lands support over 40 species of native fish and many native aquatic plants, including the rare *Oryza rufipogon*, a wild species of rice. The habitats that these wetlands offer are the result of a delicate transition between terrestrial ecosystems and the totally aquatic, e.g. lakes. Transitional wetlands are fine-tuned to the annual patterns of rain and drought, and easily lose their ecological integrity if the depth and flow of water are altered. The 400 reservoirs that the project envisages, will definitely alter the ecological integrity of wetlands locally.

Moreover, stagnation of water due to the building of reservoirs has favoured the spread of lake-adapted alien species such as the tilapia throughout the country in less than 50 years. Studies in lakes of Rajasthan have revealed that 60–70% of the fish biomass in such waters can be of tilapia. In South Africa, aggressive species of fishes, including *Austrogalaxias scottii*, *Barbus aeneus*, *Clarias gariepinus* and *Labeo capensis* have been accidentally transported through the inter-basin transfer of water. These are now a threat to the local species.

The African catfish (*Clarias gariepinus*) is at present introduced and widely cultured in India. Pathological studies have shown that the species is more prone to be a carrier of bacterial infections than the native *Clarias batrachus*. Eighteen species of infectious bacteria have been isolated from the African catfish as against three in the native Indian species of catfish. Major carps (*Catla catla*, *Labeo rohita* and *Cirrhinus mrigala*) that are found throughout south India are those that have been introduced from north Indian rivers. These carps were earlier known to hydridize only in aquaculture. The existence of natural hybrids of *L. rohita* and *L. calbasu* has been recently confirmed in Indian waters.

Against this backdrop, the plan to interlink major Indian rivers has to be put through more serious ecological scrutiny. The National Bureau of Fish Genetic Resources had initiated a programme to conserve fish genetic resources throughout the country. As part of this initiative, two fish sanctuaries have been identified in northwest India. However, the greatest diversity of Indian fishes lies in the south and locally in the Western Ghats. Linking the rivers that flow out of these hills with the other peninsula and north Indian rivers without rigorous evaluation of the ecological impacts can prove disastrous not only to the fish, but also to the many intricately linked biotic processes that have evolved over the past hundred of millions of years. Ecologists please arise. We cannot be sleeping policemen!


R. J. RANIT DANIELS

Care Earth,
No. 5, 21st Street,
Thillaiganganagar,
Chennai 600 061, India
e-mail: careearth@usa.net

**NEWS**

**Landslides at Karnaprayag: Another Uttarkashi in the making?**

A sudden change in the slope profile, particularly by landslides, has often produced disastrous results in the Himalayan valleys. This phenomenon has been investigated thoroughly. The Uttarkashi landslide of 2003 had caused widespread damage in many parts of the township. Preliminary signs of landsliding have been observed by the author in the vicinity of Karnaprayag township, Chamoli district, Uttarakhand that has the potential of turning into another Uttarkashi in the near future. The small township of Karnaprayag is situated at a height of 788 m at the confluence of Alaknanda and Pinder rivers on the Haridwar–Badrinath National Highway-58. Field investigations have revealed that some localities of the town, viz. Upper Bazar locality above Karnaprayag–Simli road, Kotwali and Police Colony and parts of Bheragoom above Karnaprayag–Nauti road south of Pinder river are highly vulnerable to landslide hazard (Figure 1).

A translational debris rock slide has developed in the immediate downslope of Upper Bazar locality in Karnaprayag. The period 2002–2004 has witnessed upslope extension of this sliding activity. In 2002, the active slide scarp was about 20 m away from the residential area of Upper Bazar, but during the rainy season in 2003, the head-ward shift of the slide scarp had brought this slide zone to as close as 10 m of the residential area just above (Figure 2a). This area is already showing evidence of gradual subsidence such as visible cracks on the road and buildings, some of which even show slight tilting. In the event of further upslope extension of the slide scarp, the immediate upslope area of Upper Bazar can experience rapid subsidence (Figure 2a). Several buildings, including 18 houses, a temple and a mosque in the Upper Bazar locality are at high risk as these are immediately above the head scarp of the active slide zone.
Another translational debris slide has developed in the downslope of Kotwali and Police Colony locality just above the Karnaprayag–Nauti road. The head-ward expansion of the slide zone may result in the subsidence of the area. Further upslope of Kotwali area is the Bhergaon locality, located just below a rockfall zone, which has been witnessing occasional falling of large boulders (Figure 2b). About 20 families are at risk here.

An old debris flowslide exists along a nala that joins the Pindar river in the immediate upstream of the Alaknanda–Pinder confluence. The Nagar Panchayat office that is located below this old slide debris as well as some hotels and commercial/residential complexes of Pindar Valley Colony are vulnerable to debris flow any time in the near future. In the northern part of Karnaprayag town, Gandhi Nagar locality on the northern bank of Pinder river and Shakti Nagar on the eastern bank of Alaknanda are also vulnerable to landslides. So is the Ira-Badhani village towards the southeastern extremity of Nagar Panchayat Karnaprayag (Figure 1), where a primary school building has been abandoned since 2001 because of the damage caused by landslides. In addition, some houses are also witnessing tilting and subsidence in Kafaldali Tok and parts of Majhera Tok in the Ira-Badhani village.

The area under investigation forms a part of the Garhwal Group of rocks comprising Hariyali quartzite (or Chamoli quartzite) and Karnaprayag metavolcanics that have been subjected to three phases of tectonic deformations. Southerly plunging Karnaprayag anticline was developed during the second phase of tectonic movements. The anticlinal axis passes through west of Karnaprayag and its nodal part is truncated by North Almora Thrust. The northern limb of the anticline is offset by the Alaknanda Fault which extends to Kaleshwaram in the east and thereafter takes a southerly turn east of Karnaprayag. The western part of Karnaprayag township in the downstream of the Alaknanda–Pinder confluence is occupied by thickly bedded Hariyali quartzite with four sets of prominent joint orientations. The metavolcanics are observed in the eastern part of Karnaprayag particularly below the Upper Bazar locality, in the form of porphyritic metavolcanic flow with well-developed schistosity.

A major part of Karnaprayag town on the left bank of Pinder river is sitting on a large colluvial fan heaping out with coarse debris comprising rock fragments and unconsolidated debris material, re-worked by small seasonal streams. The Upper Bazar and Kotwali areas are located at the distal part of this colluvial fan that is subjected to toe erosion by Pinder river (Figure 2a). Bhergaon locality, which is at the proximal end of the colluvial fan, is prone to rock-fall from the immediate upslope (Figure 2b). The Pinder Valley locality is again sitting on the colluvial fan, while the upper parts of Gandhi Nagar and Shakti Nagar localities on the opposite bank of Pinder river are located on the debris cone of an old slide.

The cumulative effects of natural processes and anthropogenic activities may act as causative factors for these potential slide zones. Factors that accelerate the sliding activity include heavy monsoonal precipitation, excessive seepage of water caused by blocking of surface drainage, narrowing of the courses of seasonal streams, absence of proper sewage system and blocked scuppers in the town.

The existing provision for draining out the excess surface run-off is in the form of narrow scuppers. But most of such scuppers are presently blocked by disposal of waste into them, in the absence of a proper sewage system in the town. The blocking and/or narrowing of the natural drainage courses in Upper Bazar and its upslope area impede the surface flow of excess rainwater into the Pinder river. This leads to seepage of water,
consequently increasing the pore water pressure in the loose, unconsolidated debris material which is already overburdened by single- and double-storied houses. Toe erosion by Pinder river coupled with slope-cutting of the lower portion of the slide for broadening of Karnpraya–Simli road and subsequent alteration of the angle of repose of slide material have resulted in the head-ward extension of the slide towards Upper Bazar area (Figure 2a).

The triggering factors for the nearby Kotwali and Police Colony slide include the unplanned cutting of slope for widening of roads in the immediate downslope area. Poor drainage network and absence of proper sewage system in the upslope of Kotwali and severe bank erosion by small seasonal drains in its vicinity may also aggravate the problem of landslide in this area. The head-ward shift of this active slide zone by about 25 m may cause subsidence of the houses in the area.

The rockfall at Bhergaon is the result of reactivation of an old rockfall zone in the upslope. Highly jointed quartzites have shown widening of joints due to blasting for road construction. These widened joints have served as conduits for percolation of water which, in turn, has exerted forward thrust and pore water pressure on the rock mass, thereby causing translational rockfall (Figure 2b).

The Karnpraya Nagar Panchayat building is obstructing the natural course of a high-gradient seasonal stream. Though the stream water is diverted into small cemented drains constructed between the boundary wall of Nagar Panchayat Bawar and the road, a cloud burst in the up-stream catchment of this seasonal stream during the rainy season may bring huge volumes of debris which can cause severe damage to the Nagar Panchayat Bhawan and the Pinder Valley Colony downstream.

Ira-Badhani village in the eastern part of Karnpraya Nagar Panchayat is located on a solifluction lobe. The slow flow has been accelerated along seasonal streams due to toe erosion and increase in pore water pressure, as a result of high seepage through springs and blocking of scuppers on the Karnpraya–Nauti road in the immediate upstream of Ira-Badhani.

There is urgent need for an emergency plan during monsoon or in the event of incessant rains for the evacuation of people residing in the danger zones immediately above the Karnpraya–Simli road in the Upper Bazar area, Kotwali, Police Colony, Nagar Panchayat office and parts of Pinder Valley Colony area.

The severe hazard-prone Upper Bazar area requires terracing of downslope supplemented with the construction of retaining walls with drain holes and toe-protection measures to minimize toe erosion by the Pinder river.

Channelization of water away from the slide zones of Upper Bazar area, Kotwali, Police Colony, Bhergaon and Nagar Panchayat office, particularly the construction of scuppers in the Upper Bazar area, needs to be taken up on priority basis.

Cleaning of existing scuppers and construction of sewage lines in vulnerable localities should also be taken up.

All construction activities should be stopped in vulnerable areas and any construction should be allowed only in areas recommended by geologists.

Indiscriminate cutting of slope for construction of multistoried commercial complexes should be restricted or controlled through effective policies by imposing strict land-use policy.

Constructions that block the drainage courses should be removed.

2. Uniyal, A., Pande, R. K., Gupta, N. K. and Rana, R. S., Abstracts 20th Convention of Indian Association of Sediementologist, Department of Geology, HNB Garhwal University, Srinagar, Garhwal, 28 November-1 December 2003, pp. 95-96.

ACKNOWLEDGEMENTS. I thank Shri K. V. Ravindran for valuable suggestions. I also thank the Department of Disaster Management, Govt. of Uttarakhand, Dr R. K. Pande, Executive Director, Disaster Mitigation and Management Centre, Dehradun and Dr Pyoosh Rautela for encouragement and support. Thanks are also extended to Nidhi and Noha.

Aniruddha Uniyal, Disaster Mitigation and Management Centre, Dehradun 248 001, India.
e-mail: aniruddhauniyal@yahoo.com

---

NIPER has new Director

P. Ramarao, who is currently the Head of the Department of Pharmacology and Toxicology at National Institute of Pharmaceutical Education and Research, Punjab has taken over as the institute Director from C. L. Kaul.

Ramarao’s research interests are determination of cause and effect relationship of diabetic complications, especially hypertension, inhabitation of opioid tolerance and dependence and G-protein coupled receptor characterization and their transmembrane signal mechanisms.