Benefit-Cost Analysis of Road Maintenance

Or A Dollar in Time Saves Nine

Andrew Carter and Sarah Olmstead
Department of Policy and Evaluation
Millennium Challenge Corporation
Background on MCC

- Competitive country selection process
- Country-led aid
- Large compacts ($60 – $700 million)
- Infrastructure intensive investments
- Policy and sustainability focus
- Five-year clock
- Evidence-based
- Results focused
MCC has conducted road projects in 18 compacts

• MCC has primarily done paved roads
  – Of 3652 kilometers improved, 2072 have been paved
  – Over 80% of MCC transportation funds have been spent on paved roads

• Previous attempts at road maintenance at MCC have been dominated by:
  – Conditions precedent (requiring the government to improve maintenance funding)
  – Light technical assistance, including network analysis training, to government staff.
  – Maintenance matching funds

• Based on experience to date, we’re turning more attention to maintenance
  – First maintenance-only investment in Liberia
Maintenance is important, and there’s some optimal allocation

- As roads deteriorate, speeds on the roads decrease and vehicle damage per kilometer increases.
- Regular road maintenance is the most efficient method of maintaining a smooth road.
- AASHTO pavement services estimates every $1 of preventative maintenance avoids $6-10 of rehabilitation.
Road works decisions sometimes based on public spectacle rather than cost effectiveness

• When turning to donors, many countries focus on big renovation and paving, rather than periodic maintenance.
  – Thinking is: In resource constrained environment, paved roads won’t need so much maintenance
  – These large investments don’t last, due to lack of maintenance and weight limits

• Maintenance is not sexy, can be difficult to have long-term vision
  – Quite common to go with a ‘worse first’ strategy, where the poorest roads receive the highest budget for repair.
  – Senegal Experience: There was an expectation that roads, once failed, would be renovated by donors. Therefore maintenance was less important.
    • This has been EU’s experience all over Africa, recently announced no longer funding major roads projects
Renovation over maintenance: you’re doing it wrong

• Status quo of paving large stretches of road and then just handing them over to government clearly not functional

• Some possible alternatives:
  – Performance-based contracts that include maintenance
  – Actually build maintenance capacity (maybe instead of large infra)

• While renovation can be important, if funds are limited the priority should be maintaining those roads already in good condition before renovating failed roads. (AASHTO, 2013)
MCC generally uses HDM-4 for modeling

- Roads cost-benefit analysis at MCC utilizes road network software, Highway Development Model (HDM-4).
- HDM-4 is an engineering model that calculates the damage vehicles do to a road along with how fast a road degrades.
- This program predicts road performance as a function of:
  - traffic volumes and congestion
  - road pavement type and strength
  - maintenance standards
  - environment and climate
- NOTE: HDM-4 is very data intensive and can be expensive to use for low-resource countries. RED can be adjusted to work as well.
The Case of Moldova’s disappearing Road Fund

- MCC reconstructed and widened 77 km of highway in central Moldova.
- Due to an MCC requirement that maintenance spending increase, MCC assumed proper maintenance would be done.
- Maintenance spending (nationally) has decreased post compact to pre compact levels.
- As a result, the CBA has been revised from a $32 million NPV (ex ante) to a -$6 million NPV (ex post).
The Road Fund that wasn’t

• The World Bank estimated $110 million would be needed for national roads

• Roads Fund peaked at $60 million in 2013, dropping to $38 million in 2015
  – Not all money was used as intended

• Past practices in Moldova have emphasized low routine maintenance, with an emphasis on renovation.
• Pre-war, Liberia kept all of its roads in all-weather condition (if unpaved) through an effective maintenance system

• In 2014 Liberia’s budget was ~$559M, with MOPW budget ~$27M
  – 35/30/25% breakdown primary/secondary/tertiary
  – Recurrent costs average ~ 5,560 $/km/yr for unpaved and 13,766 $/km/yr for paved for only a ~10 – 20 kph improvement

• MCC working with Liberia to stand up Road Fund and begin executing their master plan
  – In steady state, cost for whole network maintenance should be ~$18M
Policy is important

- Assuming perfect maintenance in our BCA overestimates benefits
  - The difference between perfect maintenance and what happens in reality is the risk of unsustainability
  - If sustainability is important, then might want to consider technical assistance or policy reform as an integral part of the project
- Need to change the dialog for policy-makers
  - Impact of maintenance over rehabilitation is far larger in resource constrained environments
  - More people can benefit per dollar spent on maintenance than rehabilitation