

**Solid Waste Pollution and the Environmental Awareness of Trekkers
in the Annapurna Conservation Area, Nepal**

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Abstract

The purpose of this study was to evaluate the effectiveness of solid waste management within the Annapurna Conservation Area (ACA), Nepal. Data that focused on waste quantity and type were collected along the Annapurna Circuit trail over 100 metre transects, as well as 100 metres near major villages. Waste was counted and classified into three categories: readily biodegradable waste (RBW), biodegradable waste (BW), and non-biodegradable waste (NBW). A number of sub-categories were used to further characterize the waste according to material composition. Overall, plastic waste contributed the largest portion of litter found in the ACA, and more waste was found near villages than along trails. A survey was completed by seventy-six tourists that focused on questions related to environmental responsibility in the ACA, and tourist awareness of the environmental initiatives developed by the Annapurna Conservation Area Project (ACAP) in the area. Results indicate that while most tourists in the region made sustainable choices, awareness of the ACAP and its initiatives have decreased in recent years. Alternative forms for raising awareness, as well as more stringent document control may contribute to addressing the issue. In addition, more comprehensive and community integrated solid waste management programs could be developed in the ACA to reduce the amount of solid waste found along trails and in villages.

Introduction

Attributed to this sizeable tourism industry, the Annapurna Conservation Area (ACA), Nepal is burdened by the generation of solid waste. Accommodating for the number of tourist visits, and catering to foreign tastes, local shopkeepers and restaurant/lodge owners resort to harvesting or importing large quantities of resources, commodities and materials that will eventually require disposal. In addition, many trekkers

bring with them supplies, items or goods that may also produce waste. Conservation efforts within the ACA attempt to address these issues by promoting sustainable waste-related practices, including waste-reduction efforts and preferred disposal initiatives (Bhujū et al. 2007).

Sustainable waste management is one element of development that the Annapurna Conservation Area Project (ACAP) attempts to promote. The effect of solid waste in mountainous regions around the world is not a novel issue, and has been a concern for many decades (Basnet, 1993). Several studies have examined the environmental impacts of solid waste on popular hiking and trekking regions, such as Mount Everest, Mount Kilimanjaro, and various mountain areas within the Himalaya of Nepal, India, and China (Basnet, 1993; Kaseva and Moirana, 2010; Kuniyal, 2002; Kuniyal, 2005; Kuniyal et al. 2003; Pawson et al. 1984). The issue arises as a consequence of the lack of or inadequacy of proper disposal sites, waste management authorities, and infrastructure to accommodate the waste that is produced in these areas. Tourists and locals are often unaware of the associated environmental impacts of the disposal of waste along the trails. Waste is often hidden in crevasses adjacent to the trails, or around villages and base camps, eventually creating large mounds of garbage out of sight from the average trekker (Kaseva and Moirana, 2010; Kuniyal, 2002).

A number of ACAP activities attempt to promote preferable disposal methods and reduce the volume of solid waste generated in ACA. The project's "Sustainable Tourism Management Programme" (STMP), has initiated some waste-management oriented activities, including: lodge management training programs, the installation or construction of rubbish bins, pits and dumping sites, and waste transportation campaigns to remove waste from ACA. Other elements of the program focus on waste reduction as attempts are made to raise awareness and educate ACA visitors with literature at visitor centres, as well as through printing on brochures and signage (Bhujū et al. 2007; KMTNC, 2005).

A study by Thomson (2007) focused on environmental consciousness in the ACA and included a questionnaire for tourists trekking the Annapurna Circuit. The survey prompted trekkers to answer questions related to their awareness of the ACAP and its goals, and the environmentally friendliness of their behaviours. Thomson stated that at the time of his study, awareness of the ACAP was poor, but that most trekkers did behave in an environmentally responsible manner. In terms of solid waste, 59% of the respondents indicated that they carried out most plastic and non-biodegradable rubbish and 83% purified their own water instead of using bottled water. Thirty-five percent also reported that they

were aware that rubbish accumulation was a problem in the ACA. In order to improve environmental conservation in the area, the author suggested that lodges should become “eco-rated” and “ACAP Approved” to allow trekkers to make more environmentally responsible choices in terms of their accommodations and meals. In addition, ACAP should do more to ensure tourists are aware of the environmental initiatives and goals undertaken in the region.

The work by Thomson (2007) formed the basis for the survey conducted as part of this study, and is used for a comparative analysis to investigate whether trekkers have become more aware of ACAP initiatives and the environmental impacts associated with tourist activities. For the purpose of providing a viable comparison, the methods employed here were designed to parallel those of the aforementioned study. This study aims to evaluate the effectiveness of solid waste management within the ACA, as well as the awareness and participation of tourists in associated initiatives.

Methodology

Solid Waste Categorization: Data that focused on waste quantity and type were collected along the Annapurna Circuit trail between May 15 and May 28, 2011. Along the trail, waste was counted and categorized twice daily over 100 metre transects measured using a measuring wheel. A total of 23 trail samples were collected. Solid waste was also quantified and categorized for 50 metres as the trail entered and exited villages in the ACA. Data were collected at the following villages: Ghermu, Chamje, Baggarshap, Qupar, Lower Pisang, Manang, Letdar, Thorung Phedi, Muktinath, Kagbeni, Marpha, Kalopani, and Tatopani. A total of 25 village samples were collected.

Each piece of waste was counted and categorized in terms of biodegradability and material make-up, which was in accordance with classifications used in similar studies (Kuniyal, 2002; Kuniyal et al. 2003). Solid waste was separated into three categories: readily biodegradable waste (RBW), which normally degrades within two weeks; biodegradable waste (BW), which degrades within a few months; and non-biodegradable waste (NBW), which degrades after several years or not at all. A number of sub-categories were used to further characterize the waste according to material composition (Table 1). Waste was counted only if it was directly on the trail or within 0.5 metres on each side of the trail.

Table 1. Solid waste categories and sub-categories

RBW	BW	NBW	
Food waste	Paper/cardboard	Non-recyclable	Recyclable
Plant residue	Clothes/fabric/shoes	Batteries	Plastic bottles
		Bones/eggshells	Plastic bags
	Straw	Rubber/leather	Glass
	Fur/hair	Juice boxes	Aluminum
	Wood	Cigarette butts	Metal
		Plastic food wrappers	
		Other plastic	
		Other	

Tourist Surveys: In addition to quantitative data focusing on the amount of solid waste in the area, qualitative data were collected using an interview-based survey based on the questionnaire used by Thomson (2007). The survey was completed by 76 tourists and focused on questions related to environmental responsibility in the ACA, and tourist awareness of the environmental initiatives developed by ACAP. The results from the interview-based survey were compared to the results of Thomson’s survey to investigate if trekkers have become more aware of ACAP initiatives and the environmental impacts associated with tourist activities.

Results

Solid Waste Categorization: A total of 2030 pieces of solid waste were identified and categorized near villages and along the trail. NBW contributed the largest portion of waste found (80.8%). Within this category, plastic waste made up the majority of litter observed, accounting for 56.8% of the total amount of waste quantified within the study. Plastic waste included plastic food wrappers, plastic bags, plastics bottles, and other plastic. Within the BW category, which made up 16.7% of the waste found, clothes/fabric/shoes accounted for the greatest portion, followed by paper/cardboard. RBW was the least common type of waste encountered within the ACA (2.5%). Overall, the top five solid waste sub-categories were: plastic food wrappers, other plastic, clothes/fabric/shoes, cigarette butts, and paper/cardboard.

The largest portion of solid waste was found near villages (70.4%) rather than along trails (29.6%). In both cases, NBW accounted for the majority of solid waste, followed by BW and RBW. The trail leading into Muktinath, a popular and sacred pilgrimage site for both Hindus and Buddhists, was the most littered area in the study. Within the 50 metre transect a total of 351 pieces of litter were observed, consisting mainly of plastic food wrappers (157 pieces), cigarette butts (85), and

clothes/fabric/shoes (45 pieces). The next four areas with the most solid waste were: Qupar, Tatopani, Kalopani, and Marpha.

Tourist Surveys: Trekkers were asked to answer questions related to the steps they took to reduce their environmental impacts. Of the tourists surveyed, almost all reported that they purified their own water or used safe drinking water stations, rather than resorting to purchasing bottled water. Similarly, 92% of those surveyed stated that they made sure to avoid littering. Most trekkers reported that they limited purchases of beverages that came in plastic bottles. Over half of those surveyed stated that they carried out their non-biodegradable waste. Slightly more than half made sustainable meal choices. Just over one third of tourists visited an ACAP information centre during their trek and just over one quarter checked the type of fuel being used by lodges.

Trekkers were asked to discuss any environmental problems they had noticed during their time spent in ACA. Almost all (93%) of those surveyed identified at least one or more environmental problem(s) within the region; only five reported not having been aware of any problems. Of the thirteen total issues reported by tourists, 71% identified littering and garbage on the trails as an environmental problem. Just over a quarter of interview subjects identified deforestation as a significant environmental problem; road construction was the third most reported at 24% of tourists. Water pollution was seen as an environmental problem by 20% of trekkers. Both air pollution as a result of garbage burning, and human waste or toilet paper near water sources, were seen as issues by 7% of subjects.

Trekkers were also asked to describe the types of waste that they had observed, if any, during their trek. Plastics made up the most observed types of solid waste, specifically plastic food wrappers, plastic bottles, and plastic bags. Clothes, rags and shoes made up a large portion as well, with just under half of tourists reporting to have seen these types of waste.

Discussion

Solid Waste Management: As tourism numbers continue to increase in the ACA, the amount of solid waste accumulating in the region will inevitably rise as the demand by trekkers and locals for imported goods increases. With the construction of new roads through the area, the problem may worsen, as the price of goods decreases and transportation becomes faster and more reliable. At the same time, it would be favourable and very beneficial if the same roads could be used to transport solid waste out of the mountainous regions to larger, main settlements that have the capacity to reuse and recycle some of the non-biodegradable

items. Currently, the majority of waste accumulated in the villages is gathered into piles and incompletely burned, leaving behind unappealing ash-ridden remnants of waste. In other instances, litter is hidden in rock crevasses or in piles behind buildings out of site from the trail. Although trekkers may feel satisfied knowing they disposed of their waste in garbage bins located in the villages, the locals have very few options for disposing of this waste.

One initiative would be to develop solid waste collecting programs that remove waste from the mountainous region through the financial support of the Nepalese government or ACAP. A portion of the money generated from the tourist ACA permit could also be used as a source of funding. In 2005, the STMP removed 690 kilograms of non-biodegradable waste in Upper Mustang, which is outside of the Annapurna Circuit trail (KMTNC, 2005). Similar undertakings have been successfully employed by the Sagarmatha Pollution Control Committee (SPCC) on Mount Everest to remove solid waste from the area (Nepal, 1999).

Another option for managing solid waste in the ACA is the development a tourist program where trekkers are required to carry-out any self-generated waste, similar to the “trash-in-trash-out” (TITO) program developed within Kilimanjaro National Park. This initiative requires tourists or their porters/guides to carry-out all solid waste generated while on Mount Kilimanjaro. Trekkers are given bags at the beginning of the trek, and along the trail weighing stations are set up to measure and record the weight of each bag. At the end of the trek, the weight of each bag is compared to the weights recorded previously to ensure that all the waste is accounted for. If there is a discrepancy, the tourists and the porters/guides must provide an explanation for the difference (Kaseva and Moirana, 2009).

An issue that was raised by several trekkers surveyed along the trail was that there were very few Safe Drinking Water Stations in villages at the beginning of the trek. In addition, the price of plastic water bottles in villages at lower altitudes was very cheap – approximately 15-30 NPR compared to 100-150 NPR at higher altitudes. Due to the inexpensive price and lack of Safe Drinking Water Stations, many trekkers purchased bottled water if they did not have iodine/chlorine tablets or UV sterilizing pens. In order to decrease the amount of plastic bottle waste, ACAP could provide more Safe Drinking Water Stations along the trail and increase the price of bottled water and even soft drinks.

Education is another important factor – not only for tourists, but also for local residents. In order for a solid waste management program to be successful in the ACA, it must involve community involvement and

education. Community members should be continually encouraged to act as environmental stewards – they must feel a sense of ownership over the program and a responsibility to protect the natural environment. Managing solid waste in the ACA must be a collaborative effort between tourists, villagers, the local district governments, ACAP, and the Nepalese government. Without cooperation and mutual support from all parties, it would be very difficult to implement a successful waste management strategy.

Declining Awareness: In terms of tourist behaviour, results reveal that there have been slight changes with respect to observations made by Thomson (2007). The findings suggest that tourists are continuing to act in a fairly environmentally responsible manner in relation to their waste production and disposal habits, despite low levels of awareness of the ACAP initiatives. Nearly all survey subjects indicated that they avoided littering and limited purchases of beverages packaged in plastic bottles. Compared to Thomson (2007), there was a small increase in the number of trekkers carrying out their non-biodegradable waste.

Despite being environmentally conscious about waste, other aspects of tourist behaviour could be improved. Compared to Thomson's findings, a slight decline to less than 50% was found in the number of ACAP information centre visits. By providing a greater level of awareness for all of ACAP's Minimum Impact Code recommendations, and by ensuring that they are accurate and standardized, the ACAP could encourage trekkers to act more sustainably, and reduce the tourism-related impact on the environment in the region.

Although tourists are acting sustainably in their waste-related behaviours, it is clear that waste management within ACA is still an issue. Over 70% of survey subjects believed that littering along the trails and in villages was an environmental issue within the region. This is a large increase over the 35% percent that reported it as an issue in the Thomson's study.

Conclusion

This paper has examined some of the issues surrounding solid waste in the ACA, its impact on trekkers and local villages, and tourist awareness of environmental initiatives. The ACAP may serve as a unique and creative solution to many of the environmental, cultural, and developmental issues that stem from tourism in the region. However, there are a number of challenges that can be addressed to allow the program to better accomplish its mandated objectives. Trekker awareness of the program and related initiatives is insufficient and has apparently decreased

in recent years. However, despite the lack of awareness, trekkers continue to act in a reasonably environmentally sustainable manner, increasingly so in terms of their waste-related habits.

In terms of waste, the majority results from tourist demand for familiar items such as soft drinks and chocolate bars – goods that are also being purchased and consumed by locals. Although most trekkers do not litter while on the trail, they dispose of their waste in garbage bins found in villages or leave their waste at lodges. This places the burden of disposal on local business owners and residents. Without the proper infrastructure and support from the government or ACAP, these villages have few available options. Plastic is the most common type of waste found in the ACA, and there is potential for these items to be reused or recycled if the proper infrastructure and transportation systems were developed. The ACA is in need of a comprehensive and community integrated solid waste management program to reduce the amount of litter found along trails and in villages. With the cooperation of all stakeholders, including funding from the local governments and ACAP, there is potential for the development of a suitable and practical program. If not, the popular trekking region may lose its ability to allure tourists with its pristine and aesthetically pleasing environment.

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