The potential of sand dam road crossings

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31% of global rural population isolated from markets and services

Source: Worldhighways.com
The scale of rural roads in Sub Saharan Africa

- 5.5M kms of rural roads.
  - 200,000 - 300,000 rural road crossings.
- Estimated annual investment in road sector: $7 bn (World Bank, 2010).

Source: Meta Meta
• Makueni County, Kenya has an area of 8,035 km$^2$ – about half that of Swaziland.

• Population: 884,52 (Swaziland’s is 1.25M.)

• 7,640 km unpaved roads.

• 483 culvert or drift crossings.

• Annual budget: 1.76M USD

Sources:
Kenya Rural Roads Authority
World Bank
Road crossings:

- 50% of infrastructure budget.
- 85% of reconstruction/repair budget.
Tamil Nadu, India
Tamil Nadu, India
Tamil Nadu, India
### Types of rural road maintenance expenditure in Asia

<table>
<thead>
<tr>
<th>Activity</th>
<th>Optimum %</th>
<th>Typical %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency repairs &amp; construction</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>Periodic maintenance</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>Routine maintenance</td>
<td>40</td>
<td>10</td>
</tr>
</tbody>
</table>
Rural roads expenditure in Makueni County, Kenya (2013-14).

<table>
<thead>
<tr>
<th>Activity</th>
<th>$</th>
<th>% of budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>225M</td>
<td>99.5</td>
</tr>
<tr>
<td>Repair &amp; maintenance (optimum)</td>
<td>13.5M</td>
<td>6</td>
</tr>
<tr>
<td>Repair &amp; maintenance (typical)</td>
<td>1.1</td>
<td>0.5</td>
</tr>
</tbody>
</table>

As a result:
25% of road crossings are in need of major repair or reconstruction.
Sand dams as road bridges
What is a sand dam?
Water abstraction
More robust road crossings & lower maintenance costs
Sand dam road crossing cross section
Raised river bed

300

Reinforced concrete road surface

200 or 150 on less busy roads

Apron or gabions

Direction of flow

2000

Original river bed

Base of footing at least 1500 mm below original river bed level

500

250

Bedrock

Y12 steel re-enforcement spaced every 200

SARF/IRF 2014 | 2-4 September, South Africa
Water for people & agriculture
A converted culvert bridge, Kenya.
Comparative investments in roads vs. water & agriculture.

- Roads investment (85.7%)
- Water (5.3%)
- Other (4%)
- Sewage (2.2%)
- Farming (1.6%)
- Roads maintenance (1.2%)

Source: Makueni District development plan budget 2002-2008
Cost/benefit of different road crossing designs

I. Asset investment.

II. Maintenance or repair costs.

III. Environmental and livelihood benefits.
Summary

- Roads are capable of conserving and regenerating land, rather than degrading it.

- Road infrastructure budgets could be used:
  1) More efficiently and effectively.
  2) To leverage investments into land management, water supply and agriculture.

- While an ELD approach could demonstrate it more clearly, the cost/benefits are clear.
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