

1 **NHESS Brief Communication**

2 **Mountain roads in Nepal at a new crossroads**

3 Dr. Karen Sudmeier-Rieux, Institute of Earth Sciences, Faculty of Geoscience and Environment,  
4 University of Lausanne, Switzerland

5 Prof. Brian G. McAdoo, Yale-NUS College, Singapore

6 Mr. Sanjaya Devkota, Institute of Engineering, Tribhuvan University, Nepal

7 Mr. Purna Lal Chandra Rajbhandari, Independent, Kathmandu, Nepal

8 Mr. John Howell, Consultant, Living Resources Ltd., Devon, U.K.

9 Mr. Shuva Sharma, Scott Wilson Nepal Ltd., Kathmandu, Nepal

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11 **Introduction – roads as vehicles of development?**

12 For the past two decades, development of the road network in Nepal has topped community and  
13 government priorities, a trend likely to continue as the country transitions to a decentralized Federal  
14 government (Rankin, 2017). In parallel, China’s new Belt and Road Initiative (BRI) offers the promise of  
15 investments in key infrastructure: expanding trunk roads, hydro-electricity, trade and development  
16 (The Wire, 2017; The Economist, 2017). Yet as Nepal devolves significant power to local and Provincial  
17 administrations, it is uncertain whether the newly formed local administrations will rise to the  
18 challenge of establishing safeguards to ensure that promised benefits outweigh potential losses. We  
19 suggest that the issue of poor roads in Nepal is a political, not a technical issue and one where better  
20 service and less environmental damage could both be significantly addressed through improved  
21 governance. This commentary points to the need for improved road governance based on research,  
22 consultations and observations of road construction and associated landslides in Nepal. It also  
23 highlights the need for more scientific studies on the topic as most relevant publications emanated  
24 from the grey literature, government publications or media articles.

25 Roads are globally accepted livelihoods links for communities in rural areas. By reducing travel time  
26 on foot, opportunities are opened for quicker transportation of goods, better access to employment,  
27 education and health (Bryceson et al., 2008; Hettige, 2006; ). Roads generally create direct and indirect  
28 benefits to rural populations, directly through employment in constructing and maintaining roads, and  
29 in providing rural transportation services. Indirectly they provide opportunities for marketing goods  
30 and services, flexibility for employment and roadside businesses, and for transporting agricultural  
31 products to markets (Bryceson et al., 2008; Iimi et al., 2016). They can provide a safety net of sorts in  
32 generating alternative livelihood opportunities, especially in circumstances where conditions for  
33 agriculture are difficult. In general, connectivity is thus positively correlated with lower poverty rates  
34 (Hettige, 2006; Iimi et al., 2016). Additionally, there are many non-monetary benefits of roads,  
35 especially greater access for the poor to health and other public services, such as education, which can  
36 significantly reduce vulnerability and even gender inequality (Starkey et al., 2013). In Nepal, roads are  
37 also linked to the current boom in migration, facilitating easier mobility to both near and distant  
38 migration destinations (Jaquet et al., 2015; Upreti and Shrestha, 2015). Finally, a robust road  
39 infrastructure can provide vital corridors for evacuation and rescue in the aftermath of disaster.

40 However, benefits of roads need to be weighed alongside evidence that roads may benefit non-poor  
41 households more, perhaps making development less even (Hettige, 2006). Furthermore, other  
42 impacts, such as increased environmental hazards, pollution, crime and unwanted cultural influences  
43 are often overlooked (Blaikie et al., 1976; Hettige, 2006; Murton, 2016; Jaboyedoff et al., 2016). This  
44 manuscript builds on research and publications questioning the aspirations of the Government of  
45 Nepal as early as the 1970s and 1980s. The Overseas Development Group at the University of East

46 Anglia pioneered studies to understand short-, medium- and long-term effects of road construction on  
47 spatial and socio-economic inequality (Blaikie et al., 1976; Rankin et al., 2017). Blaikie, Cameron and  
48 Seddon (1980) revealed the inequalities created by road construction, with loss of livelihoods for those  
49 without possibilities to invest, and enhanced opportunities for those who could (Rankin et al., 2017).

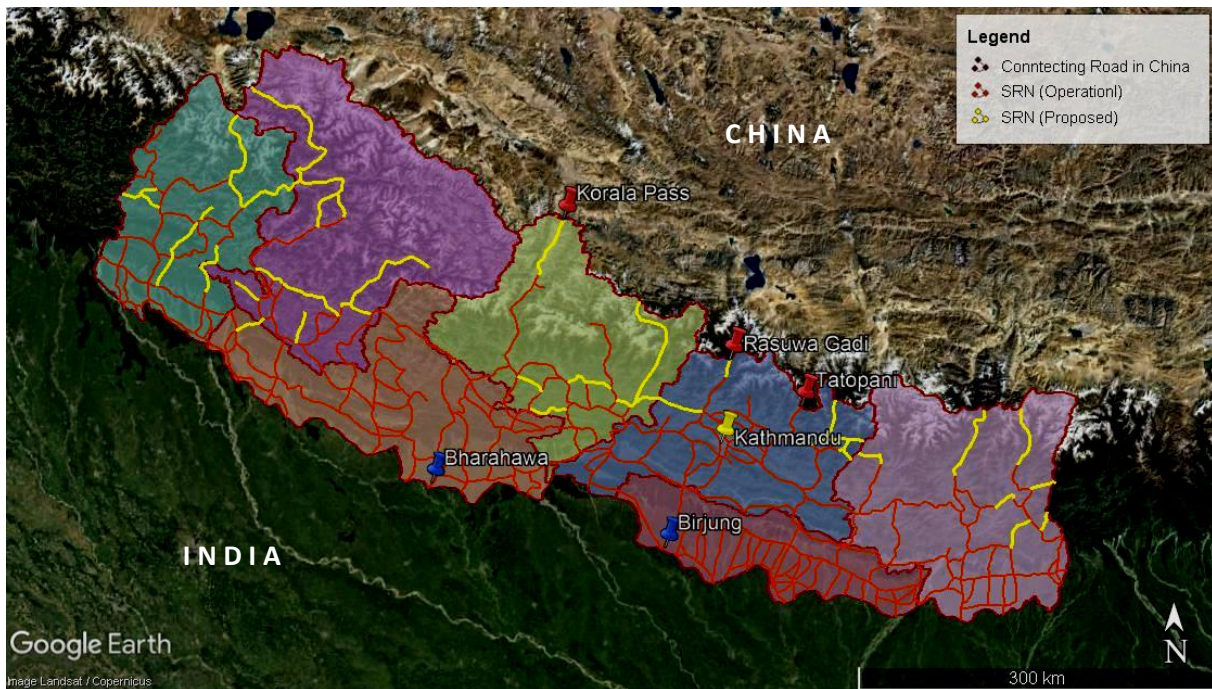
50 This work was conducted during the same period as the Laban (1979) benchmark inventory of  
51 landslides in Nepal to document the number of landslides and their origin as either natural or human-  
52 induced. Although roads represented a small proportion of total land area at the time, Laban warned  
53 that as the road network continued to expand, the number of landslides will, “increase drastically in  
54 the near future, especially if more careful construction methods are not undertaken” (Laban, 1979: iv).  
55 Both research projects were widely influential and according to Rankin et al (2017), the Blaikie et al  
56 (1976) study may have redirected domestic budgets and foreign aid toward other rural development  
57 investments. However, this reprieve was soon to end with a greater focus on connectivity in the 10<sup>th</sup>  
58 5-year plan (2002-2007) and the boom in foreign investments in road construction projects after 2008  
59 and the end of the Maoist insurgency (Pokharel and Acharya, 2015). The 11<sup>th</sup> plan (2007-2010)  
60 established the ambitious goal of constructing a road network throughout the country whereby  
61 residents in the Hills should have a road available within four hours walking distance and Terai  
62 residents within two hours (Pokharel and Acharya, 2015).

63

#### 64 **Nepal’s mountain roads – vehicles of disaster?**

65 Roads in Nepal are generally classified as national roads, (i.e. Strategic Road Network, SRN) under the  
66 jurisdiction of the Department of Roads (DOR), or local roads (i.e. Local Road Network, LRN). The LRN  
67 is comprised of District Road Core Network (DRCN) and Village Roads (VR) under the jurisdiction of the  
68 Department of Local Infrastructure Development and Agricultural Roads (DOLIDAR) (Figure 1). Road  
69 building started to gain momentum in Nepal with the advent of multi-party democracy in the early  
70 1990s, intensified further after the Maoist insurgency ended in 2006 and continues to be one of the  
71 country’s main priorities (Upreti and Shrestha, 2016; DOLIDAR, 2016a).

72



74 **Figure 1.** Nepal Provincial boundaries and national (SRN) road network highlighting existing and proposed roads, according  
 75 to DOLIDAR (2016) and main current border crossings with China and India. As Provincial administrations are in the process  
 76 of revising Master Plans to represent new administrative boundaries, there is opportunity to put in place governance  
 77 mechanisms for improved road construction and maintenance. (Source: Modified from DOLIDAR, 2016, based on Google  
 78 Earth imagery).

79

80

81 Twenty years ago, Nepal's road network was one of the lowest in the world with a road density for  
 82 both SRN and LRN estimated at 13.7 kilometers (km) per 100 km<sup>2</sup> in 1998 (DOR, 2002; DOR, 2017). By  
 83 2016, it had increased to 49.6 km per 100km<sup>2</sup> and continues to increase at a very rapid pace (DOLIDAR,  
 84 2016a). The SRN expanded rapidly from 4,740 km (blacktop, gravel and earthen) in 1998 to 15,404 km  
 85 in 2016 (DOLIDAR, 2016). The LRN experienced a 1200 percent increase during this period, from 4,780  
 86 km in 1998 to 57,632 km in 2016 and are the most common roads in rural areas (DOLIDAR, 2016a).

87 In 2007, the country spent 5.2 percent of its national budget on roads, but by 2011/12 this figure had  
 88 increased to 6.7 percent or an estimated 491.2 million USD (WB-GON, 2014). The estimated  
 89 investment in the LRN was about 245.6 million USD (2011/12), of which 54 percent of the rural road  
 90 budget originated from donors and 20 percent were soft loans to communities. Community  
 91 contributions amounted to an estimated 12 percent of the total budget through their own savings and  
 92 remittances, and earnings from community forestry (WB-GON, 2014; DOLIDAR, 2016b). This  
 93 demonstrates the significance and priority given to roads and connectivity as a vector for economic  
 94 development and population mobility.

95 Despite the budget and priority allocated to the road network, Nepal's mountain roads are in a  
 96 treacherous state, subject to frequent rockfall, landslides and accidents (Singh, 2018; DoR, 2013a)  
 97 (Figure 2). According to DoR (2013a), one of the main causes of road accidents is road design, including  
 98 very steep gradients, lack of safety features and poor road conditions. Local road construction or so-  
 99 called 'dozer roads' are most often initiated and constructed by bulldozer owners in collaboration with  
 100 politicians at the request of communities, without basic grading or drainage (ITAD, 2017; Singh, 2018).

101 The dozer roads are usually constructed or upgraded during the dry season. During the monsoon, road  
102 segments are frequently washed out because a majority of these roads lack proper engineering (WB-  
103 GON, 2013). Road failures are cleared up at high cost after the monsoon and the failure-and-clearance  
104 process is repeated for years until there is no loose soil to block roads (Leibundgut et al., 2016).  
105 Environmental impacts include destroyed irrigation schemes, springs and contaminated water supplies  
106 (Singh, 2018). Initial Environmental Examinations (IEE) to reduce environmental impacts are usually  
107 required for local road construction but are rarely enforced (ITAD, 2017).



108  
109 **Figure 2. Local road, Lower Mustang District, Province 4, Nepal. Credit: Rajbhandari, 2016.**

110  
111 Such rapid and ineffective road construction throughout the country, but particularly in the middle hill  
112 and mountain areas, is placing increasing pressure on fragile ecosystems, wasting government  
113 resources and increasing risk to road passengers and roadside dwellers (DoR, 2013a; Singh, 2018).  
114 Studies have demonstrated that roads are one of the greatest anthropogenic drivers of environmental  
115 degradation, erosion and landslides in Nepal (Leibundgut et al. 2016; Froude and Petley, 2018; McAdoo  
116 et al, accepted ; Petley et al., 2007; Vuilliez et al. 2018). This situation is worsening due to the  
117 intensifying rainfall during the monsoon, largely attributed to climate change (Bharti et al., 2016;  
118 Devkota et al. 2018; Froude and Petley, 2018; Petley et al., 2007), which has led to a greater occurrence  
119 of landslides, especially in the middle hills (McAdoo, accepted). The possibility of an earthquake of  
120 even greater magnitude than the 2015 Gorkha earthquake (M 7.8) raises concerns about poorly  
121 designed roads increasing the likelihood of catastrophic landslides (Singh, 2018).

122  
123 **Nepal at a governance crossroads**

124 Nepal has a range of acts, regulations, guidelines and directives that require proper road engineering  
125 practices, various levels of environmental assessments and approval. However, while funded by  
126 government budgets, a majority of local roads do not follow established government practices (ITAD,  
127 2017). Hence, although the legal framework for ensuring proper governance of infrastructure

128 development is well developed with public bodies to monitor and enforce governance, the lack of  
129 political will and consensus among political leaders has undermined the impact of these bodies (WB-  
130 GoN, 2013).

131 As the country shifts decision-making to the Provinces, it is unclear how management of roads will be  
132 affected among the main actors such as DOR, DoLIDAR, and rural and urban Municipalities.  
133 Institutional roles are shifting under on-going reforms, with executive authority over local  
134 infrastructure development being transferred from district level authorities (District Technical Officer)  
135 to Provincial Public Works Departments, which are supposed to coordinate with central level ministries  
136 and departments (ITAD, 2017). At the time of printing, it is not yet clear which administrative body  
137 will have oversight of road policies and alignment of policies between Provinces. The risk is that the  
138 few gains that had been achieved over the past decade, including a greater emphasis on regular  
139 maintenance of roads, become completely diluted (ITAD, 2017).

140 Another development which may affect the type and pace of road construction in Nepal is China's Belt  
141 and Road Initiative (BRI). In May 2017, Nepal became a signatory to the BRI with the promise of  
142 expanding several trunk roads in order to foster new trade and economic benefits (The Economist,  
143 2017). This new "Silk Road" will develop a trade and infrastructure network from China towards the  
144 west and south including countries in Central and South Asia and Eastern Europe.

145 The BRI has for now elicited more questions than answers, including: which roads will be expanded,  
146 will it link rural mountain communities to greater economic development opportunities, better health  
147 care and education options, and increased social networks; or will the BRI trunk roads spawn more of  
148 the poorly engineered local roads with their demonstrated low cost effectiveness and high  
149 environmental impacts? Without adequate controls and support, rural villages can be expected to tie  
150 into these trunk roads by expanding the network of poorly-constructed local roads, with ensuing  
151 environmental, economic and human risks associated with roadside erosion and slope failures that  
152 damage both the roads and the neighboring productive land.

153 Despite this bleak picture, Nepal has the governance systems in place to resolve the problem if it  
154 chooses to do so. Numerous technical manuals and departmental guidelines provide the basis for good  
155 alignment determination, careful engineering, the stabilization of incipient landslides in slopes and the  
156 prevention of erosion through the use of bio-engineering (Deoja, 1994; DOR, 2013b). Nepal has been  
157 a world leader in the past and government agencies such as DOR and DOLIDAR all have cadres of highly  
158 trained engineers and bio-engineers who could fulfill the required technical functions satisfactorily if  
159 directed properly (ITAD, 2017; WB-GON, 2013).

160 However, these abilities are currently ignored in the interest of political expediency and a misplaced  
161 public perception that quickly opened roads are a panacea for socio-economic development.  
162 Institutions were established to regulate road construction. The Environmental Protection Council was  
163 formerly established under the Chairmanship of the Prime Minister to monitor environmental impacts  
164 and to regulate the environmental and social impact assessment legal instruments (GON, 1997), but  
165 became ineffective facades. The Department of Roads' Geo-environmental and Social Unit is also not  
166 serving its function. Finally, political influence has overrun any efforts to instill checks and balances  
167 (ITAD, 2017), notably by the Commission for Investigation of Abuse and Authority, which was created  
168 to highlight cases of poor governance.

169 Yet with the revision of ministerial portfolios in 2018, the re-organized Ministry of Forests and  
170 Environment has an opportunity to ensure that statutory environmental safeguards are met by those  
171 government units that will be responsible for administering road development. Newly formed  
172 Provincial administrations are now tasked with revising their Master Plans and have the opportunity

173 to develop action plans to strengthen governance bodies, increase transparency and enforce  
174 regulations.

## 175 **Conclusions**

176 On the surface, roads are vital livelihood links for rural populations for improved access to markets,  
177 health care, education, employment and migration. Mobility is increased, rural populations can  
178 develop greater resilience to harsh environmental conditions, and there are possibilities of new  
179 economic opportunities, ultimately reducing economic vulnerability. However, mountain roads,  
180 especially when poorly constructed, present particular challenges of sustainability, risk and  
181 governance (Sidle and Ziegler, 2012). Hence, the full benefits of such roads in mountainous areas  
182 should be questioned.

183 Finally, the issue of poorly designed and risk-filled roads in Nepal, is a political, rather than technical  
184 issue. As Nepal moves towards greater decentralization of power, there is considerable opportunity  
185 for its local and national administrations to turn the tide toward safer and more sustainable road  
186 development. The two new major drivers of road development in Nepal – decentralization of power  
187 and the BRI – could be harnessed to change road construction from the current trajectory of  
188 environmental disaster to vectors for development. The high environmental and maintenance costs of  
189 haphazard ‘dozer roads’ could be significantly reduced if government policies were enforced to achieve  
190 well-established road engineering designs, including basic standards of road grading, alignment,  
191 drainage and bio-engineering. Nepal is at a new crossroads with fresh opportunities to rein in the  
192 “dozer road” constructors, but this will require concerted effort and considerably more political will  
193 power than has been demonstrated over the last decade.

194

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