

## Sustainability Threats to Mountain Tourism with Tourist Mechanized Mobility Induced Global Warming: A Case Study of Nepal

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### Abstract

Mountain tourism is sensitive to global warming and responsible in coping to and adapting with its effects. The fast growing global tourism industry is bound to increase its share from existing 5 per cent of total global CO<sub>2</sub> emissions, one of the high up sources of global warming. The three quarters (as the majority) of this emission is covered by mechanized mobility of passengers (both tourists and non-tourists). The trend of growing ecological footprints of tourists mechanized activities from all kinds of tourism (e.g. mass or alternative) is not only adding to the challenge of global warming but also gradually threatening the sustainability of mountain tourism destinations.

In this context, this paper brings its attention towards mass tourism bound emerging mountain tourism destination of Nepal which is bound for high growth on international tourist arrivals. Such a trend is compelling to grow tourists' mechanized mobility segments in Nepal. The paper focuses tourists' mechanized mobility induced global warming trend and its related various spatial effects in Nepal Mountains. This paper also finds out the responses of various direct and indirect tourism actors in managing tourist mechanized mobility segments and copings. The innovative responses of the local actors in recent time reveal about the considerable contribution to transform the conventional mountain tourist destination of Nepal into a new form of sustainable tourism destination. The recent mass tourism bound landlocked mountain tourism destination of Nepal and others can learn much from the early matured European tourist destinations of all kinds (e.g. Alps, Andes and Rocky mountains) of Europe and Americas on responding to such negative impacts. The paper finally stresses for the substantial exchange of scientific research information and mutual learning among the mountain tourist destinations of all kinds.

**Keywords:** Tourist mechanized mobility; Mountain tourism; Global warming effects; Local responses; Sustainable tourism

### Introduction

This unprecedented growth of international travels in recent time with 1.087 billion in 2013 has benefited mountain tourism, coastal tourism and other tourists' destinations of cultural and natural interests on an accelerating pace [1].

Mountain tourism as an integral part of global tourism has appeared as a romantic idealism for tourists who are dwellers and lovers of mountains. As a major growth center of mass tourism from its surface area, mountain tourism in these destinations accounts about 15-20 per cent share with a total turnover of US\$ 70-90 billion per year in the global tourist industry [2]. This share of mountain tourism in global tourism industry is spread in Mountains of all kinds (e.g. Alps, Hindu Kush-Himalayas, Andes and Rocky mountains) which caters one-fifth (nearly 24 per cent) of the earth's land surface area in a great variety of shapes, climatic conditions, ecosystems and diversity of cultures [3]. Nevertheless, mountain tourism has been facing a number of global challenges for its sustainable development [4,5]. Such challenges namely; [1] managing dynamic growth, [2] global warming and climate change, [3] poverty alleviation, [6] support for conservation and [7] health, safety, and security largely threaten the sustainability of this (mountain) tourism. Among the five key challenges, global warming and its induced climate change have emerged as one of the greatest global challenges in general and also to sustainable development of the UN Millennium Development Goals in particular. Such climate change phenomena is caused by the massive increase of greenhouse gases such as carbon dioxide, methane, ozone, nitrous oxide, and water vapor in the atmosphere resulting from deforestation and the burning of fossil fuels for energy production, industrial processes and transport.

The exponential growth in the demand for tourist services coinciding with the growing modern mechanized transportation mobility like cars, trains, ships and flights have made many valleys in mountain regions of the globe as easily accessible for tourists. With such easy accessibility of tourists on mechanized transportation mobility, the tourist mobility component has included tourists' ecological footprints from the travel to the airport at source area, travel in the air (outbound and inbound) and on surface (ground and water) at transit area and travel whilst in final destinations (e.g. organized tour, travel in car etc.) [8]. Thus, there are ecological footprints of tourism activities widespread throughout source area, transit area and destination area. This phenomenon is particularly threatening the sustainability of mountain tourism destinations. In this context, the reciprocal close relationship between tourism and environment and the importance of environmental planning and sustainable tourism development planning are being increasingly recognized.

As the syndromes of global change, the mechanized mobility has affected the economic, social and political agendas of the globe. It is one of the supplementary collective elements of global warming on glaciers

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and mountains in Nepal Mountains as Nepal faced from the problems of pollution, deforestation and litter [9]. There are transformations of nonmotorized trekking routes (Note-1) into motorized (mechanized) routes in mountain tourist destinations. It has resulted with increased tourist arrivals. Various literatures [10-19] have paid increased attentions to the need of the sustainability of tourism mechanized mobility system in this regard. In this context, this paper covers the case studies of Annapurna trekking area, Manakamana cable car in Manakamana (Gorkha) and Kathmandu in the landlocked country of Nepal. These studies offer distinct examples of tourist sites which are in the verge of such effects of global warming. In these contexts, this paper attempts to address following research questions on the consequences appearing in mountain tourism and responses shown in relation to the tourist mechanized mobility induced warming effects in Nepal Mountains.

- a) What are some noticeable spatial impacts of mass tourism induced tourist mechanized mobility? How are such impacts occurring?
- b) How are the local transport companies responding to reduce CO<sub>2</sub> emission or offset carbon schemes while managing tourists' mobility on environmental friendly modes?
- c) What are supplementary local responses being made by other actors in Nepal Mountains to manage and prevent tourist mobility induced global warming effects in Mountain tourism?

While addressing above questions, this authors came across some remarkable responses in Nepal Mountain tourist destinations to cope with such effects. A close look at such coping responses in such destinations and their exchange of knowledge can not only be useful learning experience in Nepal but also be beneficial for other mountain tourist destinations in the world which have similar landlocked features as like Nepal.

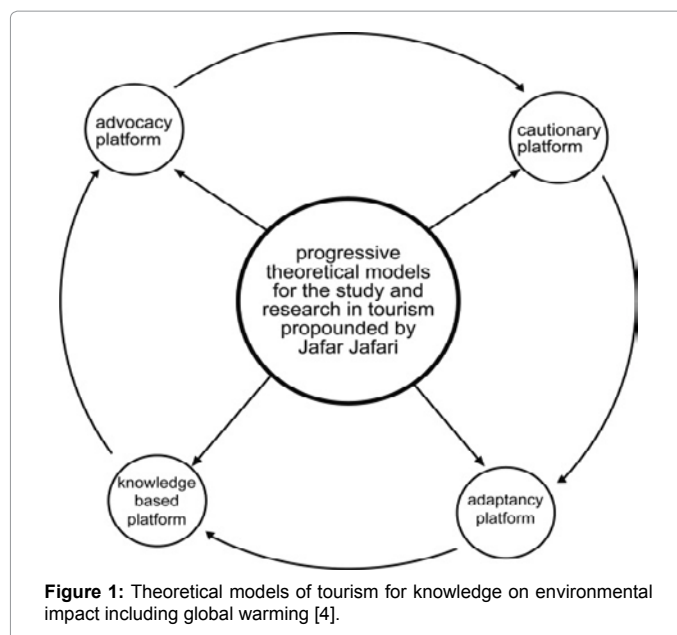
The responses made by transport companies in reaction to climate change in these destinations also reveal the gradual development of an alternative form of sustainable tourism informed by the awareness of interdependence between tourism and global warming effects on mountain tourism destinations.

## Methodology

The author has applied eclectic approach for the formulation of this paper. The qualitative and quantitative information were collected through secondary and primary source of information from the research based work in the year 2010 in Nepal. The secondary source of information included a comprehensive review of relevant published and unpublished literatures, reports and data. The primary source of information consisted of empirical observations through site visits and in-depth interviews with local people, owners and managers of tourist hotels and restaurants and tourism promotion authorities as selected under purposive sampling in Annapurna trekking region and Manakamana (Gorkha) in Nepal. The site visits for data collection in Nepal included destinations like Annapurna trekking region and Manakamana (Gorkha) during September-October 2012.

## Global Warming Induced Threats to the Sustainability of Mountain Tourism: A Conceptual and Theoretical Foundation

Mountain tourism coinciding with global tourism is found rolling through four progressive theoretical platforms (e.g. advocacy, cautionary, adaptancy and knowledge based platforms—Figure 1) in



which two earlier platforms (e.g. advocacy and cautionary) clearly indicate and warn against mass tourism stimulated unsustainable tourism practices and its' resulting negative effects both in economic and non economic areas in which global warming is evidently high up [6,7].

There are a range of crucial elements under cautionary platform (Figure 1) which clearly states about its sustainability threats. These threats from environmental perspectives include destruction of natural environment, exploitation of local resources for outside interests, growing environmental impacts of tourism, etc., [20]. Such elements are hidden reasons for resource degradation, inequity and inequality and can fuel conflict.

In relation to the increased global warming and climate change from environmental perspective, a recent report published by the Intergovernmental Panel on Climate Change (IPCC) brings together a consensus on the state of knowledge on all key researches. It states the clear evidence of a 0.75°C rise in global temperature and 22 cm rise in sea level during the 20<sup>th</sup> century [21]. The catastrophic effects of a superheated world is seen with places that are facing the global warming in different forms of natural calamities like cities deep underwater, frozen continents and the collapse of global agriculture and so on [22].

There are a number of other challenges in various forms (e.g. glacier retreat, melting of permafrost, less snowfall, changes on ugly appearance of mountains due to melting of glaciers, formation of glacial lakes, lakes' outbursts and devastating floods, slight climate changes, etc.) as accelerated in recent times. The IPCC synthesis also predicts that global temperature could raise further between 1.1 and 6 degree Celsius by 2100 and sea level could rise by between 28 cm and 79cm, more if the melting of Greenland and Antarctica accelerates [21]. This has necessitated giving a closer look in the nitty-gritty of this globally challenging issue.

These studies reveal about the fast growing global tourism industry as bound further to increase its share from existing 5 per cent of total global CO<sub>2</sub> emissions in which three quarters of the total global CO<sub>2</sub> emissions is caused by passenger transport.

## The State of Art of Mountain Tourism in Nepal

Over 80 per cent of land mass from a total of the 1, 41,181 sq. km [23] area of Nepal is covered with mountain landscapes including Himalayas that cover around 800 sq. km. beginning from Byasrish Himal in Darchula in the West and ending in Kanchejunga in the East [24].

Mountain tourism in Nepal is six decades old (e.g. Maurice Herzog's first successful ascend to Mt. Annapurna in 1950 and Sir Edmund Hillary and Tenzing Norgay Sherpa's first ascend to Mt. Everest in 1953). As a pioneer tourism activity in Nepal, Mountain tourism started only from 1950, the year Nepal formally opened for tourists. The number of tourists visiting Nepal Mountains had risen in mass numbers in latter periods during 1980s, 1990s and 2000s. There were peaceful and exotic Mountain trekking routes with snow cover and pristine mountain landscapes as the principal attraction in earlier period in Nepal Mountains which were normally free from noise, air and dust pollutions.

Nepalese Mountain tourism is being popularized for mass arrivals of tourists in recent years through various national mega events (e.g. Visit Nepal Year 1998, Destination Nepal Campaign 2002-03 and Nepal Tourism Year 2011) of tourism. Such promotion events with targeted growth of international tourist arrivals are persuading to promote mechanized tourists transportation in the days to come in Nepal.

Tourists coming to Nepal in the year 2012 for mountain tourism related activities (including trekking, mountaineering, pilgrimages and holiday pleasures in mountains areas) constituted about 74.02 per cent from a total of 803,092 arrivals [25]. The pioneer and major mountain tourists destinations like Manakamana in the Central region, Annapurna in the Western region, and Kathmandu in Central Nepal (which are selected as case studies in this article) and Everest in the Eastern region have witnessed sharp increase in tourist arrivals (Table 1) except the years 2002, 2004 and 2005 when there was armed insurgency coincided with political instability in Nepal.

The gradual growths of tourism on mass form being based on the mechanized tourist mobility in these destinations (as show in Table 1) have resulted with significant environmental challenges [26,27]. On these backgrounds of tourists' increments on mountain tourism in Nepal Mountain, this author now comes up to answer three specific questions as raised earlier in this paper.

## Spatial Impacts of Tourist Mechanized Mobility

The popularity of Nepal Mountain tourism destinations coinciding

with the increased uses of the mechanized tourists' mobility in recent period have started to threaten their sustainable tourist destination statuses. Currently, many of the historical routes in the Himalayan countries in Hindu Kush Himalayan regions and specially Nepal Mountains are affected by the construction of new motorable roads as the consequence of prioritized rural access, poverty alleviation efforts and modern development needs. With such trends, the mountain tourist destinations in Nepal are under the verge of both positive and negative repercussions. Such mechanized tourists transportations constitute major factors of carbon emissions.

The respondents (e.g. tourism promotion authorities, local people, tourist restaurant owners and managers of hotels in mountain tourist destination in Nepal) who were questioned for their remarks mentioned that they are little known and not sure about the real factors and phenomena in the system of atmosphere that are causing on these changes. However, they perceive some negative spatial changes occurred on their surrounding mountains and glaciers. Such impacts included noise, air (CO<sub>2</sub> emission), and dust pollutions resulting from tourists' mechanized mobility. The other secondary spatial impacts are arisen as less snowfall, changes on the amount of glaciers, glacier melting, changes on ugly appearance of mountains due to melting of glaciers, formation of glacial lakes, lakes' outbursts and devastating floods below, slight climate changes, etc. Such changes do not support mountain tourist destinations from the sustainability perspectives.

In line with these scenarios, short but specific reflections on the spatial effects on mountains and glaciers caused by mass tourism induced rapidly growing tourist mechanized mobility coincided with some other factors of global warming in Nepal Mountains are presented in succeeding paragraphs.

### Mechanization of highways with heavy tourist traffic pressure, an eyewitness in Manakamana

Manakamana, a mountainous Hindu pilgrimage destination situated towards the West of Kathmandu on a distance of 125 km in Western Nepal is operational with Manakamana cable car since 1998. It links the Bottom Station (258 m) at Kurintar (2½ hrs from Kathmandu) with the top Station (1302 m) at Manakamana, a famous mountain pilgrimage destination with Hindu goddess temple. This cable car has ferried more than 7,000,000 passengers till 2012 since the beginning of its operation.

Earlier to 1998, there was road plus trekking combination instead

Year	Tourist (International and domestic) arrivals in Manakamana	% change	Tourist arrivals in Annapurna Conservation Area	% change	Tourist arrivals in Sagarmatha (Everest) National Park	Change
2001	444,082		65,313		25, 920	
2002	327, 689	-26.2	38,642	-40.83	19, 670	-24.11
2003	432,644	32.02	40,668	5.24	20, 051	1.93
2004	296,416	-31.48	42,347	4.12	21,950	9.47
2005	311,696	5.15	36,224	-14.45	19,522	-11.06
2006	446,102	43.12	37,901	4.62	20,693	5.99
2007	568,693	27.48	60,237	58.93	26,511	28.11
2008	582,945	2.5	72,175	19.81	31,201	17.69
2009	668,323	14.64	78,500	8.76	29,036	-6.13
2010	801,987	19.99	88,418	12.63	32,084	10.49
2011	978,424	21.99	85,314	- 3. 51	33,390	4.07
2012	1,074,108	9.77	102,570	20.22	35,671	6.83

Source: [25,36,37]

**Table 1:** Trends of growth of tourists in Manakamana, Annapurna and Everest Mountain regions.

of road plus cable car to reach the temple. The towering temple hamlet came into the sight very slowly as result of one's own labor of the heterogeneous qualities of physical movement in a landscape imbued with cultural significance [28]. The intake of maximum physical exertion was also a barrier preventing the rapid growth of pilgrims. The start of cable car has greatly induced the mechanization of highways and modern mechanical means of transportation connecting Kurintar. This is clearly evident when there was very few or non of vehicle (photo 1) and now higher number traffic and frequent jam of vehicles in the highway (photo 2).

This has triggered the mobility of a significant number of domestic pilgrims as well as international tourists (Table 1). This is ultimately causing congestion, carbon emission, and waste.

### Motor road constructions on round Annapurna Circuit Trek and increased tourist traffic pressure

The round Annapurna circuit trek route (RACTR), a highly popular trekking route with unique natural and cultural attractions near the city of Pokhara in Western Nepal is currently seriously endangered by the massive construction of roads along the Marsyangdi and Kali Gandaki river valley (photo 3). The construction of a road in the northern part of the Annapurna Circuit-through Tatopani to the temple at Muktinath has started to cater the needs of surface transportation of growing tourist traffic. As a result, the traffic reached to 88,418 numbers in 2010, 85,314 numbers in 2011 and 102,570 numbers in 2012 as continuous increase from the previous years [25].

It has interrupted the pristine natural environment through tourists' mechanized mobility induced supplementary carbon dioxide emissions and noise and dust pollutions at local level. A study done by ShreeKanta Sharma Khatiwada on the impact of road construction in trekking tourism on the round Annapurna trek in 2011 states that the result of road construction gives more negative impact rather than



Source: Author, 2014

Photo 1: Low carbon emission.



Photo: Author, 2014

Photo 2: Heavy carbon emissions with unlimited vehicles.



Photo 3: The popular Mt. Annapurna circuit trek route being motorized as an augmented source of carbon emission.

positive [29]. It mentions that the road construction is not really good for the conservation of wonderful nature and culture. The increased trucks, jeeps and bikes coincided with growing number of tourist traffic are creating noise and air pollution and thus irritating the tourists themselves. Trekking trails and motorable roads should be separate and away from each other as the great trekking route like round Annapurna circuit trek needs to preserve by stopping road construction. There is high need to stop the further process of road construction from Muktinath to Thorang pass, from Humde Manang to Tilicho Lake and from Tilcho to Bhimtang of Manang. It will, otherwise, not only increase carbon emission and global warming but also distract tourists.

### Increased mechanized mobility in Kathmandu valley

Kathmandu Valley is the fastest growing metropolitan area in Nepal in the South Asia region. Transport emissions have only strongly influenced air quality but they have also constituted a large portion of gaseous emissions that are linked to climate change.

Many studies over the last decade have shown that ambient air in the Kathmandu Valley of Nepal is heavily polluted and not in accordance with international standards. The air quality issue of the valley is primarily attributable to a rapid rise in the number of petrol and diesel vehicles and lacking enforcement of vehicles emission standards. In past ten years, the number of registered vehicles in Bagmati Zone has increased by nearly three times. According to the data from Department of Transport Management, around 688,028 vehicles have been registered in Bagmati zone till fiscal year 2013/14, which accounts for 45% of total vehicles registered in Nepal. Of the registered vehicles, 93% are cars and motorbikes, which are generally private. Tourism, one of the major sources of country's economy, is adversely affected by air pollution in the valley for its sustainability. A survey of tourists in Thamel found that 54% of the tourists rated air quality as either very bad or fairly bad [30] (photo 4).

### Local transport companies' responses to offset carbon emission

Responding to CO<sub>2</sub> emission in this paper is concerned with changes on awareness, behavior and actions which are used in proactive and reactive approaches to bring positive impacts by managing the situations. In relation to these responses, the first (2003) and second (2007) international conferences on climate change and tourism in Djerba, Tunisia and Davos, Switzerland respectively are global collective ignitions which have comprehensively touched and sensitized this burning issue and provided a framework to protect from the effect of unsustainable mass tourism related mechanized



**Photo 4:** Cabinet meeting of Nepal government near Mount Everest base camp (5,542m) as a stern response to global warming in the Himalayas. Photo: Department of Information, 2014



**Photo 5:** Green Hiker Campaign to opt for sustainability of mountain tourism. Source: World Wildlife Fund Nepal, 2014

mobility and other elements induced global warming on mountain tourism. In this context, the use of electric vehicles in tourism industry is considered as a concrete response.

Kathmandu Electric Vehicle Alliance (KEVA) in partnership with Kathmandu Environment Education Project (KEEP-Note 2) undertook a four-month campaign on “Promoting Electric Vehicle in Tourism Industry” in 2005-2006 to understand the impact of air pollution as well as the prospect of electric vehicles (EV) in Nepal’s tourism industry. The activities held as a part of the campaign included: Kathmandu air Quality Survey, Hotel Awareness Campaign and Tourism Awareness Campaign [31]. KEEP Program Report [31] mentions ‘being a zero emission vehicle, less noisy and using recyclable batteries, EVs are one of the most environmentally friendly vehicles in use. Currently, these vehicles serve more than 22 different routes in the mountainous valley of Kathmandu including various tourist world heritage sites.’ The use of electric vehicles to cater the service of both tourist and non tourists demonstrate a strong measure to mitigate the negative consequences of the environmental deterioration by tourists’ mechanized mobility (photo 5).

### **The Supplementary Local Responses to Manage and Prevent Tourist Mobility Induced Global Warming Effects**

Studies of the damaging effect of the expanding skiing industry in the Alps in the 1970s led to the idea of Sustainable Tourism in practice [32]. With this tangible negative observation caused by the warming of earth surface, some specific responses from sustainable tourism perspectives are continuously initiated. There is a number of following single and joint responses made on proactive approach in Nepal Mountains to create positive effects.

The private sector and government in Nepal Mountains have been applying mitigating and coping measures with a number of good practices for policy advocacy and capacity building for sustainable tourism operation and management [33]. Some such responses are highlighted below.

### **Development of alternative non-motorized trekking routes**

Though there is high stress for the expansion of motorable road networks to connect remote exotic destinations in mountains of Nepal, still the tourism and trekking sector as whole is determined to expand non motorable paths, and trekking and hiking trails to let these areas be free from possible carbon dioxide emissions from the operation of tourists’ mechanized mobility. There are a number of new trekking trails recently added in the total network of such trails. Some of such newly built trekking routes untouched by motorable roads include the Greater Himalayan Trails in upper northern area, Tamang Heritage Trail in central northern area, Chepang Heritage Trail in central southern area, Budanilkantha-Gosaikunda Trek in central area, Indigenous Trekking Trails in central region, and Machhapuchre Model Trek and Ghalekharka Sikles Ecotourism circuit in Annapurna Conservation area in western region of Nepal mountains to cater the demand of growing tourists arrivals [34].

### **‘Plant a tree’ or ‘adopt a tree’ scheme for tourists**

The enhancement of carbon sinks through forestry is recognized in the article 3 of Kyoto Protocol as a mitigation measure. In this context, the Nepal Tourism Board (the National Tourist Organization) in Nepal is involved in ‘plant a tree’ or ‘adopt a tree’ scheme through international visitors’ volunteer involvement to support Climate Neutral Planet Fund-Nepal (Information from interview with Lekhnath Bhusal, Senior Officer at Nepal Tourism Board, Kathmandu, October 2013). This is to compensate the carbon emission either by voluntary planting a tree or paying certain amount in the Climate Neutral Planet Fund- Nepal.

### **Sagarmatha (Mount Everest) declaration on climate change, a high attention to Mountain tourism**

The cabinet meeting among 23 ministers of Nepal Government chaired by the Prime Minister at Kala Patthar (5,542m) near the base camp of world’s highest mountain Everest (photo 3), held on December 4, 2009 issued a 10-point Everest declaration about the climate change.

Its goal is to draw international community’s attention toward the adverse impact of climate change on the Himalayas. This event, held just one week before the global climate summit in Copenhagen, was covered by around 100 international television channels. With the Everest declaration, the government has committed to increase the protected areas in the country from 20 percent to 25 percent and consolidating 40 percent of the total landmass in view of protecting the mountain ecosystem. It also drew the attention of the developed and neighboring states for development and easy transfer of appropriate and state-of-art technologies and investments believing that the development of clean energy in Nepal would contribute to lesson carbon emission also caused by mechanized tourists’ mobility in this region [35].

### **Launching of Green Hiker campaign**

Green Hiker Campaign is World Wildlife Fund – Nepal’s initiative in partnership with Nepal Tourism Board to encourage tourists and tour operators in the Himalayan region to undertake environment-

friendly actions to opt for sustainable and responsible tourism. Covering almost the entire Himalayan region, the programme unveiled to mark the 4<sup>th</sup> International Sagarmatha (Mt. Everest) day on May 29, 2011 aims at reducing the baggage of tourism while inviting tourists to enjoy the Himalayas in its pristine form.

The campaign is especially to raise awareness about the vulnerability of the Himalayan eco-system, and encourage tourists and tour operators to adopt disciplines and promote responsible tourism, which will help reduce the footprint (impacts) of tourism, through positive messages. The program continued throughout Nepal Tourism Year 2011 and beyond. While Nepal Tourism Board is working through its network of tourism partners, World Wildlife Fund – Nepal is involved through its field offices, community based organizations and local communities under the Sacred Himalayan Landscape program to help promote the campaign. Merchandising, interpersonal communications and event are the major tools used in this campaign. With the initiation of this programme, tourists have shared their stories, images, videos, and tips for green living that will encourage other tourists to undertake environmental-friendly actions and contribute to local economies while traveling through the fragile eco-region [36-38].

## Discussions and Conclusion

Tourism contributes to global warming and climate change, and, at the same time, is victim and sensitive to these effects. Like other mountain regions of the world, Nepal with the some succession on mass tourism trend is sensitive to global warming effects. The growth trends of mass tourism have appeared as the prime factors for environmental degradations.

The Mountain tourist destinations like Manakamana, Annapurna and Everest witnessed sharp increase in tourist arrivals with the facilitations of the mechanized terrestrial and aerial transportation to tourists. The mechanization of road and increased modern transportation like cable car in Manakamana Nepal strongly exemplify the effects of tourists' mechanized mobility on carbon dioxide emission in Nepal and subsequent environmental degradation. There are both tangible and intangible indications of various negative implications caused by increased tourist mechanized mobility coinciding with unsustainable form of mass tourism.

The mountain tourist destinations are now vulnerable to global warming and climate change. Carbon offsetting is only one of the available mechanisms to mitigate tourism related aerial transport's (aviation) impacts on climate. However, this scheme seems that producer responsibility is turned into customer responsibility which is not fully sensible. However, it is still good in a context where there is no proper alternative remedy.

The empirical observations in the mountain tourist destinations of Nepal reveal some unique responses to prevent and cure these destinations from the effect of global warming. The local tourism actors and institutions, experiencing the current challenges and envisioning the future threats brought by mass tourism induced mechanized tourist mobility at these destinations, are found cautiously involved with good practice measures for mitigation to and the adaptation of these syndromes. The development of new historical and cultural trekking routes (e.g. new trekking routes developed in Nepal) on the backdrop of the mechanized mobility of tourists in growing numbers to promote non mechanized tourist mobility in Nepal Mountains are seen as proactive responses to reduce the effects of global warming on mountain tourism while offering differential non motorized (e.g.

Indigenous Trekking Route, Machhapuchhre Model Trekking route, etc.) trekking tourism experiences.

A number of stakeholders like Nepalese tour operators, transport companies, tourism industry and the government have adopted and applied various coping measures mostly on curative rather than proactive approach to save its mountain tourism from the negative repercussions of global warming and climate change. Such responding measures of this challenge are apparent mainly on two fold strategies:

(1) reorganization (change) of existing tourists' mechanized mobility on environmental friendly modes and

(2) reductions and/or restrictions on tourists' mechanized mobility through various means that did not accelerate CO<sub>2</sub> emissions.

The various responses and innovations to cope with mechanized mobility of growing tourists numbers and its induced repercussions in Nepal mountains can be marked as the shift from cautionary platform to adaptancy platform under the four progressive theoretical models/platforms (e.g. advocacy, cautionary, adaptancy and knowledge based platforms) of tourism as developed by Jafar Jafari (Jafari, 1990). The exploration on the changes and progression of mountain tourism in Nepal Mountains also reveal that these conventional destinations, while responding to the effects of global warming, are gradually transforming themselves into sustainable tourism destinations. These initiations in Nepal appear as the new forms of sustainable tourism developments.

Since there are very little in-depth knowledge on the dynamism of interrelationship of tourist mechanized mobility associated global warming effects in these mountain tourist destinations; this paper stresses the substantial exchange of scientific research information and mutual learning on good practices and coping mechanisms between mountain tourist destinations and among Mountains, Alps, Andes and Rocky mountain destinations of the globe. Such networking will support to upscale the sustainable tourism initiations and benefit mutually.

## Notes

1. Non-motorized trekking routes: On foot, bicycle, Horse riding, etc.
2. KEEP is a non-profit, non-governmental eco-tourism organization established

1992 in Kathmandu. Its mission is twofold: to provide impartial and independent information to travelers, and to ensure the future ecological and cultural prosperity of Nepal through the positive impact of tourism and outreach project work. Through its Travelers' Information Centre, KEEP has always been in the forefront of disseminating information about tourism and its negative impact on the pristine Himalayan ecosystem.

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