Conference Volume	5th Symposium for Research in Protected Areas 10 to 12 June 2013, Mittersill	pages 205 - 210

Depicting community perspectives: repeat photography and participatory research as tools for assessing environmental services in Sagarmatha National Park, Nepal

Rodney Garrard[1], Thomas Kohler, Urs Wiesmann[1], Martin F. Price[2], Alton C. Byers & Ang Rita Sherpa[3]

[1]Centre for Development and Environment (CDE), University of Bern, CH
[2]Centre for Mountain Studies (CMS), Perth College, University of the Highlands and Islands, UK
[3]The Mountain Institute, Washington DC, USA & Asia Programme, Kathmandu, Nepal

Abstract

Efforts have been made to provide a scientific basis for using environmental services as a conceptual tool to improve conservation and livelihoods in mountain protected areas (MtPAS). Little attention has been paid to locals' concerns, which can illuminate the complex interplay between mountain ecosystems, environmental services and human well-being. This study uses a novel application of repeat photography to examine local perceptions of change in ES in Sagarmatha (Mt. Everest) National Park. We argue that our methodology could complement biophysical ecosystem assessments in MtPAS.

Keywords

environmental services, repeat photography, perceptions, Sagarmatha National Park, participatory research, qualitative methodology, photo-interviewing, UNESCO World Heritage Site, mountain protected areas, conservation, livelihoods, human well-being.

Introduction

Mountain ecosystems provide many environmental services (ES): protection from natural hazards, water provision and regulation, food and fiber production, and scenic beauty (e.g., KÖRNER & OHSAWA 2005), all of which are sensitive to climate and land use changes. The Khumbu region (or SNPBZ - Sagarmatha National Park and Buffer Zone; fig. 2) has changed rapidly in recent years (e.g. BYERS 2005; STEVENS 2003).

Himalayan case studies reveal overexploitation, fragmentation and degradation (e.g. CHAUDHARY et al. 2007). These affect ecosystems' ability to provide ES, which affects human well-being (e.g. TEEB 2010). Despite efforts to provide a scientific basis for using ES for conservation in mountain areas (e.g. GRÊT-REGAMEY et al. 2012; RASUL et al. 2011), little attention is paid to locals' concerns (ZILBERMAN 2007), especially in the Himalayas.

This article presents and tests repeat photography as a way to examine local perceptions of change in selected ES: food, fodder, water provision, aesthetic landscape, timber and protection from natural hazards.

Case area

SNP and its buffer zone (BZ) is in the Solu Khumbu district of north-eastern Nepal (fig. 1). SNPBZ is administered by three village development committees (VDCs) (fig. 1).Recent satellite images show dramatic changes in higher mountain environments, with new lakes and retreating glaciers (BAJRACHARYA et al. 2007; MOOL et al. 2001). Since assessing and improving ES requires integrating diverse stakeholders' knowledge, recognizing power imbalances, and grappling with complex social-ecological systems, we believe our methodology could complement biophysical ecosystem assessments in MtPAs.

Historical photos were used in a diachronic photo-diary (143 side-by-side photos) from both the cultural and natural resource perspective over nearly six decades. We re-took selected photos across all 3 VDCs.

Methodology

We used a case study approach (DE VAUS 2001) and qualitative interviews, as these focus on concepts relevant to research participants.

Purposive sampling (HENDERSON 1991) was used to select interviewees who were communicative and concerned about the region's development. We also used theoretical sampling (HUNZIKER et al. 2007), to find contrast among interviewees (GARRARD et al. 2013b forthcoming), for example in age. 46 locals were interviewed. We assessed the

sample's sufficiency via LINCOLN & GRUBA`s (1985) guideline for ending data collection: the appearance of regularities in the data.

In each interview, we presented topographical maps and a diachronic photo-diary, which helped researchers and participants elucidate difficult concepts. We discussed perceptions of changes over time, then changes in selected ES. Interviewees ranked the degree of change on a 7-point Likert scale from -3 (negative change) to +3 (positive change) for each ES. Interviews were subjected to qualitative content analysis (HAY 2000).

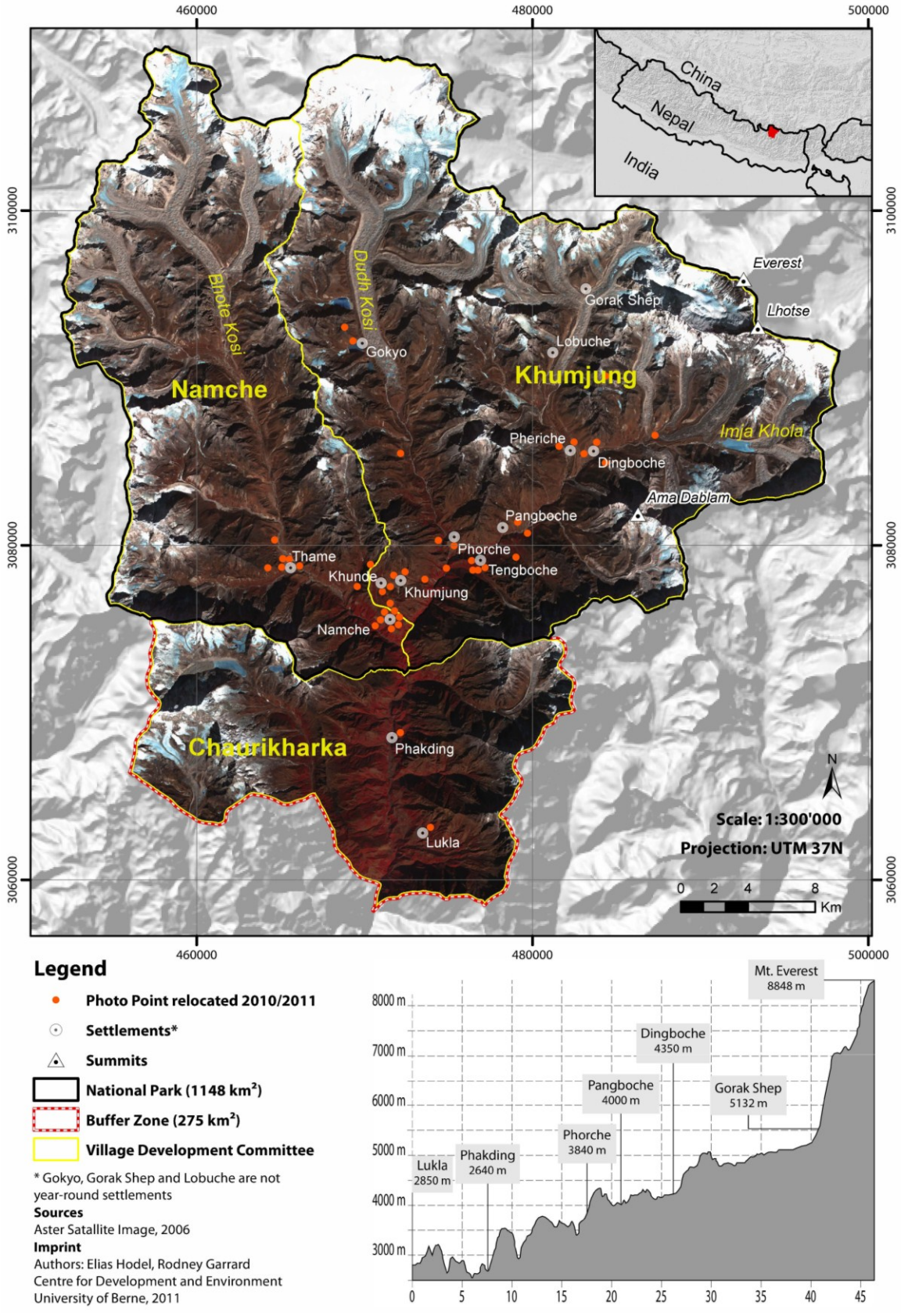

Figure 1: Sagarmatha National Park and Buffer Zone (SNPBZ)

Figure 2: [left to right] Namche 1950 (Photo: C. Houston), courtesy of A. Byers; Namche 1995 (Photo: A. Byers); Namche 2010 (Photo: R. Garrard).

Results

Interviewees made complex evaluations of multiple ES. All VDCs outlined negative changes to regulating services (protection from landslides and flooding) and provisioning services (firewood) and positive changes to water provision. Changes in cultural services (aesthetic landscape) and provisioning services (building timber) were seen positively if of value for tourism, especially by those wealthier individuals, or negatively if at odds with local values (e.g. access to forests).

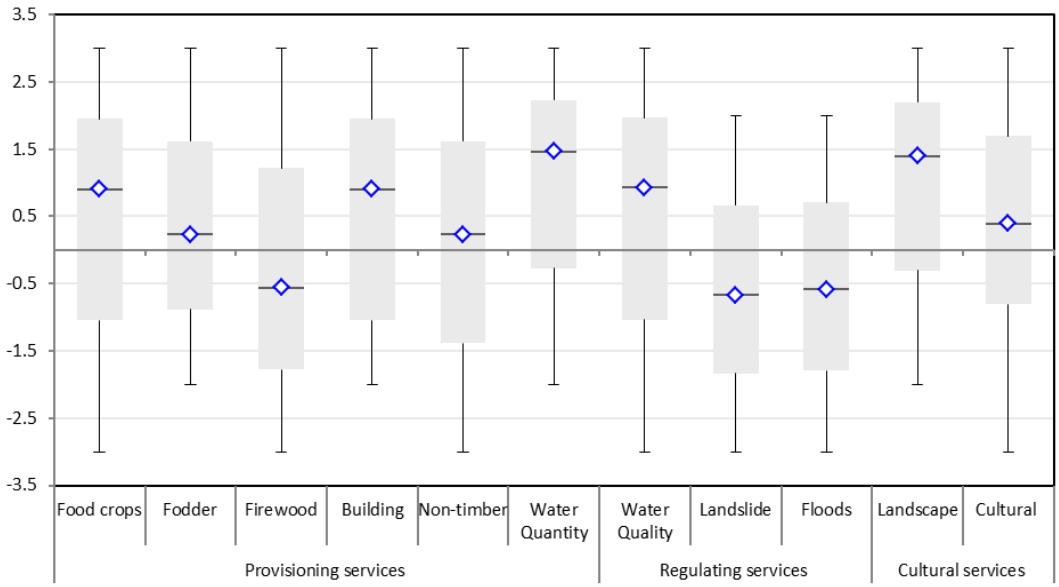

Figure 3: Perceptions of change in relation to selected ES in SNPBZ; the Likert assessment mean, 75% quartile, and ranges are shown. (N=46).

Food crops and fodder

53% of participants say traditional farming is getting harder. 67% blame demographic and economic factors (increased tourist demand, reduction of Sherpa workforce); 21% blame intensification of production factors (chemical fertilisers, new seed types, irrigation, greenhouses).

Most think the changes in farming are positive (fig. 3) but are worried about recent climate variability (ZIERROGEL & CALDER, 2003).

Firewood and timber

National Parks conservation policies are seen as failing to balance local well-being, conservation and development:

> FS610: we used to manage the collection of firewood within the community through our *shinngi nawa* [timber use tradition]... Now we are only allowed to collect two times a year [for] 10 days and we feel that next year it will be five days and then no access at all....

Since 1979, the SNP Forestry Programme has planted about 2 million seedlings in the region (GURUNG et al. 2010). Yet only 36% of participants believe the forest situation has improved, and 14% report degradation of the forest.

Water

81% say water provisioning is better (fig. 3). Virtually 100% of the park's population now has safe drinking water. However, 66% think winter snow has decreased, and 51% said monsoon rains are now heavier, but shorter.

This and increased demand are affecting water supply in five of the villages.

92% said the water has always been of very good quality, in contrast to this report:

> "Water sources along the major trails are being contaminated from improper affluent discharge, human waste, and garbage dumping. Sewerage and toilet waste can be found piped into nearby streams and rivers." (SNPBZ Management Plan, 2006: 46).

The uncertainties about the relationship between precipitation, watershed functions and land-use changes in SNPBZ need further exploration (GARRARD et al. 2013a forthcoming).

Landslides and floods

75% worried about changes to regulating services: river flooding, landslides and erosion due to land-use change.

With predictions of more intense rain (IPCC 2007), and more building in high-risk zones, landslides and floods are likely to accelerate.

Aesthetic landscape and culture

Participants are positive about cultural services (e.g. aesthetic landscape) especially lodge development for its tourism potential (fig. 3), but 27% worry about the deteriorating environment:

> CS1710: Look at these changes here (Gokyo photo # 90) even in this remote place it looks like a city... The way we live nowadays it's not natural.

17% thought tourist income was not fairly distributed, and 52% thought the significant change in SNPBZ was inflation. Sherpas' perception of their villages is changing; lodges have replaced *gombas* [monasteries] as the centre of civic life. 73% are concerned about recent in-migration of lowlanders.

Discussion

This paper has posed a question that is both empirical and methodological. Empirically, the study suggests three things. First, adverse changes in regulating services (landslides and flooding) are a concern, which underscores the need for a risk assessment and reduction programme based on improved understanding of local priorities.

Second, multiple complex factors affect perception of local ES change. This is reflected in participants' attention to the visual photo-diary and attachment to natural resource governance.

Finally, most interpretations of ES change carried an evaluative weight, often dualistic and rooted in each participant's values. This coloured the Likert scale assessment and shed light on aspects a more systematic assessment might ignore.

The perceived ES changes tally with case studies of incipient 'mountain transition' (e.g., CHAUDHARY et al. 2007) where economies struggle to cope with tourism. Unless policies change, the region's sustainability is threatened.

These empirical results help answer the methodological question: does this method work? As seen above, it provides valuable insights, allowing participants to discuss what matters most to them, not to the researcher, and to assess positive, as well as negative, change.

This aspires to be a first step in influencing conservation policies in SNPBZ towards broader participation for locals.

This article can be read in full in eco.mont Vol. 4 No. 2:
http://hw.oeaw.ac.at/eco.mont_collection?frames=yes

Acknowledgements

The authors wish to thank the participants and the community of the Khumbu; The Dept. of National Parks, Kathamndu; ICIMOD, Kathmandu; Ev-K2-CNR, Kathmandu; The Swiss Development Cooperation; Pemba Yangi Sherpa, Sonam Futi Sherpa, Gyanu Raja Maharjan, Da Yula Sherpa, Pasang Tendi Sherpa, Alton Byers, Ang Rita Sherpa, Tengboche Ringboche, Lama Gieshe, Sonam Hishi Sherpa and Tenzing Tashi Sherpa.

References

BASS, J. O. 2010. Learning Landscape Change in Honduras: Repeat Photography and Discovery. In: Repeat photography: methods and applications in the natural sciences / edited by WEBB H,R.; BOYER E,D; TURNER, M,R. Island Press. Washington DC.

BAJRACHARYA, S. B., MOOL, P. K., SHRESTHA, B.R. 2007. Impact of Climate Change on Himalayan Glaciers and Glacial Lakes - Case Studies on GLOF and Associated Hazards in Nepal and Bhutan. Kathmandu: ICIMOD.

BYERS, A. C. 1997. Landscape change in the Sagarmatha (Mt Everest) National Park, Khumbu, Nepal. Himalayan Research Bulletin XVII (2): 31–41

BYERS, A. C. 2005. Contemporary Human Impacts on the Alpine Ecosystems in Sagarmatha (Mt. Everest) National Park, Khumbu, Nepal. Annals of the Association of American Geographers, 95(1), 2005, p. 112–140.

BYERS, A. C. 2007. An assessment of contemporary glacier fluctuations in Nepal's Khumbu Himal using repeat photography. Himalayan Journal of Sciences. Vol 4 Issue 6. 2007.

CARPENTER, SR., MOONEY, HA., AGARD, J., CAPISTRANO, D., DEFRIES, RS., DIAZ, S., and others. 2009. Science for managing ecosystem services: beyond the millennium ecosystem assessment. In: Proceedings of the National Academy of Sciences of the United States of America, 106(5):1305–1312

CHAN, M. K., SHAW, M. R., CAMERON, D. R., UNDERWOOD, E. C., DAILY, G. C. 2006. Conservation planning for ecosystem services. Public Library of Science Biology, Vol. 4, No. 11. e379.

CHAUDHARY, R. P., AASE, T.H., VETAAS, O.R. & SUBBEDI, B.P. 2007. (Editors) Local Effects of Global Changes in the Himalayas: Manang, Nepal. Tribhuvan University, Nepal and University of Bergen, Norway.

CONSTANZA, R., D'ARGE, R., DE GROOT, R., FARBER, S., GRASSO, M., HANNON, B., LIMBURG, K., NAEEM, S., O'NEILL, R. V., PARUELO, J., RASKIN, R. G., SUTTON, P. & M. VAN DEN BELT 1997. The value of the world's ecosystem services and natural capital. Nature 387:253–260.

DAW, T., BROWN, K., ROSENDO, S., POMEROY, R. 2011. Applying the ecosystems services concept to poverty alleviation: the need to disaggregate human well-being. Environmental Conservation 38 (4):370-379.

DE VAUS, D. 2001. Research Design in Social Research. Sage Publications, London.

GARRARD, R. 2010. Landscape dynamics in Sagarmatha (Mount Everest) National Park, Nepal: Impacts on selected environmental services and adaptive capacities. A Ph.D. project. Research note in the Mountain Research Initiative (MRI) Newsletter 4th Edition, May.

GARRARD, R., KOHLER, T., WIESMANN, U., PRICE, F M., BYERS, C. A., SHERPA, R. A. 2012b. *An Ever-Changing Place*: Interpreting landscape change in Sagarmatha National Park, Nepal: re-photographic survey and encounter. eco.mont Vol. 4 No.

GARRARD, R., KOHLER, T., WIESMANN, U., PRICE, F M., BYERS, C. A., SHERPA, R. A. 2013a forthcoming. Interpreting landscape dynamics: Multiple methods in the study of the drivers of land use and land cover change in Sagarmatha (Mt. Everest) National Park, Nepal.

GARRARD, R., KOHLER, T., WIESMANN, U., PRICE, F M., BYERS, C. A., SHERPA, R. A. 2013b forthcoming. Listening to locals: A participatory assessment of environmental service change by different social groups in Sagarmatha (Mt. Everest) National Park, Nepal.

GRÊT-REGAMEY, A., KYTZIA, S. 2007. Integrating the valuation of ecosystem services into the input-output economics of an Alpine region. Ecological Economics 63:786-798.

GRÊT-REGAMEY, A., BRUNNER, H.S., KIENAST, F. 2012. Mountain Ecosystem Services: Who Cares? Mountain Research and Development 32(S1):S23-S34.

GURUNG, R., LEDGARD, N., KLATZEL, F. 2010. High Altitude Forestry Manual, Sagarmatha National Park Forestry Project. Sir Edmund Hilary Foundation of Canada, the Himalayan Trust. Mera Publications. Kathmandu.

GURUNG, S. M. 1989. Human perception of mountain hazards in the Kakani-Kathmandu area: experiences from the middle mountains of Nepal. Mountain Research and Development, 9(4), 353-364.

HARPER, D. 2002. Talking about pictures: a case for photo elicitation. Visual studies. 17(1):13-26

HAY, L. 2000. Qualitative Research Methods in Human Geography, Oxford University Press.

HAY, R. 1998. Sense of place in development context. Journal of Environmental Psychology 18:5–29.

HENDERSON, K. 1991. Dimensions of Choice: A Qualitative Approach to Recreation, Parks and Leisure Research. Venture Publishing, State College, PA.

HEWITT, K. 2009. Culture and risk: Understanding the sociocultural settings that influence risk from natural hazards synthesis report from a global E-Conference organised by ICIMOD and facilitated by the Mountain Forum Kathmandu, ICIMOD: 14.

HUNZIKER, M., BUCHECKER, M., HARTIG, T. 2007. Space and Place—two aspects of the human–landscape relationship. In: Kienast F, Ghosh S, Wildi O, editors. A Changing World—Challenges for Landscape Research. Landscape Series. Dordrecht, The Netherlands: Springer, pp 47–62.

HURNI, H., WIESMANN, U., SCHERTENLIEB, R. (editors) 2004. Research for Mitigating Syndromes of Global Change. A Transdisciplinary Appraisal of Selected Regions of the World to Prepare Development-Oriented Research Partnerships, Perspectives of the Swiss National Centre of Competence in Research (NCCR) North-South, University of Berne, Vol, 1, Berne: Geographica Bernensia: pp 13.

IPCC 2007. Climate change 2007: Impacts, adaptation and vulnerability. Working group ll Contribution to the Intergovernmental Panel on Climate Change Forth Assessment report. Cambridge UK: Cambridge University Press.

IVES, J.D. & B. MESSERLI 1997. Mountains of the world: a global priority. New York, USA and Carnforth, UK, Parthenon Publishing Group.

KÖRNER, C. & M. OHSAWA (Coordinating Lead Authors) 2005. Mountain systems. Chapter 24 In R. Hassan et al. (eds.) Ecosystems and Human Well-being: Current State and Trends, Volume 1, Island Press, Washington DC: pp 681-716

KREUTZMANN, H. 2009. Transformations of High Mountain pastoral strategies in the Pamirian Knot. In: Nomadic Peoples 13 (2), pp. 102-123

KRUGER, L. 2005. Community and landscape change in southeast Alaska. Landsc. Urban Plan. 72, 235-249.

LINCOLN, Y. & E. GUBA 1985. Naturalistic Inquiry. Sage Publications, Beverly Hills, CA.

MA [Millenium Ecosystem Assessment] 2003. Ecosystems and Human Well-Being: Current State and Trends. Washington, DC Island Press.

MAY, T. 1997. Social Research, Issues, methods and process, Open University Press, Buckingham, UK

McCracken, G. 1988. The Long Interview. Sage Publications, London.

Mool, P.K., Bajracharya, S.R. & S.P. Joshi. 2001. Inventory of glaciers, glacial lakes and glacial lake outburst floods: monitoring and early warning systems in the Hindu Kush–Himalayan region, Nepal. Kathmandu: ICIMOD.

Naidoo, R., Balmford, A., Constanza, R., Green, R.E., Lehner, B., Malcolm, T.R., Ricketts, T.H. 2008. Global Mapping of ecosystem services and conservation priorities. PNAS 105(28):9495-9500.

Nepal, K. S., Kohler, T. & R. B. Banzhaf 2002. Great Himalaya: Tourism and the Dynamics of Change in Nepal.

NPC 2011. Nepal Status Paper – United Nations Conference on Sustainable Development 2012 (Rio+20) Synopsis. Kathmandu, Nepal: National Planning Commission

Nüsser, M. 2001. Understanding cultural landscape transformation: a re-photographic survey in Chitral Eastern Hindukush, Pakistan. Landscape and Urban Planning 57, pp. 241–255.

Oven, K., Petley, D. N., Rigg, J., Dunn, C. & N. Rosser 2008. Landslides, livelihoods and risk: vulnerability and decision-making in Central Nepal. In N. Casagli, R. Fanti, & V. Fanti (Eds.), Proceedings of first world landslide forum, Tokyo, Japan, 2008 (pp. 236-240).

Rasul, G., Chettri, N., Sharma, E. 2011. Framework for valuing ecosystem services in the Himalayas. Kathmandu. ICIMOD.

Salemo, F. et al. 2010. Energy, Forest, and Indoor Air Pollution Models for Sagamatha National Park and Buffer zone Nepal, Implementation of a Participatory Modelling. Mountain Research and Development, 30 (2) pp 113-126

Schindler, B., Brunson, M., Stankley, G. 2002. Social acceptability of forest conditions and management practices: a problem analysis. Gen. Tech. Rep. USDA Forest Service, Pacific Northwest Research Station, Portland. http://www.fs.fed.us/pnw/pubs/pnw_gtr537.pdf, accessed 15 March 2012

Sharma, K. S., Manandhar, P., Khadka, S.R. 2010. Political Ecology of Everest Tourism. Forging links to Sustainable Mountain Development. VDM Verleg Dr. Müller GmBH & Co. KG, Germany.

Sherpa, Lhakpa Norbu. 1998. Effects of forest land use on structure and distribution patterns of High-altitude forests: A case study of Nangpa and Hinku valley, Northern Solukhumbu. Ph.D. dissertation at the University of Washington, Seattle.

Sherpa, Y.D. & R.B. Kayastha 2009. A Study of Livestock Management Patterns in SNPBZ: Trends as Affected by Socioeconomic Factors and Climate Change. Kathmandu University Journal of Science, Engineering and Technology 5 (2) 110-120.

Smadja, J. 2009. [1st edition 2003]. Reading Himalayan Landscapes over time. Environmental Perception, Knowledge, and Practise in Nepal and Ladakh. CNRS, Paris.

SNPBZ Management Plan 2006-2011. Sagarmatha National Park Office, Namche VDC, Solukhumbu, Nepal.

Stevens, S. F. 2003. Tourism and deforestation in the Mt Everest region of Nepal. The Geographical Journal. Vol. 169 Issue 3.

TEEB [The Economics of Ecology and Biodiversity]. 2010. Mainstreaming the economics of nature – A synthesis of the approach, conclusions, and recommendations. Available on http://www.teebweb.org/Portals/25/TEEB%20Synthesis/TEEB_SynthReport_09_2010_online.pdf, accessed 15 March 2012.

Turner, W.R., Brandon, K., Brooks, M.T., Gascon, C., Gibbs, K.H,. Lawrence, S.K., Mittermeier, A.R., Selig, R.E. 2012. Global Biodiversity Conservation and the Alleviation of Poverty. BioScience 62: 85–92.

Webb, H.R., Boyer, E.D., Turner, M.R. 2010. Repeat photography: methods and applications in the natural sciences. Island Press. Washington DC.

WWF Nepal [World Wildlife Fund] 2008. Landslide Hazard Zonation Mapping and Vulnerability Assessment along the trekking route from Ghat to Manjo in Solukhumbu District, SNPBZ. July 2008.

Zierrogel, G., Calder, R. 2003. Climate variability and rural livelihoods assessing the impacts of seasonal climate forecasts. Royal Geographic Society. http://uct.academia.edu/GinaZiervogel/Papers/198981/Climate_Variability_and_Rural_Livelihoods_Assessing_the_Impact_of_Seasonal_Climate_Forecasts_In_Lesotho (accessed on the 21.03.12).

Zilberman, D.V. 2007. Payments for environmental services: who gains who loses? Agricultural and Resource Economics Update 11 (1), 1-3.

Contact

Rodney Garrard
rodney.garrard@cde.unibe.ch

Centre for Development and Environment (CDE)
University of Bern
Hallerstrasse 10
3012 Bern
Switzerland
Tel.: +0041 44 820 1203