Inclusive and Green Rural Roads:
Green Roads for Climate Resilience and Water Management
Tailor Made Training - Dhulikhel, Nepal
Rural Roads: Routes to Inclusive Development
Rural roads – a formidable development opportunity:
• 20% of land surface within 1 kilometer of a road – 50% of remaining patches < 1km²
• Current connectivity, i.e. population > 2 kilometer of all weather road: 1 Billion people globally unconnected; only 30% in SSA

How to capitalize on the opportunity?
How to make roads inclusive and green development vectors?
How to have roads systematically and effectively contribute to many SDGs?
Rural Roads: Routes for Inclusive Development

(1) Unblock access for goods and services
(2) Create direct employment/ skills development opportunities
(3) Enormously trigger local economy activities
(4) Change land and water environment – for the better
(1) Increased access to services and opportunities

- Access to services (health and education)
- Access to economic opportunities
- General freedom that comes with mobility
Rural mobility by trip purpose

- Trips in rural areas are often made for economic activities, social services, social activities and community association.

The dominant form of travel in the rural area is social services mainly education and health, followed by economic activities which includes travel for market, agricultural activities and travel for employment.

**Fig 3: Average monthly distance travelled by trip purpose**
Access to markets: apart from connectivity cost of transport is a main factor
Market access and distance to road

- In developing countries, transport cost constitutes more than half of the marketing costs.
- More than three fourth of respondents in surveys revealed an increase in marketing of agricultural products after road construction.
- More negotiation-minded – have more options.

<table>
<thead>
<tr>
<th>Product type</th>
<th>Changes in sales</th>
<th>Changes in sales attributed to road</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Increase</td>
<td>Decrease</td>
</tr>
<tr>
<td>Cereals</td>
<td>69</td>
<td>3</td>
</tr>
<tr>
<td>Vegetables</td>
<td>81</td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td>81</td>
<td></td>
</tr>
<tr>
<td>Other products</td>
<td>87</td>
<td>2</td>
</tr>
</tbody>
</table>
Yet on feeder roads it is also the traffic that matters: some roads have little traffic.

Average Daily Traffic per km

Mean = 2.36
Maximum = 6.06
Minimum = 0.48
Sometimes walking remains the most important means of transport
Business operators’ means of transport

Business operators important means of transport

- Walking
- Three wheel drive (Bajaj)
- Minibus
- Cart
- Animals
- Lorry
- Motorcycle
- Car
(2) Direct employment opportunities: incl capacity building

<table>
<thead>
<tr>
<th>Workers categories</th>
<th>Within the project site (%)</th>
<th>Elsewhere /Outside (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Feeder Road Workers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skilled construction worker (builder)</td>
<td>59.7</td>
<td>40.3</td>
</tr>
<tr>
<td>Unskilled wage labourer</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Sub-contactors</td>
<td>30.2</td>
<td>69.8</td>
</tr>
<tr>
<td><strong>Building material suppliers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td>61.4</td>
<td>38.6</td>
</tr>
<tr>
<td>Concrete materials</td>
<td>47</td>
<td>53</td>
</tr>
<tr>
<td>Stone</td>
<td>62.2</td>
<td>37.8</td>
</tr>
</tbody>
</table>

Source: Authors compilation, 2016
(2) Direct employment opportunities

<table>
<thead>
<tr>
<th>Employment Modality</th>
<th>As Skilled workers</th>
<th>As Unskilled workers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean Days worked</td>
<td>Mean DWR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily base</td>
<td>349</td>
<td>98.6</td>
</tr>
<tr>
<td>As a foreman</td>
<td>755.5</td>
<td>41.7</td>
</tr>
<tr>
<td>Land clearing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earth work</td>
<td>60</td>
<td>7</td>
</tr>
<tr>
<td>Culverts/ditches</td>
<td>336.7</td>
<td>45</td>
</tr>
<tr>
<td>Minor maintenance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major maintenance</td>
<td>100</td>
<td>107.5</td>
</tr>
</tbody>
</table>
(3) Creating new business opportunities

Feeder roads are major boost for new business (81% of business) Because of:

- Open connectivity
- Bundling of customers and commodities
- Capitalization of economy
- New orientations

(3) Creating new business opportunities
What are the primary constraints for non-farm business operations and growth?

- Lack of access to finance
- Transport related problems
- Access & shortage of power
- High taxes
- Others
Secure landscapes

Knowledge and Experience Sharing
- Experience-sharing
- Horizontal learning

Existing Program

Additional New Approaches
- Systematic Planning
- Roads for Water
- Shallow well Development
- Micro-climate
- Research and Development of new Materials

Local Economy
- Existing
- Local Procurement System
- Local Credit
- Capacity
- Transport
- Value Chain Upgrading
- Agriservices

Green Future Farming

Regenerative Agriculture
- Improve Existing Government Programs
- Introduce New Programs on: Soil, Poultry, EBRM, WASH, Agroforestry, and Vermicomposting

SCALE IN

SCALE OUT
Revolving: promote regenerative agriculture
Are new activities diversified?
Economies as a circular flow of activities?
Has the road created new opportunities for your business?

- Yes but not fully seized on the opportunities
- Yes and fully utilized
- No
Issues affecting business related to the use of the road network

- High cost of public transport
- Low frequency of public transport
- Low availability of public transport
- High cost, low frequency and availability of public transport
- High cost and low frequency of public transport
(4) Effect on land, water and air

Roads can have unwanted environmental consequences that affect the livelihood of rural communities

<table>
<thead>
<tr>
<th>Effects of roads</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flooding</td>
<td>179</td>
<td>34</td>
</tr>
<tr>
<td>Water logging</td>
<td>61</td>
<td>12</td>
</tr>
<tr>
<td>Erosion</td>
<td>153</td>
<td>29</td>
</tr>
<tr>
<td>Sediment deposition</td>
<td>95</td>
<td>18</td>
</tr>
<tr>
<td>Dust</td>
<td>229</td>
<td>44</td>
</tr>
<tr>
<td>Weeds</td>
<td>47</td>
<td>10</td>
</tr>
</tbody>
</table>

The environmental consequences of roads in the order of number of respondents are:
1. Dust
2. Flooding
3. Erosion
4. Sediment deposition
5. Water logging
6. Weeds

Total observations = 525
Unpaved roads contribute almost 40% of all dust. Long-term exposure to traffic-generated dust has been known to contribute to 1.5-2 million deaths annually.

Layering of dust on crops in road-adjacent fields is known to affect photosynthesis, respiration, transpiration, and to lead to an increase in fungal spots on several crops. Impact of dust from the estimated 13 million km of unpaved roads worldwide is estimated to affect around 26 million hectares of productive land, and lead to a reduction in agricultural revenue to the tune of USD 260 million.

Affects:
- Human health
- Animal health
- Crop production
Promote road side tree planting
How can road infrastructure planning, road development, and transport be more inclusive and greener so that benefits accrue to a larger section of rural societies?