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Deleterious effects of corruption in the roads sector

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A rational approach has been taken in Bangladesh to the maintenance of its highway network. As part of this approach it was necessary to introduce a road management system, which required the use of the economic model known as the 'highway development and maintenance tool', HDM-4, to establish logical strategies for road upgrading and steady-state maintenance. This established appropriate standards for the different road types in the network in terms of traffic, construction and road condition. During this study it was observed that the effective unit rates for road works varied as a function of the funding source. Where a source, such as the World Bank, demanded close audit of works the rates were lower than where this was not the case. This paper deals with the quantification of this corruption and examines its effect in the highways sector, noting how this has consequent effects on the wealth of the nation as a whole.

1. INTRODUCTION

The road network of any country is a major capital asset. In England, for example, the trunk route network alone with a route length of some 9500 km, is worth around £60 billion, and is considered by the National Audit Office as the largest single government asset.[1] In order to ensure that the network fulfils its function of providing safe and economic transportation for the goods and people of the country it would be usual for between 5 and 10% of those roads to be maintained each year at an average cost of something over US$87 500 (£50 000) per kilometre. Clearly road maintenance is big business. For road users it is important that these sums of money are spent wisely and efficiently as they will thereby ensure an appropriate level of serviceability, it being well known that the transportation costs to users rise dramatically as serviceability declines. Hence anything which reduces road performance will have an impact on the competitiveness of a country in the world market and will thereby reduce the wealth of that country.

There has been considerable concern over a number of years, particularly in developing countries, that where there are these large sums of money being spent on an annual basis, there is firstly a major risk of corruption and secondly that such corruption might impact adversely on the road serviceability and ultimately the well-being of its people.

2. THE PROBLEM

Data provided by the World Bank[2] some years ago showed that there was indeed a link between money spent on road maintenance and the gross domestic product (GDP) of the country.

Figure 1 clearly shows that as the money spent on road maintenance increases so also does the likelihood of achieving a reasonable GDP for a country as its goods become more competitive through enhanced road serviceability. It has been argued that it is the converse which is the case, but with the availability of remedial funding from the international agencies the investment of appropriate sums in road maintenance practices has to be seen as a good investment. The next issue is to examine whether high levels of corruption are associated with those countries where low road expenditure occurs together with a low GDP. If data on GDP and perceived corruption levels from a wide range of developed and developing countries are taken from International Monetary Fund and Transparency International statistics,[3,4] and plotted as in Fig. 2, a clear relationship is again seen in which the likelihood of low GDP is associated with high levels of perceived corruption; that is, low corruption perception index (CPI) values.

The implication of this is that where corruption runs at a high level it is likely that monies allocated to road maintenance are diminished through 'wastage' on corruption. Such corruption manifests itself in a multiplicity of activities such as simple embezzlement, bribery and the use of inferior materials or processes, all of which will result in reduced performance of the network.

To an extent, much of the work to date in this area has been anecdotal. Although it is pleasing to see that the millennium goals now recognise the effects of the lack of good governance, which includes issues such as corruption, it is necessary both to quantify the extent of corruption and also to show clearly that the damaging effects it causes are greater than any perceived 'oiling of the wheels' of development.

To that end a study was undertaken by the second author together with the University of Birmingham and in cooperation with the Road and Highways Department of Bangladesh (RHD), which in part sought to examine both of these issues, and this paper sets out the findings therefrom.[5] Bangladesh is an interesting case as it has a low value of CPI at 1·2 and it also has a low GDP per head of population at US$403, in comparison with, for example, its neighbour India with a CPI of 2·9 and a GDP per head of US$714 or another Asian country

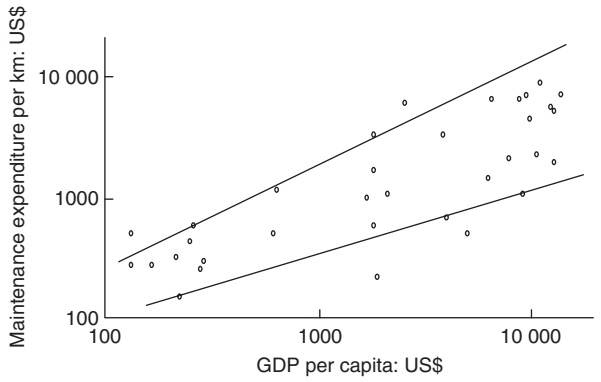

Fig. 1. The relationship between road maintenance expenditure and GDP

Malaysia with a CPI of 5·1 and GDP per head of US$5040, or with another Road Engineering Association of Asia and Australasia country, New Zealand, with a CPI of 9·6 and a GDP per head of US$26 440.[3,4]

3. THE ROADS AND HIGHWAYS DEPARTMENT OF BANGLADESH

The Roads and Highways Department (RHD) of Bangladesh is responsible for the construction and maintenance of all major roads in the country, totalling 20 800 km with a roads-associated budget of US$375 million, of which US$65 million is allocated for the maintenance of the network. This results in an average annual expenditure per kilometre of around US$3200, which is felt to be about one-third of what is actually required to maintain a steady state.[6] It has been working for some time to improve its organisational structure, processes and governance. As part of this it has introduced HDM-4[7] together with a pavement management system (PMS) known as the RHD-PMS.[8] In addition it has instituted staff development to improve internal skills, which has involved in-depth studies of various components of the RHD activities such as that by Khan on the optimisation of maintenance standards[5] to be used on the network. During this work it became clear that there was a considerable difference in the efficacy of works carried out under different management schemes. This prompted a review of the type and costs of work done under the different regimes together with an assessment of the long-term impacts on total transport costs resulting from any differences observed. Specifically the extent of corruption was investigated by a questionnaire to determine the difference in unit rates for similar tasks carried out under funding derived from the World

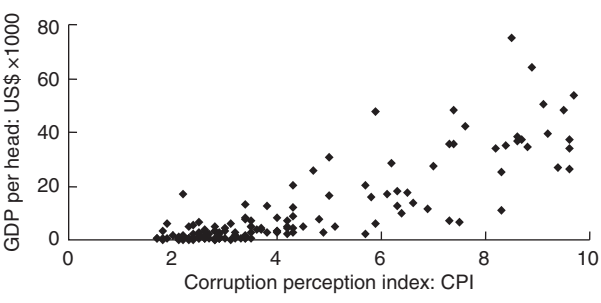

Fig. 2. The effect of corruption on national wealth

Source of funds	Treatment considered	Percentage range	Average loss: %
World Bank	Reconstruction	5–5	5·00
Asian Development Bank	Reconstruction	5–13	10·00
	Widening	5–18	12·50
Government of Bangladesh	Reconstruction	10–25	21·67
	Overlay	20–25	21·67
	Seal coat	20–40	38·33

Table 1. Percentage increases in unit rates due to corruption under different regimes

Bank, the Asian Development Bank (ADB), and directly from the government of Bangladesh (GoB).[5]

4. THE QUESTIONNAIRE

Clearly this was a sensitive issue and the response rate was consequently low at 30%. However statistical methods were used to measure the reliability at a 10% level of confidence which resulted in the data presented in Table 1.[5]

As noted, there was an understandable reluctance to respond and it is felt that these figures are lower than were expected in view of the known perception of corruption levels both from outside Bangladesh, as noted above, and from within Bangladesh, as reported by Transparency International, Bangladesh, as 32% overall in the roads sector.[9]

Although it was felt that the actual 'picture' may, however, be worse than that indicated in this study, it does show clearly that where external audit is a standard activity, as in the case of the World Bank, then the level of 'loss' is minimised and it is evident, particularly with 'reconstruction', that the GoB-procured works suffer more severely than those of the World Bank and ADB. Alarmingly the widely practised seal coating, upon which the majority of bituminised roads rely for their continued existence, has the highest level of 'loss' of productivity through corruption at 38%.

Further information on the questionnaire may be found elsewhere.[5] The important issue, however, is whether these levels of corruption reduce the effectiveness of the road network, noting that overall the World Bank believes that if corruption across the board in Bangladesh were eradicated then there would be a 2–3% improvement in the GDP.[10]

5. ANALYSIS OF THE EFFECT OF CORRUPTION THROUGH INCREASED UNIT RATES ON THE ROAD NETWORK

In Bangladesh it is reported that the maintenance budget is inadequate, in part through corruption.[9] The strategy for dealing with this is to set reduced standards either for maintenance intervention or the level, or class, of remedial works to achieve 'some' cover of all the roads. Although this is a debatable practice, as it is likely to lead ultimately to excessive lengths of road requiring reconstruction, over short periods it is felt by RHD that this is the only option open to it. In some ways this policy makes it easier to quantify the economic effect of the corruption over a period of years by calculating the increase in both agency and user costs following the need for lower

Analysis	Assumptions	Roughness standard (IRI)	Treatments considered: routine maintenance (RM) plus:	Finding: Figure
1	'Ideal' standard *with* reduced treatment class	All cases: 4	'Ideal': 80 mm overlay World Bank: 50 mm overlay ADB: 40 mm overlay GoB: DBST	IRI: Fig. 3 NPV: Fig. 4
2	Reduced standard *with* 'Ideal' treatment	'Ideal': 4 World Bank: 4·5 ADB: 5 GoB: 6	RM and overlay 80 mm for all cases	IRI: Fig. 5 NPV: Fig. 6

ADB, Asian Development Bank; GoB, Government of Bangladesh; NPV, net present value.

Table 2. Summary of conditions applied for the two analyses

standards forced by the 'wastage' of corruption. Accordingly HDM-4 was used over an analysis period of 20 years initially to determine the 'ideal' or optimal intervention roughness level in terms of the international roughness index (IRI) and remedial treatment with respect to the optimisation of the total costs of road operation. Thereafter two analyses were performed to cater for the loss of maintenance funds.

(a) Analysis 1, in which the intervention level was maintained but the class of remedial works was reduced to cater for the diminished available funds.
(b) Analysis 2, in which the class of remedial works was maintained but the intervention levels were made less severe to increase the time period between treatments thereby allowing the reduced budget to be met.

This was done for a number of traffic levels, pavement widths and road types. As an example, the findings for the most widely used bituminised road type are presented herein: surface-treated, medium-traffic, two-way, two-lane, single-carriageway road (SMTTT). The values obtained in the questionnaire and given in Table 1 were used in this study for the different treatments and funding sources.

HDM-4 showed that an IRI of 4 with an overlay of 80 mm at intervals of 6 years, in addition to routine maintenance (RM), was the 'ideal', or optimal, strategy for SMTTT where no effects of corruption were assumed. In analysis 1 the class of remedial works was reduced to cater for the indicated loss of value in Table 1. Hence where a 21% loss was expected for an overlay, as in the case of GoB projects, a double bituminous surface treatment (DBST) was used, whereas for the World Bank and ADB the overlay thicknesses were reduced as shown in Table 2.

In analysis 2, whereas the 'ideal' overlay of 80 mm was maintained, the period between treatments was increased by allowing the IRI to decline to a lower serviceability before being

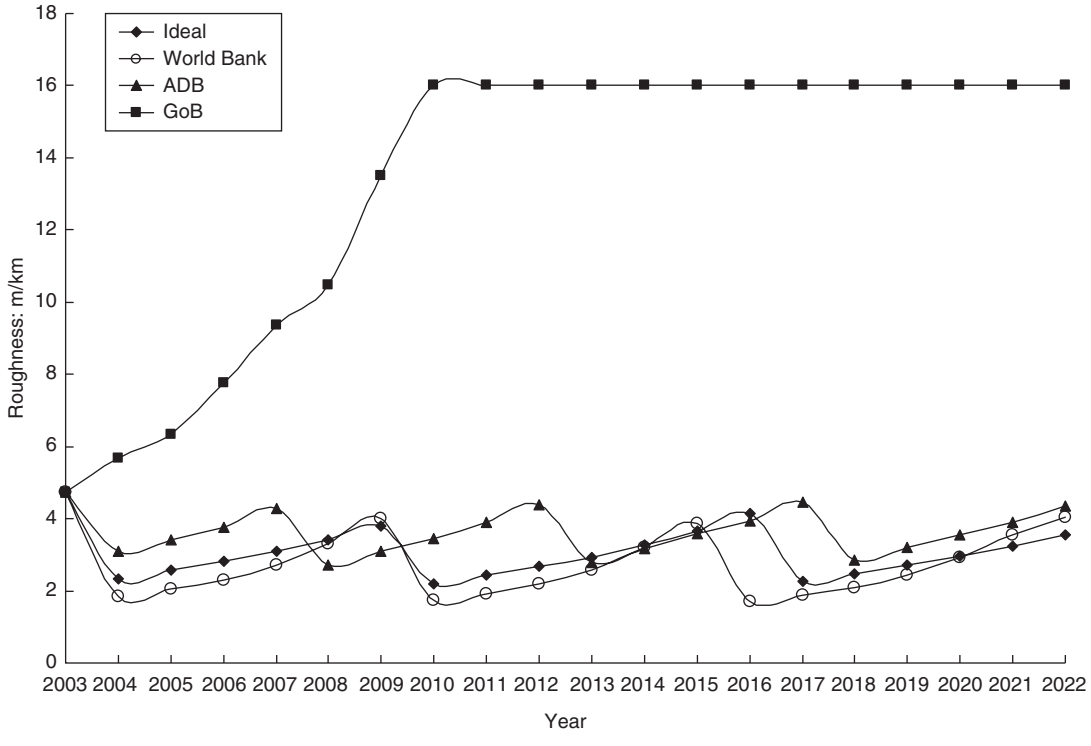

Fig. 3. Roughness progressions for different corruption levels under analysis 1

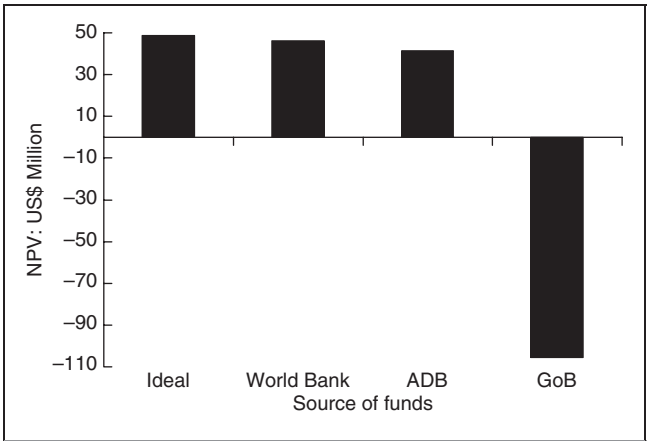

Fig. 4. NPV for different corruption levels under analysis 1

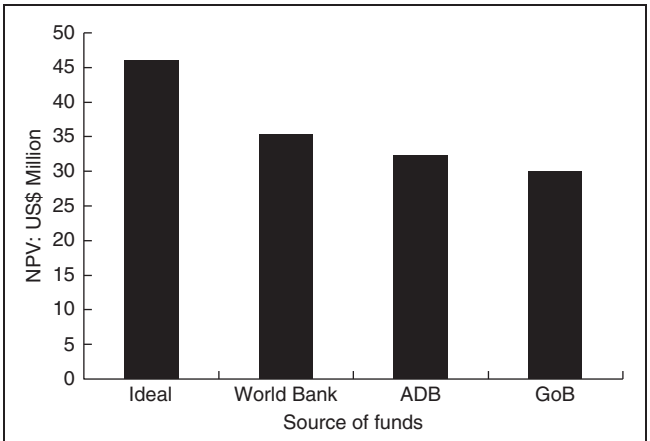

Fig. 6. NPV for different corruption levels under analysis 2.

triggered; that is to 4·5, 5 and 6 for projects under the auspices of the World Bank, ADB and GoB, respectively, again as indicated in Table 2.

In the case of analysis 1 it may be seen in Fig. 3 that the rates of roughness progression are understandably increased with the reduced thickness of overlay resulting in more frequent applications of maintenance, which increased both direct and indirect costs over the analysis period. For the GoB situation, for which DBST was used, it is clear that the roughness progression is unaffected by the treatment and hence the overall costs of route operation will rapidly become prohibitive. This is clearly seen with the decline in net present value (NPV) as the level of corruption increases as shown in Fig. 4.

For analysis 2, shown in Fig. 5, the relaxation of roughness intervention levels clearly increases the intervals between treatments and results in considerably higher roughness levels over longer periods of time. As in the case of analysis 1 this will result in dramatically increased total transport costs, as similarly demonstrated in Fig. 6 by the reduction in NPV with increasing corruption levels.

It may be seen that the NPV of route operation necessarily declines with the increasing levels of corruption, clearly refuting the possible suggestion that corruption 'oils the wheels' of development; rather it sucks money away from productive activities.

6. CONCLUSION

This paper has sought to demonstrate with hard data from the road sector of Bangladesh that corruption in a specific sector can and does have a clearly definable effect on the economy of a country. It shows that where it is endemic it is necessary to

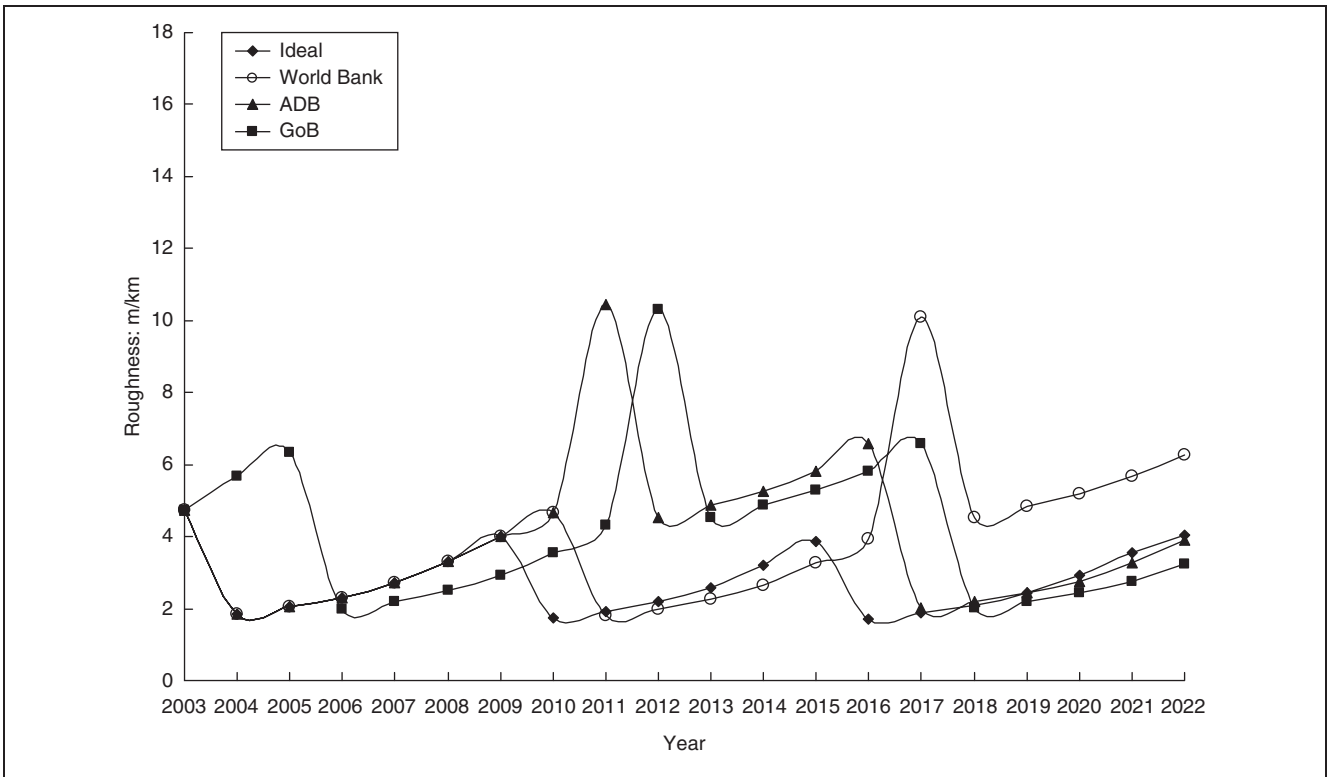

Fig. 5. Roughness progressions for different corruption levels under analysis 2

eliminate it and that such action would improve the state of the road network, thereby reducing user costs, which in turn would reduce the unit costs of the production of goods for both internal and external consumption. It is felt that this study confirms that, in the roads sector, the contention of the World Bank that the elimination of corruption would improve the wealth of the country is correct and that the general thesis of this paper that corruption leads to low levels of GDP and hence poverty is proven.

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