

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

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### 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. GRÉT-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).

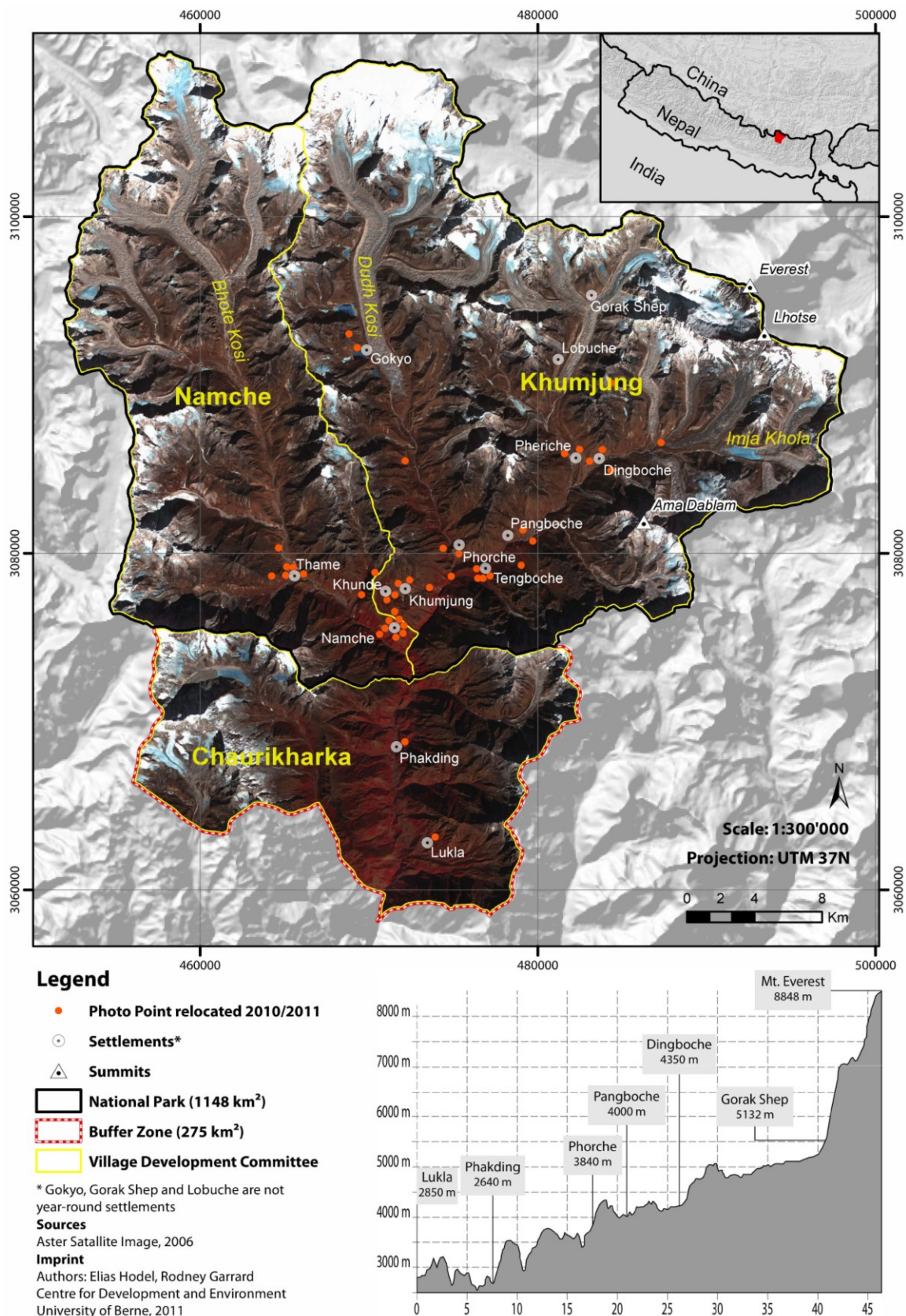


Figure 1: Sagarmatha National Park and Buffer Zone (SNPBZ)



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).

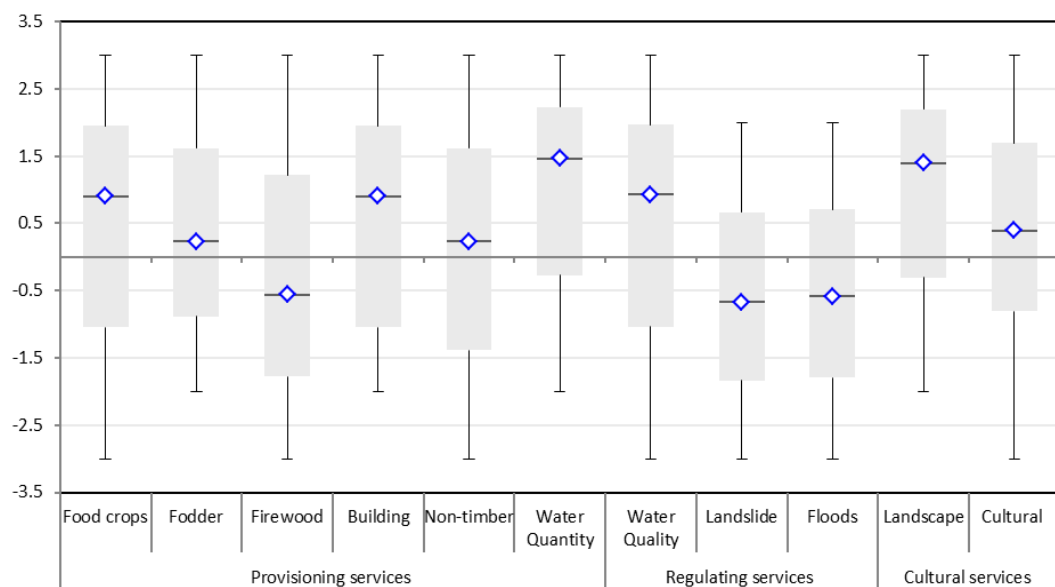


Figure 3: Perceptions of change in relation to selected ES in SNPBZ; the Likert assessment mean, 75% quartile, and ranges are shown. (N=46).

### 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](http://hw.oeaw.ac.at/eco.mont_collection?frames=yes)

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