

4. Road Washouts in Nepal

Road failures from heavy rain and floods during the monsoon have caused more than 2.5 billion rupees worth of rehabilitation work in the last thirteen years (1979-1993). A brief account of these failures is given below.

1979

The 1979 monsoon rains resulted in washouts of i) a 30m span bridge across the Bijayapur *Khola* on the Prithvi Highway and of ii) a 60m long bridge across the Karra *Khola* along with the partial washout of road sections and minor bridges and culverts on the Hetauda - Birganj road leading to a rehabilitation cost of about Rs 8 million.

1981

Twenty-seven kilometres of the 114km-long Arniko Highway was severely damaged during the 1981 monsoon, mainly due to unprecedented floods along the Bhote Kosi River caused by glacial lake outburst floods from Tibet. The damage cost Rs 62 million approximately.

1983/84

A total of about 500 metres of road length at various sections of the Dharan-Dhankuta Highway, which cost Rs 23 million per km for rehabilitation at 1990 prices, was washed out during monsoon (Madav 1989).

115,000 cubic metres of slip debris occurred on this road during the 1984 monsoon.

1987

Floods and an earthquake in 1987 seriously affected 350km of roads. Road failures at 37

locations and damages to 41 bridges had occurred. A total of 15km of road and three bridges were completely washed out.

A 50km length of the 114km-long Arniko Highway was severely affected by the 1987 monsoon. Twenty-one per cent of the entire road is under risk of major failure. The rehabilitation costs are estimated at Rs 520 to 730 million with additional maintenance costs of six to seven million rupees per year at 1990 prices.

Several sections of the Dharan-Dhankuta Highway suffered damage resulting in the washout of a total of about 0.5 km due to rains and an earthquake during the monsoon season. The damage cost Rs 10 million (appx.) at 1987 prices.

The Charnawati area of the Lamosangu-Jiri road was affected by the washout of the Charnawati Bridge and major gulying and landslides in the three kilometre section near Charnawati, resulting in a rehabilitation cost of Rs 190 million from 1987-1991.

A rehabilitation programme costing Rs 91 million at 1991 prices is going on to correct the damage on the Thankot-Naubise road.

Damage to bridges, river protection, and several road sections on the East-West Highway has led to rehabilitation costs of Rs 163 million at 1991 prices.

1991

The heavy rainfall on September 1, 1991, resulted in severe undercutting of banks of the Seti River and caused the collapse of a 33m span bridge over the Seti Gorge at Pokhara on the Prithvi Highway. The

rehabilitation has involved the construction of a 200m span cable, stay type bridge on the same site.

1993

Heavy rainfall and floods on the 19th and 20th of July, 1993, caused massive damage to the Prithvi Highway and the Tribhuvan Rajpath and severe damage to the East-West Highway, Phidim-Taplejung Highway, Bardibas-Sindhuli Road, and Dhalkebar-Birtamod road. The total rehabilitation cost is estimated at 1,290 million rupees at 1993 prices. Road access to Kathmandu was completely cut off for 28 days.

Damage valued at:

- i)Rs. 200 million for the penstocks and powerhouse of Kulekhani dam, and
 - ii)Rs.150 million for the Bagmati Barrage
- have also been incurred from the disastrous floods.

The additional socioeconomic losses resulting from the damage is far beyond the costs of the infrastructural damage and is yet to be quantified.

The bridge approach on the Mahendra Rajmarg (East-West Highway), Pathlaiya-Dhalkebar, and Hetauda-Narayanghat section - 10 different bridges were damaged besides minor damage to the embankment in nine places, incurring damage worth Rs 48 million (appx.).

Prithvi Rajmarg, Naubise-Mugling Section

A 22m span out of a 44m total span of Malekhu Bridge, a 66m span of Balkhu

Bridge, and 66m out of a 88m span of Mahadevbesi bridge (Agra *Khola* bridge) were washed out. Further, severe road damage and failure of retaining structures occurred in 60 places. The losses are valued at Rs 572 million (appx.).

Tribhuvan Rajpath, Naubise-Hetauda Section

Three bridges (10m, 61m, and 7m span), 23 culverts, and 534m of road section in 19 places were completely washed out. Retaining structures failed along more than 103m of road. Further, severe damage occurred due to landslides in more than 2,090 places, road failure in 10 places for a total of 1,019m length, and damage to two bridges. Fifteen kilometres of road length in six sections were the worst affected.

Phidim-Taplejung Highway

Serious damage to a 16km length of road and landslides in various places resulted in damage worth Rs 23 million (appx.).

It is estimated that the damage to and from the hill roads in Nepal is as follows (Yadav 1989):

- o 400 to 700 cubic metres of landslides per km per year are occurring on the hill roads,
- o 10 to 25 per cent of hill roads following river valleys are completely washed out every four to five years, and
- o 3,000 to 9,000 cubic metres of landslides per kilometre of hill road occur every year during the construction period.