escalation?

The inflation cost for expressway construction costs measured for the USA for the last 10 years has been 10%⁵. In Australia the index adjusted to USD is around 20%⁶ while in most EU countries the construction index rose by just 2-3%⁷. In India, though the index rose 40% between 2007 and 2014,⁸ when adjusted for exchange rate variations the cost of construction in USD per km was found to be nearly constant. The road construction cost index published by ICTAD in Sri Lanka rose from 240 points in the year 2004 to double that in 2013. But when adjusted for the USD variation from 100 to 130 rupees to the USD, the cost increase in USD reduces to just above 50%. Hence the most reasonable estimate for non-urban expressway construction in Sri Lanka should average around 6-8 million USD per km, and at most another 50% for more difficult soil conditions and frequent structures and interchanges. Thus claims that Sri Lanka's expressways cost 5 to 10 times more than earlier is very difficult to substantiate. However, they are significantly higher than what they should be. Such an escalation in construction cost cannot be explained by price inflation or design alone.

Explaining High Construction Costs

There are three possible arguments to try to explain this gap. The first is that Sri Lanka is now moving to a middle income country and thus construction costs are rapidly increasing compared to other developing countries. Below are some specific figures from several developed countries.

Construction Cost of 4 Lane Expressways (mn USD per km) in Developed Countries			
Country	Urban	Rural	Mixed
Norway - 4 lanes			8.1
Poland - 4 lanes	34	9	
Oman - 8 lanes			10
USA/Canada - 4-8 lane	24	5	

This does show that costs are higher in high income countries due to increased costs of land acquisition, labor and construction. There is also evidence that expressway construction in urban areas costs around 4 to 5 times more than in rural areas, while mountainous terrains, tunneling and bridges also shoot up the costs for individual projects. However the expressway construction contracts awarded over the last 12 months in Sri Lanka ranging from 19 to 72 million USD per km appears to be in a class of its own and raises questions about the economic viability of new expressway projects in Sri Lanka.

⁴ <http://www.news.lk/news/business/item/4599-kottawa-to-hambantota-expressway-to-link-major-economic-centres>

⁵ <https://www.fhwa.dot.gov/policyinformation/nhcci/pt1.cfm>

⁶ https://www.bitre.gov.au/publications/2013/files/is_049.pdf

⁷ <http://www.ssb.no/en/priser-og-prisindekser/statistikker/bkian/kvartal/2014-10-17>

⁸ <http://www.cidc.in/new/support/ci/ci-2014/CCI%20-%20Oct%202014.pdf>

In order to try to better understand this phenomenon we can compare with some Asian countries as shown below:

Construction Cost of Expressway Projects in Asia (mn USD per km)					
Country	Expressway	Year Completed or Planned	kms	Cost mn USD	km cost mn USD
India	Mumbai-Pune (6 lane)	2002	93	190	2.0
	Ahmedabad Vadodara	2004	91	110	1.2
	Jaipur-Kishangarh (6 lanes)	2005	90	118	1.3
	Ambala Chandigarh	2009	35	55	1.6
	Mumbai to Nashik (6 lanes)	2011	150	728	4.9
	Mumbai to Vadodra	planned	380	1100	2.9
	Average/Total (India)			839	2301
Pakistan	M3 Pindi Faisalabad (6 lanes)	2004	52	56	1.1
	M1 Islamabad Peshwar y (6 lanes)	2007	154	117	0.8
	Hazra (6 lanes)	2017	60	326	5.4
Malaysia	North South Highway (4- 6 lanes)	1996	772	1716	2.2
Vietnam	North South Highway	Planned	1941	18,500	9.5
China	Shenyang-Dalian Expressway	1990	348	512	1.5
	Gunagshen Expressway (6 lanes)	1997	123	1340	10.9
	Mianyang and Guangyuan	2004	130	790	6.1
	Guanzhou-Gaoming (6 lanes)	2007	130	450	3.5
	Zunyi-Maotai expressway	2010	45	324	7.2
	Mengzi-Xinjie expressway	2010	85	815	9.6
	Average/Total (China)			861	4231

This shows that our neighboring country, India has one of the lowest expressway construction costs in the world. However, our own costs are double that of Vietnam, quadruple that of Pakistan and are generally 5-10 times more expensive than India. In India land acquisition costs and construction material as well as labour are less expensive and this can be partly the reason. There should then be other reasons.

Short sections of urban expressways where tunneling and other complex structure are required can cost several hundred USD per km. Also Japanese expressways cost over 200 million USD per km on account of very special conditions in that country – mountainous terrain, high seismic activity and exorbitant land acquisition costs. The section of the Outer Circular Highway between Kadawatha and Kerawelapitiya at USD 72 million per km comes close to being the world’s costliest suburban expressway outside of Japan, know to the author.

Why Higher Costs?

There are a number of possible reasons for higher expressway construction costs in any country. These would be:

- Poor planning
- Poor design
- Poor estimation and cost control
- Poor or non-existent competitive procurement process
- Lender-nominated contractors or negotiated contracts and
- Corruption.

Where are the Feasibility Studies?

Poor planning results in expensive changes to schedules, traces, relocations of interchanges and other critical control points. But good planning takes time. The hurry demonstrated by the Government and the RDA for initiating and awarding the recent most contracts appears to have been a costly mistake. These feasibility studies and public discussions have remained known to only a few and even senior officers of the RDA are still unable to even provide basic details of these recent projects. The exclusion of transport and highway experts in the planning process of the RDA for its multi billion rupee investment must surely be for a reason. In previous expressways the feasibility studies were done by both foreign consultants and local institutions such as the University of Moratuwa. Such checks and balances are essential and a possible reason why earlier expressway costs were cheaper and prices were globally comparable.

Another potential danger of poor planning is that even benefits can be overlooked. Today expressway design requires integration with complex supply chains and logistics nodes, regional development, urban development and a host of other key components that will make an expressway derive the benefits from those industries. Poor scheduling of projects by starting many road construction projects simultaneously can increase resource costs created by short term shortages.

Cost of Corruption

The most alarming reason for high cost is the possibility of corruption. Both the World Bank and University of Oxford Study referred to earlier found that corruption levels in a country as measured by the Transparency International Index⁹ and the World Governance Indicators increased road construction costs. It concluded that countries with corruption levels above the median have about 12% higher costs and that corruption and collusive practices might be yet higher for projects undertaken directly by governments without the need to comply with international procurement procedures. Perhaps this is why most road projects in developing countries are assumed to have the age-old cliché of '10% - commission'.

Is it only Expressway Construction that is expensive?

Apart from expenditure on the expressway program, Sri Lankan road network has seen rapid expansion and improvement at national, provincial and even rural levels. This accelerated development program has improved motorability of many trunk roads. Even though travel speeds have not improved due to increasing vehicle imports, deteriorating public transport and road safety still remains a critical issue. This development holds great potential for integrating the production and consumption areas as well as the transport nodes such as the ports and airports. These are vital for sustainable economic development.

However, the expenditure on road rehabilitation too is being questioned in recent times. Given that the investment on road reconstruction was well below par for several decades, the expenditure is justified if these roads will result in the envisaged benefits. If we have indeed spent more than is warranted on a

⁹ Transparency International (2011). Bribe payer's index 2011.

road, it becomes that much more difficult to make it economically viable. A multiplicity of such roads can bankrupt an economy.

Even though existing roads have also been improved in recent years giving an impression of the beginning of a long awaited development of the country, the investments on these roads has to earn its economic value over the life of the asset. International funding agencies and banks are happy to lend and it should be the borrower's responsibility to ensure that borrowings are economically productive. If such benefits are not forthcoming in the immediate years, there is a possibility that such infrastructure was built prematurely and would deteriorate before adequate benefits are reaped. Scarce public funds and loans are tied up in such unproductive projects depriving other sectors of investment and could risk future economic progress with heavy loan repayments .

Analysis of the Cost of Reconstructing Existing Roads

This study has also completed the detailed analysis of 22 national road development programs that were inaugurated from 2011 to date, worth a total of Rs 406 billion, financed with external and internal borrowings. These include road and bridge programs funded by a host of agencies including the ADB, World Bank, JICA, Saudi Arabia, Kuwait, France, Korea and China. It also includes borrowing from foreign and local commercial banks. The majority of funding has been for road rehabilitation and improvement. This also includes a variety of roads ranging from 2- lane national roads in mostly rural flat terrain costing USD 0.5 million per km to multi lane roads in urban areas that cost over USD 2 million per km. The analysis shows that in general, the cost varies with width, terrain and traffic conditions. It is also affected by acquisition and inclusion of structures such as bridges.

A comparison of 2 lane projects in similar flat terrain carrying low to moderate traffic is shown below. This shows that the four projects funded by China Development Bank (CDB) to be ranging from 20% to at least 80% higher than comparative projects funded by the ADB. Moreover there is a further sharp increase in costs, especially for the CDB projects, commencing in 2013/2014, as compared to those that commenced in 2011.

Cost for Reconstruction of 2 lane National Highways (non urban) in Sri Lanka (mn USD per km)								
Funding Institution	Program	No of Road Projects	Period	kms	Cost LKR (mn)	Cost per km (LKR mn)	Cost per km (USD mn)	Province
ADB	CAREP (Comp A Part 3	2	2011/14	66	4,392	66.5	0.5	NCP/NP
ADB	NRCP	11	2011/14	174	12,187	69.9	0.5	NCP/NP
ADB	NRCP (Additional)	9	2013/15	118	9,495	80.8	0.6	NCP/NP
China Dev Bank	PRP1	6	2011/14	179	14,615	81.6	0.6	SP/WP/EP
China Dev Bank	PRP2	8	2011/14	191	18,156	95.0	0.7	SP/WP/EP
China Dev Bank	PRP2 (Nothern)	11	2011/14	408	37,517	91.9	0.7	WP/Uva/EP/Central
China Dev Bank	PRP 3 Phase 2	9	2014/	93	13,078	140.7	1.1	SP

Haste makes Waste! The impact of Negotiated Contracts

Non adherence to established engineering costing and procurement processes can also contribute to higher costs. An even more detailed and rigorous analysis was performed on a total of another 93 individual road projects awarded between 2005 and 2010 again using borrowings. This showed that the best estimate of the cost of rehabilitating a two lane national road in 2005 was Rs 47.5 million per km. This compares well the international average of 0.2 to 0.7 million USD per km for varying degrees of

road widening required. This has increased to Rs 72 million in 2010 which perfectly matches the recorded changes in the ICTAD road construction index over the same period. Project costs were tested statistically¹⁰ against different funding agencies and the only variation that was established was for the 8 projects financed by China and awarded without competitive bidding to 5 selected Chinese contractors for an amount of Rs 63 billion rupees. In this case the cost per km was found to be an outlier at 55% above the rate of all other projects funded by all other agencies. These were also the only projects that did not have competitive bidding.

It is observed that increasingly road construction projects are awarded on non-competitive bids. From information available, all expressway contracts awarded over the last couple of years as well as an increasing number of road reconstruction projects were awarded without competitive bids (tenders). Based on mathematical inference, there is clear forensic evidence that such projects were 55% costlier than those that were bid competitively in 2011. However, the same statistical testing shows that this difference increased to an average of 80% in 2014. For example the Kadawatha-Kerawalapitya section is estimated to be over priced by at least 68%, while the Northern Highway which was launched last month appears to be over priced by 126%. The extension of the Southern Highway from Matara to Beliatta however appears to be in a class of its own being over priced by an astounding 545%. The common denominator of all these projects is that they were funded with Chinese borrowings and contracts have all been awarded in 2014 without calling for competitive bids. The loss arising from these 4 projects alone is estimated at Rs 200 billion.

Estimated Loss from award of Road Contracts without Competitive Bidding					
		kms	Rs mn	Estimated Over pricing %	Estimated Loss Rs bn
Rehabilitation & Improvement	PRP 3 Phase 2	92.9	13,078	55	4,641
Outer Circular Expressway	Kadawatha- Kerawalapitiya (China)	9.3	86,600	68	35,052
Northern Expressway	Enderamulla-Ambepussa (China)	52.8	130,000	126	72,478
Southern Expressway	Matara-Beliatta (China)	30.0	103,300	545	88,329
Total 4 projects		185.0	332,978		200,500

Conclusion

While we all like to travel on new roads, we need to remember that there is a cost for such use. The story of what happened to thousands of kilometers of rural roads constructed in Sri Lanka in the years after independence in a bid to secure rural road connectivity needs to be retold. Even though many of these were paved on election promises, these roads still have little traffic, as no economic growth has followed. Consequently, in most cases, these roads have fallen into poor state of repair due to financial inability of local governments to maintain them. Thus investment in roads does not always lead to prosperity. It can even end up to a spiraling down of economic potential if economic benefits that are required to pay off the loans are not forthcoming. A country can face a number of difficulties if these assets cannot be paid for fully. This is why it is the usual procedure for feasibility studies to be carried out prior to investing in roads or any other investment. Many countries table such feasibility studies for public study and comment. The best local experts and often foreign experts are used as advisors. The

¹⁰ Using Regression Analysis

cost of the investment should be proportionate to the scale of economic returns and traffic volumes. Building oversized infrastructure ties up scarce national resources in underutilized assets and eventually imposes an increasing financial burden in operating and maintenance costs. Such waste a nascent middle income country can ill afford. Wide empty roads that motorists like to speed on could actually be a symptom of poor judgment and reckless expenditure and not necessarily a sign of visionary development. It is thus easy for a well intended road building program to become an end in itself or worse still a means of massing personal wealth for a corrupt few.

Recommendations

The following recommendations are made with respect to investments in the road sector:

1. Stop forthwith the practice of awarding contracts on negotiated terms. Return to competitive bidding which is the regular process adopted in all societies and governments valuing transparency in business dealings. There is sufficient evidence to show that negotiated road contracts in the last 12 months alone have cost the country over 200 billion rupees.
2. Conduct proper feasibility studies using both local and foreign experts/institutions. There is evidence that the lack of checks and balances and the restriction of access to information of road projects is most likely being used for corrupt practices.
3. To seek private funding at least in part for road projects that have revenue potential as is the case in most countries. This will release more public funds for education, health and other urgent social investments. Such private public partnerships will curb wide spread overspending as has been observed in some road projects.
4. To develop an integrated Masterplan that would enable benefits from these roads to reach the masses and not just the car owning and tour-loving public.

The summarised article appeared as follows:

<http://www.sundaytimes.lk/141221/news/road-building-or-rip-off-128259.html>