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Mountains as Water Towers E-Discussion:  
The Quantity and Quality of Water in - and from -  
Mountain Areas  
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### TOPIC 3: DISCUSSION SUMMARY

#### Who Owns It? Integrated Water Management

Sincere thanks to everyone who contributed to the second topic of discussion. Like the first and second summaries, this last summary is categorized by discussion thread, with common conclusions listed at the end.

#### WHO OWNS IT? INTEGRATED WATER MANAGEMENT

##### Discussion Threads:

- \*\*\* Distant Impacts
- \*\*\* Practical Ways to Minimize Watershed Degradation
- \*\*\* Tourism and Mountain Watersheds
- \*\*\* Managing Mountain Watersheds
- \*\*\* Paradigms
- \*\*\* Common Conclusions

##### \*\*\* Distant Impacts

Vimal Khawas began this discussion by pointing out that there are "symbiotic and intimate" relationships between natural resources. The destruction and degradation of one resource may directly or indirectly affect others. For example, in the Darjeeling Himalaya, changes in the uplands' river regime have negatively impacted the resource base on the plains downstream.

According to Vimal, an unprecedented depletion and degradation of forest resources took place during the 1980s and 1990s in the Darjeeling Hill region of the eastern Indian Himalaya. As a result, small streams began to dry up. This in turn, has negatively impacted the volume of larger rivers and contributed to soil instability. According to Vimal, landslides, soil seep, and subsidence have become regular features in the region, especially during the monsoon season. Rural mountain communities are most heavily impacted.

Vimal sites this as evidence of the importance of planning environmental strategies at the regional level. He also suggests several steps to prevent degradation from occurring in the first place.

### \*\*\* Practical Ways to Minimize Watershed Degradation

Vimal Khawas' suggestions included:

- Checking unplanned and illegal deforestation
- Promoting and communicating the importance of river systems, particularly in areas where degradation occurs
- Checking population growth
- Alleviating poverty, particularly where the working poor are dependent upon forests for their livelihood
- Expand the activities of people and organizations who protect and restore the environment
- Launch micro-watershed management programs, which may generate employment and interest at the grass root level

These are actions that governments can take to help protect mountain watersheds. Dennis Doncaster described steps that individuals can take to do the same.

By "Keeping Water of the Land Longer", Dennis explained that the productivity of the land can be maximized. The brochure he provided describes soil as a sponge, and fast-flowing water as an erosive force. These metaphors give readers a helpful framework to understand the impacts of their actions.

To increase water absorption and reduce the speed at which it flows off the land, Dennis' brochure suggests that individuals:

- maintain or increase vegetation cover
- prevent soil compaction
- protect drainages from increased flow energies (fast flowing water)
- carefully design, construct and maintain roads, houses, and drainages
- keep streams in their proper shape
- ensure that riparian areas (areas next to streams) are filled with the right plants and healthy soil, because this increases "sponge-action", reduces high energy flows, and

releases water slowly.

### \*\*\* Tourism and Mountain Watersheds

Vimal Khawas also wrote that increasing tourism and a lack of refuse disposal facilities in the Himachal Pradesh, of the Western Indian Himalaya, have led to high alpine watersheds being polluted by human refuse and excreta.

While tourism undoubtedly places increased pressure on watersheds, William Van De Berg described how the whitewater tourism industry has, in some cases, sought to mitigate these impacts.

According to William "strict regulations in high use areas such as the Grand Canyon of the Colorado River and 'leave no trace' environmental ethics among river guides" have led to more sanitary waste disposal methods to avoid problems like those faced in the Himachal Pradesh. Although the United States' Forest Service lists whitewater rafting is one of the eight fastest growing forms of outdoor recreation in the US, William believes that this does not necessarily translate into greater impacts. For example, in the Wild and Scenic corridor of the Chattooga River in Georgia and South Carolina, environmental conditions have improved despite increased user levels.

William also explains that "organizations such as the American Whitewater Affiliation (AWA) have taken the lead in addressing environmental issues affecting whitewater rivers in mountain areas" including "dam removal and stream flow restoration, gaining and maintaining controlled flows of water in streambeds that have been dewatered by hydropower operations" and resolving user group conflicts that have resulted in closures and restricted access points. Local and regional groups have also undertaken river cleanups, such as those organized by the University of Georgia's Whitewater Club on the Apalachee River of Northern Georgia.

### \*\*\* Managing Mountain Watersheds

Despite the best efforts of tourism operators, Jack Imhof believes that the unique characteristics of mountain

watersheds have management implications. "Mountains rake the sky and harvest water vapour for the lands below. Water from the sky is stored in several fashions on and within mountain ecosystems," including:

- Glaciers
- Snow cover
- Mountain Lakes
- Soils on mountain slopes (depending on depth, slope and vegetative cover)
- Lakes and pools on floodplains
- Alluvial fill

Jack believes that in order to manage mountain watersheds effectively, we must understand how mountains capture, store and release water, and how this happens in the air and on the ground. These processes are affected by a mountain's composition (type of rock, etc.), the structure of the local mountain range (topography, etc.) and the climate of that particular range.

Jack asks, if mountain environments affect the water system to such an extent:

- Is there a discrepancy between the scale at which water and mountains interact versus the planning scales used by many governments?
- Can we develop better science-based tools for analyzing and managing mountains and their water resources? At appropriate ecological scales?
- If we classified mountain systems based on their composition and structure, could better manage mountains and their water resources?
- Can we determine the relative water storage mechanisms available in any particular range and their relative local importance?
- How can we inform all stakeholders, communities and groups that it is possible to ensure a better set of mechanisms for managing mountains and their water resources?

\*\*\* Paradigms

Jack Imhof was not the only participant who expressed

concern with the paradigms that govern watershed management. Dennis Doncaster suggested that by examining the process of effective management from beginning to end, one can identify procedures that are barriers to effective management. He and Hans Schreier also asked a number of questions.

Dennis asked:

- Would the long-term benefits of ensuring a steady supply of clean water outweigh other courses of action leading to economic gain in the short-term?
- Are the gaps in our ability to manage watersheds in the physical sciences (what to do) or the social sciences (convincing folks to work together for an agreed upon common goal)?
- How do private land rights and local access to public lands balance against public benefits from healthy watersheds?
- Is there a way for the majority of downstream users to compensate upstream land-owners and the local public for conservation practices?
- Is watershed health best determined by obtaining goals (e.g. numbers of species), by processes (e.g. energy dissipation, habitat production, and physical resiliency), or a combination of both?

Hans asked:

- If private companies begin generating hydropower, what kind of water-use rights and regulations should be put in place to assure equity of use is assured?
- As glaciers continue to melt, what kind of provisions should be made to assure that there is sufficient water in streams once the ice that stores and regulates flow has disappeared?

\*\*\* Common Conclusions

- Mountain watershed management must be undertaken at a regional level, with due care and attention paid to the unique structure of specific ranges.
- Tourism places increased pressure upon mountain watersheds, but tourism operators and recreational groups can play a

meaningful role in restoring and protecting mountain watersheds.

- Both governments and individuals can take meaningful steps to reduce the degradation of mountain watersheds.