THE IMPACT OF POOR ROAD MAINTENANCE

Source: General Review: Heggie, Ian G. and P. Vickers. 1998. Commercial Management and Financing of Roads. Technical Paper 409, World Bank, Washington, DC.

Source: Example of Honduras: Zietlow, G., International Road Federation (IRF), Organization of American States (OAS) and Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH. Paper prepared for the Birmingham University Senior Road Executive program, 2004.

GENERAL REVIEW

The economic costs of poor road maintenance are borne primarily by road users. When a road is allowed to deteriorate from good to poor condition, each dollar saved on road maintenance increases VOCs by between $2 and $3. Far from saving money, cutting back on road maintenance increases the cost of road transport and raises the net cost to the economy as a whole. Furthermore, when traffic levels rise, as they have been in most countries, the proportion of total road transport costs attributable to vehicle operation will also increase sharply, while those attributable to road expenditures will decline.

It is estimated that the extra costs of insufficient maintenance in Africa amounts to about $1.2 billion per year, or 0.85 percent of regional GDP. In Latin American and the Caribbean equivalent figures were estimated at $1.7 billion per year in 1992, amounting to 1.4 percent of individual countries' GDP. The Ministry of Surface Transport in India has estimated that $4 billion of the roughly $39 billion in annual VOCs could be saved through proper road maintenance—more than twice total annual expenditures on capital and maintenance works on national and state roads (Indian Ministry of Surface Transport 1996). About 75 percent of these additional VOCs in developing and transition economies must be paid with scarce foreign exchange. It is no surprise that road maintenance and rehabilitation projects produce economic rates of return in excess of 35 percent.[4]

Four maintenance strategies evaluated in 33 countries have proven to be highly cost-effective, with annualized benefit-cost ratios varying from 1.4 to 44.8 (see box below). In other words, on an annualized basis each dollar spent on patching and overlays saves at least $1.4 in operating costs and can save as much as $44 depending on traffic volume.

Though based on the roughness of road pavement, the analysis does not fully reflect pothole damage. Most vehicles, particularly loaded freight vehicles, are not designed to deal with the sharp, repeated shocks caused by potholes. Trucking companies are well aware of the extra costs that poor roads impose on road transport operations. According to a recent Russian study, trucks operating on unmaintained rural roads during harvest time suffer a staggering 30 percent reduction in vehicle life, with a resulting sharp increase in depreciation and hence VOCs.[5] An unpublished study conducted in 1992 by the Federation of Zambian Road Hauliers estimated that the additional costs associated with potholes amounted to more than $14,000 per truck per year in spare parts alone—an increase in VOCs of 17 percent. Furthermore, this figure did not include extra fuel, accidents, down-time for repair, and damage to freight inside the vehicle. It is no wonder road transport associations around the world keep pressing for better road maintenance and express a willingness to pay for it—provided that the money is spent on roads and that the work is done efficiently. This common-sense view, well-supported empirically, is at the heart of a functional maintenance policy.

The impact of road maintenance on vehicle operating costs

This example analyzes the impact of road maintenance on VOCs using data from 33 countries. It compares a limited number of potential road maintenance strategies against a base case consisting of routine maintenance only (that is, off-carriageway work). The four maintenance strategies evaluated are:
• Patching, plus 5 cm overlays when surface roughness reaches 6.0 international roughness index (IRI) meters per kilometer (m/km).

- Patching, plus 5 cm overlays when surface roughness reaches 5.0 IRI (m/km).
- Patching, plus 5 cm overlays when surface roughness reaches 4.0 IRI (m/km).
- Patching, plus 5 cm overlays when surface roughness reaches 3.0 IRI (m/km).

The evaluation looked at these strategies over a 50-year period during which traffic was assumed to grow at 3 percent per year. The benefits and costs of each option were calculated using a 12 percent discount rate.

The results are summarized below for roads in fair condition for average daily (two-way) traffic (ADT) volumes of 300, 1,000, 3,000, and 10,000 vehicles per day (vpd). Thirty percent of the traffic consists of trucks with medium loading (that is, the loading corresponds to the average loading for the 33 countries included in the analysis). To make the tables understandable to a wider audience, expenditures on maintenance and VOC savings have been expressed as equivalent annual discounted outlays divided by savings, rather than as total net present value. The benefit-cost ratio thus shows the equivalent annual (discounted) payoff from each strategy.

Road maintenance is shown to be highly cost-effective, with equivalent annual benefit-cost ratios that vary from 1.4 when traffic volumes are 300 vpd to 44.8 when traffic volumes are 10,000 vpd. That is, each equivalent annual dollar spent on maintenance saves at least $1.4 per year in VOCs (with 300 vpd) and as much as $44.8 per year (with 10,000 vehicles per day).

	ADT = 300 vpd				Fair condition, ADT = 1,000 vpd			
Strategy:	1	2	3	4	1	2	3	4
Increased maintenance (dollars per year)[a]	2.39	4.83	7.96	10.15	2.72	4.94	8.04	10.13
VOC savings (dollars per year)[b]	3.32	4.74	5.88	6.15	12.48	16.83	20.69	21.59
Benefit-cost ratioc	1.39	0.98	0.74	0.61	4.59	3.41	2.57	2.13
Net present value (millions of dollars)	8.69	–0.85	–19.31	–37.26	90.73	110.63	117.62	106.59
Incremental benefit-cost	n.a.	0.58	0.37	0.12	n.a.	2.04	1.24	0.43

	ADT = 3,000 vpd				ADT = 10,000 vpd			
Strategy:	1	2	3	4	1	2	3	4
Increased maintenance (dollars per year)[a]	4.07	5.82	8.42	10.51	3.88	5.68	8.32	10.08
VOC savings (dollars per year)[b]	56.02	67.26	78.05	80.86	173.83	213.54	250.51	258.79
Benefit-cost ratio[c]	13.76	11.55	9.27	7.69	44.84	37.60	30.13	25.69
Net present value (millions of dollars)	483.14	571.40	647.64	654.28	1,580.7	1,933.31	2,252.68	2,313.33
Incremental benefit-cost	n.a.	6.42	5.16	1.34	n.a.	22.06	14.00	4.71

n.a. Not applicable.
a. Equivalent annual VOC savings attributable to increased maintenance spending.
b. Equivalent annual expenditures in addition to routine maintenance.
c. VOC savings divided by spending on increased maintenance.

CASE STUDY IN HONDURAS

It might be difficult to convince road users to pay an additional road maintenance tariff, because they will argue that the government already receives enough funds from taxes on motor fuels, motor vehicles, licensing fees, etc. to cover the cost of road construction, rehabilitation and maintenance. Probably equally difficult might be to persuade governments to renounce part of “their” taxes and thus leave room for levying road maintenance tariffs so that the pump price of motor fuels will not be affected. The fact is that road users presently face the consequences of poor road maintenance in the form of higher vehicle operating costs. **Investing 1/3 of the additional vehicle operating costs now spent on bad roads in road maintenance, would save the road user the other 2/3** (see figure 2). Most road users are not aware of these facts. Knowing what they could save by paying a road maintenance tariff, most road users would be willing to pay, even if this would mean paying in addition to what they pay already in the form of fuel taxes and other road vehicle related taxes, but **only** if they can be sure that the funds raised through tariffs will be used for road maintenance only. On the other hand, governments very often are willing to decrease fuel taxes by the amount actually used for road maintenance when the responsibility for the funding of road maintenance shifts to the Road Maintenance Fund.

Figure 2: Road Users Save by Paying Road User Charges **(Example Honduras)**

	Passenger car	Heavy truck
Vehicle operating costs in US$ driving on 100km of bad roads	14	63,5
Vehicle operating costs in US$ driving on 100km of good roads	10,5	51,7
Savings in vehicle operating cost in US$ on 100km of roads	3,5	11,8
Equivalent road user charges in US$ for driving 100km	-1,0	-3,6
Resulting savings in US$ on 100km of roads	2,5	8,2

Vehicle operating cost on asphalt concrete roads in hilly terrain (July of 1995)