Identifying Pressurise and Threatful Tourism Products In Relation To Global Warming and Climate Change

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ABSTRACT
Tourism Industry in India is contributing a lot towards improving the financial position of the country directly or indirectly and satisfying the needs of tourist by providing good services, comforts, and luxuries at a very reasonable cost. Travel and Tourism contributes to be one of the world’s largest industries. 2011 was one of the most challenging years ever experienced by the global travel & tourism industry. Despite political upheaval, economic uncertainty and natural disasters, the industry’s direct contribution to world GDP grew by nearly 3% to US$ 2 trillion and directly generated 1.2 million new jobs. This was supported by a 3% increase in visitor exports to US$ 1.2 trillion, with almost 3% growth in capital investment, which rose to over US$0.7 trillion. But unfortunately in recent years some adverse effect of tourism development and tourism related activities on environment has been observed. It has been seen as a major contributor of spreading pollution and as a major source of emitting dangerous greenhouse gases in the atmosphere. Thus it becomes necessary to study the problematic relationship of tourism development with environment. Present study helps in finding out the causes, consequences and solution of the environmental problem caused by the tourism industry. In this paper efforts have been made to highlight the problem of climate change and global warming in relation to tourism development. To find out the actual situation data has been gathered through the various research articles, research study, books, news papers, and e-journals. After analyzing all the facts it can be concluded that the problem of climate change or global warming can only be removed through collective efforts of World Environment Organizations, Government, Tourism related national and international organizations, Media, local community and of course with the contribution of tourist by maintaining the sustainability and adopting the eco-friendly approach while visiting any tourist destination.

KEY WORDS:- Climate Change, Depletion of Glaciers, Global Warming, Precipitation, Run-off season, Natural Water-bodies

Tourism And Climate Change
In India, tourism has made significant contribution to the Indian economy by providing an increase in foreign exchange earning, creating more employment opportunities and infrastructure development. It is clear from the tourism statistics that international tourist arrival has increased from 5.11 million in 2009 to 5.58 million with a growth rate of 8.1% in 2010 and foreign exchange earning has increased from US $11394 million in 2009 to 648.89 billion in 2010. Approximately 705 million domestic tourists have visited different states/UTs of India in 2010. Share of India in world tourist arrival and world tourism receipts is 0.58% and 1.24% respectively. It is also expected that tourism demand will grow at an annual growth rate of 8.8% over the next ten years. Tourism protects and maintains the natural and cultural resources of the country, helps in avoidance of migration of the local population, and brings about improvement in the economic and socio cultural level of the local community. It serve as a tool to financial protection of natural areas and increase their economic importance and raise awareness regarding environmental values.

On the one hand tourism industry is helping in socio-economic development of India; on the other hand it is degrading the culture, environment and belief system of the society by giving birth to several social problems like increased use of narcotics and drugs, sex tourism, child labour, seasonal employment, commercialization of cultural products, environmental degradation, increased pollution, extinction of rare species and increase in the price of commodities.

Objectives
As tourism is emerging as the maximum revenue generated industry in India, it is necessary to protect the advantages, which can be ruined by ecological disturbances. In this study an effort has been made to identify the causes and cure for this emerging problem of climate change. For this purpose some objectives has been laid down which are as follows:-
1) To explore the problematic relationship between Tourism and Climate Change.
2) To study the main impacts of climate change and their implications for tourism.
3) To identify the projected increases in air temperature and changes in precipitation.
4) To know the role of Government in removing the problem of Climate Change.

Review Of The Literature
The literature associating climate with tourism implies that changes in climate are likely to affect both the length of the season for tourists and the expected environment. The literature has shown that temperature could potentially have positive implications for the length of the season and for the environment, while other studies have found results to indicate that it has negative implications for tourism.

Hamilton and Tol (2007), during his study has focused mainly on economic factors and did not include climate variables in the modelling process. The studies had short time horizons, and climate was taken to be a constant variable. However, there is much evidence to show that climate will change in the long run, and that this change is being hastened by human activities. More recently, researchers have begun to include climatic variables and, in some cases, a tourism climatic index.

A study has been conducted by Koenig and Abegg, 1997, to estimate the effect of forecasted changes in temperature on the ski industry in Switzerland. The study revealed that, under the present conditions, with prevailing temperature and a snow line of 1,200 m, there was an 85% chance that there would be snow to keep the industry functioning. However, if temperatures were to increase by 2°C, then only 65% of all Swiss ski areas would be snow reliable. This would clearly have serious implications for the growth of that sector of the industry. The increasing volume of literature on the impact of climate on tourism demand is due to the recognition that a more precise modelling of tourism demand must include weather and climate, since they are significant influences on the tourism industry.

According to Stern, 2006; Hamilton and Lau, 2004, temperature, sunshine, radiation, precipitation, wind, humidity and fog are the climatic factors which affect the tourism industry in a very bad manner. It is therefore essential that these elements must be measured and evaluated, since they form an important resource for tourism.

Hamilton and others (2005) used a simulation model to investigate the effects of climate change on international tourism using the A1B scenario. They found that international tourism is expected to increase in the coming decades, but may become sluggish later on in the century.

Another study, Berrittella and others (2006), used a computable general equilibrium model to measure the potential effects of climate change. They employed two pathways to capture the impact of climate change, namely, modifications in the composition of final consumption, and international income transfers. The rationale was that spending by visitors has an impact on consumption and income transfers in the domestic economy. The Berrittella and others (2006) study predicted that, at the international level, changes in climate would eventually lead to a loss in welfare, and that this loss would be disproportionately spread across the various regions of the world.

Temperature is considered to be the most important climate variable in the analysis of tourism demand because, outside a certain range, it affects comfort. There is evidence to show that other weather parameters are also important, for example, rain, wind and hours of sunshine (Scott and McBoyle, 2006). If any of these parameters is to be included in the analysis of tourism flows, it must be included as a determinant or in an index. Many studies include both temperature and precipitation to examine the impact of climate on tourism demand (for example, see Scott and McBoyle, 2006).

One noteworthy microanalysis by Uyarra and others (2005) examines the significance of environmental characteristics in influencing the choices made by tourists. The study used a self-administered questionnaire on tourists visiting Bonaire and Barbados – 316 from Bonaire and 338 from Barbados. The study established that warm temperatures, clear waters and low health risks were the main environmental attributes important to tourists visiting the islands. The study found that visitors to Bonaire placed additional importance on marine life attributes while tourists going to Barbados had a preference for certain beach characteristics. Uyarra and others (2005) examined the impact of climate change by asking respondents about the likelihood of their returning to these islands in the event of coral bleaching and sea level rise. They found that more than 80% of the visitors to Bonaire and Barbados would be expected not to return to the islands in the event of these occurrences.

Mather and others (2005) examined the attraction of the Caribbean as a tourism destination for travellers from North America. This study established that the Caribbean subregion is likely to be less attractive to tourists due to factors such as increased temperatures, beach erosion, deterioration of reef quality and greater health risks. The climate change variables being used in this study (temperature and precipitation) are
considered to be significant determinants of tourism in the Caribbean for important reasons. Trenberth and others (2007) have highlighted the fact that temperatures in the Caribbean sub region have been warming at a rate ranging from 0.0C to 0.5C per decade for the period 1971-2000. In a related study, Peterson and others (2002) have reported that in the Caribbean, the percentage of days with cold temperatures has decreased since the 1950s, while the percentage of days with very warm maximum or minimum temperatures has increased significantly[1]. In relation to precipitation, it was found that the number of heavy rainfall occurrences has been on the increase (Trenberth and others, 2007).

Research Methodology
Research methodology is partly descriptive, partly exploratory and partly casual .For this study data and information has been collected with the help of Books, Magazines, Newspapers, Research Articles, Research studies, Research Journals, E-Journals, WTO Report, Report of UNWTO, Report of WWF etc.

Limitations Of The Research Study
I. This research study is basically based on secondary data which may not be reliable.
II. Preparation of a research study is a time consuming process.

III. Organization of data is itself a very tough task.

Analysis And Discussion
The severe problem which has originated from the tourism related activities in India is the climate change, global warming, depletion of natural resources and extinction of rare species. Some of the environmental problems caused by tourism industry are as follows:-
1) Depletion of natural resources
2) Land degradation
3) Increase in pollution
4) Destruction & alteration of eco-Systems
5) Climate Change
6) Extinction of rare species
7) Global Warming

This climate change is affecting the lives of human being in different ways. Tsunami,earthquakes, landslides. Depletion of glaciers, and change in the weather can be seen as the major adverse impact of imbalance interaction of the nature with human beings. Increasing pressure on natural resources to meet the demand of tourism industry is creating a lot of problem for the society .The most serious impacts will result from the effects of sea level rise on small island states.

Increasing pressure on natural resources to meet the demand of tourism industry is creating a lot of problem for the society . The most serious impacts will result from the effects of sea level rise on small island states. The Maldives,which are an increasingly popular tourist destination, are particularly vulnerable to sea level rise.Climate change is expected to increase the risk of illness in several parts of the world and consequently discourage tourism. Recently India has experienced periods of extreme heat around 460, 480 in a day which is likely to continue if nothing is done to protect the environment[2]. This increasing temperature has given rise to various diseases like...
malaria, dengue, and swine-flu etc. Excess emission of CO2 and CFC in the environment is not only spoiling the environment but also damaging the historical, archeological and heritage sites of world importance.

The increased number of tourists in India has led to the excess vehicular movement and emission of dangerous gases in the atmosphere. As a result of the increasing concentration of these gases, more longwave radiation from the Earth is absorbed, thus reducing the energy lost to space and so altering the natural balance between incoming and outgoing radiation. Thus tourism sector is prone to affect by the climate change which has a significant economic and social value and playing a vital role in sustainable development of the society.

Tourism Industry is considered to be highly climate sensitively economic sector, as it has very close relation with climate and environment. According to IPCC (Intergovernmental Panel On Climate Change) an increase in carbon dioxide and other GHGs like methane, ozone, nitrous oxide and chlorofluorocarbons in the atmosphere is expected to increase the global temperature by 1.5°C to 4.5°C and likely to lead changes in rainfall, frequent droughts, floods and storms as well rise in sea level between 18 cm to 59 cm which will endanger coastal areas and small islands. If nothing is done to protect the environment from these threats it will certainly damage our world recognized monuments and wonders and will left our resorts seriously overcrowded[3].

The share of tourism transport industry in global total CO2 emissions is as follows:-

<table>
<thead>
<tr>
<th>TABLE-1</th>
<th>SHARE OF TOURISM TRANSPORT INDUSTRY IN GLOBAL TOTAL CO2 EMISSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport</td>
<td>75% - 90%</td>
</tr>
<tr>
<td>Air Transport</td>
<td>54% - 75%</td>
</tr>
<tr>
<td>Coach and Rail Transport</td>
<td>13% - 34%</td>
</tr>
<tr>
<td>Long Haul Travel</td>
<td>17% - 25%</td>
</tr>
</tbody>
</table>

Source: Self Made Table

Below table is showing that the transport industry is sharing a large proportion of CO2 emission in the atmosphere. According to a study, globally the world’s 16,000 commercial jet planes generate more than 600 million tones of CO2 per year.

<table>
<thead>
<tr>
<th>TABLE-2</th>
<th>MAIN IMPACTS OF CLIMATE CHANGE AND THEIR IMPLICATIONS FOR TOURISM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact</td>
<td>Implications for Tourism</td>
</tr>
<tr>
<td>Warmer temperatures</td>
<td>Altered seasonality, heat stress for tourists, cooling costs, changes in: plant wildlife-insect populations and distribution range, infectious disease ranges</td>
</tr>
<tr>
<td>Decreasing snow cover and shrinking glaciers</td>
<td>Lack of snow in winter sport destinations, increased snow-making costs, shorter winter sports seasons, aesthetics of landscape reduced</td>
</tr>
<tr>
<td>Increasing frequency and intensity of extreme storms</td>
<td>Risk for tourism facilities, increased insurance costs/loss of insurability, business interruption costs</td>
</tr>
<tr>
<td>Reduced precipitation and increased evaporation in some regions</td>
<td>Water shortages, competition over water between tourism and other sectors, desertification, increased wildfires threatening infrastructure and affecting demand</td>
</tr>
<tr>
<td>Increased frequency of heavy precipitation in some regions</td>
<td>Flooding damage to historic architectural and cultural assets, damage to tourism infrastructure, altered seasonality (beaches, biodiversity, river flow)</td>
</tr>
<tr>
<td>Sea level rise</td>
<td>Coastal erosion, loss of beach area, higher costs to protect and maintain waterfronts and sea defences</td>
</tr>
<tr>
<td>Sea surface temperature rise</td>
<td>Increased coral bleaching and marine resource and aesthetic degradation in dive and snorkel destinations</td>
</tr>
<tr>
<td>Changes in terrestrial and marine biodiversity</td>
<td>Loss of natural attractions and species from destinations, higher risk of diseases in tropical-subtropical countries</td>
</tr>
<tr>
<td>More frequent and larger forest Fires</td>
<td>Loss of natural attractions, increase of flooding risk, damage to tourism infrastructure</td>
</tr>
<tr>
<td>Soil changes (such as moisture)</td>
<td>Loss of archaeological assets and other natural resources, with</td>
</tr>
</tbody>
</table>

www.borjournals.com
levels, erosion and acidity) impacts on destination attractions.

Source: WTO-UNEP-WMO (2008) Climate Change and Tourism: Responding to Global Challenges

It is estimated that this percentage will rise up percentage will rise up to 75% by 2015. The share of aviation industry emission will grow from 40% in 2005 to 75% by 2035[4]. Climate change is not only affecting the lives of the rural areas but also of the urban people. In rural areas, it is easier to explain the interconnectedness of the ecosystem using live examples. It is also easier to see physically the signs of climate change, the changing weather patterns, the need to sow different crops because of that, etc.

![CLIMAP: The Last Glacia Maximum](image)

Source: Becken and Hay (2007), *Tourism and Climate Change*

Tourism Industry in India is becoming a major source of emitting dangerous gases into the environment. It has to adopt some strategies to cope with this changing environment and to reduce the percentage of pollution for maintaining the ecological balance of the environment. If nothing is done to reduce the increasing level of the temperature, the whole world will have to be ready to face the adverse and ugly impacts of climate change. The following table is showing the projected changes in the temperature and precipitation variables for the period 2010 to 2099[5].

**TABLE -3**

**PROJECTED INCREASES IN AIR TEMPERATURE AND CHANGES IN PRECIPITATION**

<table>
<thead>
<tr>
<th>Region</th>
<th>Forecast period</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2010 to 2039</td>
<td>2040 to 2069</td>
</tr>
<tr>
<td>a) Projected increases in air temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mediterranean</td>
<td>0.60 to 2.19</td>
<td>0.81 to 3.85</td>
</tr>
<tr>
<td>Caribbean</td>
<td>0.48 to 1.06</td>
<td>0.79 to 2.45</td>
</tr>
<tr>
<td>Indian Ocean</td>
<td>0.51 to 0.98</td>
<td>0.84 to 2.10</td>
</tr>
<tr>
<td>Northern Pacific</td>
<td>0.49 to 1.13</td>
<td>0.81 to 2.48</td>
</tr>
<tr>
<td>Southern Pacific</td>
<td>0.45 to 0.82</td>
<td>0.80 to 1.79</td>
</tr>
<tr>
<td>b) Projected changes in precipitation (percentage)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mediterranean</td>
<td>-35.6 to 55.1</td>
<td>-52.6 to 61.0</td>
</tr>
</tbody>
</table>
Caribbean & -14.2 to 13.7 & -36.3 to 34.2 & -49.3 to 28.9  
Indian Ocean & -5.4 to 6.0 & -6.9 to 12.4 & -9.8 to 14.7  
Northern Pacific & -6.3 to 9.1 & -19.2 to 21.3 & -2.7 to 25.8  
Southern Pacific & -3.9 to 3.4 & -8.23 to 6.7 & -14.0 to 14.6  

Source: Becken and Hay (2007), *Tourism and Climate Change*

In India the problem of climate change and global warming can only be handle through the process of sustainable development. India can ask for help to developed countries to provide them with environmentally sound and cleaner energy technologies to implement them in order to reduce the level of temperature and pollution in our own country. The International organisations are taking various corrective measures to combat and mitigate the adverse effect of climate change under the UNFCCC[6]. India welcomes the successful outcome in Cancun on climate fund, Technology mechanism, Adaptation framework and tropical forestry. UNWTO is playing a vital role in responding in a very positive manner towards controlling the problem of climate change. The Davos Declaration that was adopted in Second International Conference on Climate Change and Tourism held in October 2007 promotes the concept of “tourist destination carbon footprint”. The resolutions of UNWTO and UN General Assembly should emphasize sustainable development of countries on the basis of nationally appropriate mitigation actions[7]. There should not be any linkage of measures in the specific industries like tourism or aviation for reducing emissions or mitigation. It may be noted that the Cancun agreements adopted in December 2010 do not recommend any such sectoral measures. India strongly feels that climate change should not be used as an excuse to impose such unilateral trade measures on developing countries through tourism and aviation industry which may constitute a means of arbitrary or unjustifiable discrimination or disguised restriction on international trade. The measures for addressing climate change should include not only adoption/development of appropriate clean technologies but also provision of resources and creation of enabling conditions to take necessary actions in accordance with the established principles of equity and common but differentiated responsibilities and respective capabilities of nations. The APPCED, is an ideal forum to interact and understand each other’s concerns cutting across countries, cultures and climates.

<table>
<thead>
<tr>
<th>Problematic Relationship Between Tourism Industry And Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tourism has a very close relationship with Environment. Whereas on the one hand it works for the conservation and preservation of the natural environment, on the other hand proving a threat to the ecological balance of the natural tourism sites. To tap more and more financial advantage of the tourism, public and private tourism planners are exploiting natural resources in their own way without caring about the carrying capacity and ecosystem of that particular tourist destination[8]. This selfish act of them is creating an unnecessary pressure on rare and valuable natural resources and natural water bodies and causing several kinds of problems which are as follows:-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Natural Resource Depletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over-consumption/excessive or unnecessary use of resources ,Non-equitable distribution of resources , Overpopulation, Slash and burn agricultural practices, Technological and industrial development, Erosion, Irrigation, Mining for oil and minerals, Aquifer depletion, Forestry, Pollution, or contamination of resources, and development of the infrastructure to meet the increasing demand of tourism industry are the major cause for the depletion of the natural resources. Tourism Industry has put our finite natural resources such as oil, gas, usable water, agricultural produce and forest wealth in danger. A huge cutting of forest to made furniture, to cook food, to bonfire at campsites, to construct buildings has given an invitation to the various natural calamities like earthquakes, landslides, and tsunamis and changed behavior patterns and forms of the flora and fauna. Excessive exploitation of agriculture land to produce more and more regular crops to meet the increasing demand of the population is decreasing the fertility level of the land. In 2006, the world used 3.9 billion tons of oil for automobiles and powering machines . If humankind continues to use fossil fuel at the same rate we do today, the world’s oil will run out by 2030, the world’s gas by 2040, and coal by 2200 In 2005, the United States gave off over twenty-one</td>
</tr>
</tbody>
</table>
percent of global carbon emissions from fossil fuel burning. Over the entire world, fossil fuel usage in 2005 produced 7.6 billion tons of carbon emission[9]. Fossil fuels are largely being depleted but the Earth’s land is also being affected greatly. A quarter of the planet’s fertile soils have been destroyed by overuse and misuse.

![FIGURE-3](image-url)

Source: http://www.google.co.in/imgres?hl=en&bih=1093&biw=514&tbm=isch&tbnid=myjDMO3no31ngm...

Unnecessary pressure on petrol, diesel, crude oil and fossil fuels to carry the passengers and to cook food for them is making our country dependable, because India is not self-reliant to fulfill the increasing demand of oil. The cost of food with its huge embedded fossil fuel energy costs, will inevitably increase financial instability and produce more recessions. Human population increase is often considered the major problem that will impact on both resource depletion and global warming. The depletion of natural resources caused by humans requires immediate and intelligent solutions for the benefit of our world. Statistics show that 1.5 acres of forest are lost every second & Forty percent of forests worldwide have been depleted since the 1700s[10]. Deforestation occurs when people want the land to grow crops or to obtain timber to make products.

Depletion Of Sea-Life
Another drawback of tourism activities on environment is the extinction of the sea-life. In 2004 around 156 million tons of seafood was eaten worldwide. Many tourist whether they are national or international, rely mainly on fish as a major food source and causing their depletion at this alarming rate.

Depletion Of Coral-Reefs
Tourism has disturbed marine life in a very different way. It has overstressed the natural water resources to meet the increasing demand of fresh water for the tourist. By 2025, the number of people suffering due to water stress will rise to approximately 3.5 billion. Almost half the world’s population is expected to experience high water stress by 2030. The usage of million gallon water in swimming pool has tremendously disturbed the balance of natural water-bodies. Now we are not in the position to supply safe and fresh drinking water to our local residents. In 2009, more than one in five people on earth lacked clean drinking water. Agriculture is the another largest water consumers, consuming about seventy percent of global water use. Further the water sports activities, performed by the tourist is damaging the valuable coral reefs of the ocean, approximately one-third of coral reefs have been damaged or destroyed by humankind.

Depletion Of The Forest-Wealth/ Deforestation
The water cycle is also affected by deforestation. Trees extract groundwater through their roots and release it into the atmosphere. When part of a forest is removed, the trees no longer evaporate away this water, resulting in a much drier climate. Deforestation reduces the content of water in the soil and groundwater as well as atmospheric moisture. The dry soil leads to lower water intake for the trees to extract. Deforestation reduces soil cohesion, so that erosion, flooding and landslides ensue.

Humans are using natural resources about 20% faster than they are being replenished. One third of the human beings rely heavily on forests for their
energy source, for cooking and heating. Tourism industry is also dependable on wood products to provide souvenirs and to be use as a energy source in most of the dhabas and restaurants, and to make buildings and furnitures. It also overstressed the usage of flora and fauna to make different tourism products and souvenir and to serve for relishing the food in different hotels. Individual nations have passed thousands of laws to protect common natural resources and have established more than 100,000 protected wild life sanctuaries, national-parks and other protected areas[11] to protect natural resources from damage of tourism development.

Ozone Layer Depletion

One another drawback of Tourism development is the depletion of Ozone layer. Excessive vehicular movement for the purpose of visiting tourist destinations, use of refrigerators and air conditioners in hotels, is resulting in the excessive emission of the CO₂, CFC, hydrochlorofluorocarbons (HCFCs), methyl bromide, halons, methyl chloroform and carbon tetrachloride, and carbon monoxide which in turns depleting the ozone layer and have created a hole in ozone layer. Once they have been released into the atmosphere, they remain there for as long as 200 years[12]. In the presence of UV light, these gases dissociate, releasing chlorine atoms, which then go on to catalyze ozone destruction. This is not only damaging the environment but also leading to a lot of skin disease like damage of the skin tissues, and skin cancer. Depletion of ozone layer is also a danger to the historical monument. They are not only getting paling but loosing their beauty and glory as well.

FIGURE-4

Government of various nations, are now having keen interest in taking serious actions to recover the condition of depleted ozone layer. Ozone layer protection is currently supported by 189 countries of the world, including Latvia. For example, in the year 1986 the world consumed approximately 1 100 000 tons of HFO or CFC (one of the most widespread ozone layer depletion matters, also named Freon), but in 2001 the total amount of consumed HFO was only 110 000 tons. It is estimated that in lieu of currently implemented ozone layer protection measures the ozone layer will be recovered up to its normal condition by 2050 – 2060.
Invitation To Major Natural Disasters
Deforestation, and excessive exploitation of natural resources for the sake of construction of hotels, buildings and roads, over-stress on waterbodies to supply fresh water, over exploitation of agriculture land to supply foods to the tourist, over cutting of the trees to make furniture and to compensate energy source etc. is giving an invitation to the various natural calamities. Following table will rightly explained about this:-

TABLE-4
LIST OF NATURAL DISASTERS

<table>
<thead>
<tr>
<th>Natural Hazards</th>
<th>Water Disasters</th>
<th>Weather Disasters</th>
<th>Health &amp; Diseases</th>
<th>Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Movement Disasters</td>
<td>Floods</td>
<td>Blizzards</td>
<td>Epidemic</td>
<td>Gamma Ray Bursts</td>
</tr>
<tr>
<td>Avalanches</td>
<td>Limnic Eruption</td>
<td>Cyclonic Storms</td>
<td>Famine</td>
<td>Impact Events</td>
</tr>
<tr>
<td>Earthquakes</td>
<td>Tsunamis</td>
<td>Droughts</td>
<td></td>
<td>Solar Flares</td>
</tr>
<tr>
<td>Lahars</td>
<td></td>
<td>Hailstorms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volcanic Eruption</td>
<td></td>
<td>Heat Waves</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tornadoes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Becken and Hay (2007), *Tourism and Climate Change*

Pollution
Pollution and Tourism has close relationship. Tourism is one of those industry which is sharing a large portion in emission of those dangerous gases which causes air pollution. Use of motar cars, motar bikes, ships, airplane, railways, buses and coaches by the travelers to visit tourist destination is the major cause of polluting the environment of that particular tourist destination. The close relationship of tourism with various kinds of pollution is clear from the following table:-

TABLE-5

<table>
<thead>
<tr>
<th>Air Pollution</th>
<th>Water Pollution</th>
<th>Noise Pollution</th>
<th>Soil/Land Pollution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive Vehicular movement emitting dangerous CO$_2$, CFC, carbon monoxide, &amp; Led into the environment</td>
<td>Spills of oil from ships, damaging the sea-life and coral-reefs</td>
<td>Use of public address system at temples, mosques, churches &amp; Gurudwaras, to some extent lead to the noise pollution</td>
<td>Throwing of undisposable litter, water bottles &amp; tins, and use of wafer packets, during their travelling is reducing the soil fertility</td>
</tr>
<tr>
<td>Establishment of garment factories, Wood furniture factories, Paint &amp; Varnish factories, Soft drink factories etc. to meet the needs of foreign as well as domestic tourist is spreading various dangerous elements like HCFCs, methyl bromide, halons, methyl chloroform and carbon tetrachloride, and others into the environment in many ways</td>
<td>Water-Sports Activities i.e. water motor-biking, yatching, kayaking, water-skiing, scuba-diving, boat-race, white river-rafting, water-surfing etc., crushing the eggs of the sea-animals at the very prior stage and disturbing the ecological system of natural water-bodies</td>
<td>Over crowded population at tourist places, hotels, Local shopping markets and other religious destinations not only make the noise but also spoil the cultural and religious value of that place</td>
<td>High rate of deforestation for the purpose of construction of roads and buildings is reducing the tree’s capacity of water absorption</td>
</tr>
<tr>
<td>Burning of wood and other fossil fuels to lit the bonfire in campsites and to substitute the energy source for cooking food in interior tourist destination is spreading air pollutants into the environment</td>
<td>The use of soaps and detergent in the name of holy bath in the form of Clothing &amp; bathing has turned our holy rivers into gutters</td>
<td>Late night parties with the use of loud DJ at the time of new year eve and Christmas day eve contributed a lot towards creating Noise pollution</td>
<td>Use of chemicals, pesticides and fertilizers to increase the fertility of soil and to obtain various crops at regular basis is damaging the quality of soil</td>
</tr>
<tr>
<td>Use of cigars, Cigarettes and other local tobacco products like local bidis also helps in spreading dangerous gases into the environment</td>
<td>Direct discharge of industrial waste, paint &amp; varnish and throwing of bottles, chipps packets and other waste material in to water is ending the sea-life at their very early stage</td>
<td>Unnecessary blowing of loud horn, excessive movement of transport, useless talks and arguments of tourist causes noise pollution</td>
<td>Use of plastic materials, plastic bags and polythenes which can’t be decomposed or recycled, is degrading the quality and fertility of land</td>
</tr>
</tbody>
</table>

Source: self made table

Impact Of Pollution On Climate And Environment

Pollution is not only degrading the environment but also affecting the human life in a very adverse manner. Some of these effects are as follows:-

- As a result of the process of Biomagnifications, harmful toxins such as heavy metals are through trophic levels.
- Continuous emission of CO$_2$ is causing ocean acidification and decreasing the pH of the earth’s ocean.
- The emission of greenhouse gases into the environment is leading to an increase in global warming and affecting the ecosystem in many ways.
- Invasive plants can contribute debris and biomolecules (allelopathy) that can alter soil and chemical compositions of an environment, often reducing native species competitiveness.
- Rain has removed Nitrogen oxides from air and fertilize land and leading to a change in the species composition of eco-systems.
Smog and haze can reduce the amount of sunlight received by plants to carry out photosynthesis and leads to the production of tropospheric ozone which damages plants.

- Soil can become infertile and unsuitable for plants. This will affect other organisms in the food web.
- Sulfur dioxide and nitrogen oxides can cause acid rain which lowers the pH value of soil.

**Depletion Of Himalayan Glaciers**

The major source of freshwater outside the polar ice caps is the Himalayan Glaciers. These glaciers supply 303 million cubic feet of water to many major rivers of the world like Indus, Ganges, Brahmaputra, Mekong, Thanlwin, Irrawady, Yangtze and Yellow Rivers, on which more than ten percent of humanity depend on their freshwater needs. According to the report of World Wildlife Fund (WWF), about 67% of the nearly 12,124 square miles of Himalayan Glaciers are retreating at the rate of about 10-15 meters (33-49ft) each year, and could be vanish completely in another 50 years[13].

The source of holiest river Ganga i.e the Gangotri Glacier in India is depleting 75ft a year and another Khumbu Glacier, which is in Nepal is depleting at an alarming rate and has lost more than 3 miles of its actual position since 1953. If nothing is done in coming years to protect the glaciers from the adverse effect of global warming and climate change, than there is no chance to protect the world as well as India with the scarcity of fresh water and other natural calamities.

**Increase In Sea Level**

If Glaciers will continue to deplete in such a way, it will lead to a increase in the sea level. According to the World Glacier Monitoring Service(WGMS), in the past 20 years it has been seen that 24% of the sea level rise in the world has been contributed by the depletion of Himalayan Glaciers. Tsunami and another high tide storms recently faced by USA, India and another coastal countries is the one of the direct consequence of the sea level rise. From the Himalayan perspective, most of the coastal cities like Karachi, Mumbai, Kolkata, and Kochi(Cochin) are in danger and may be flooded out in few years, if the sea level continues to rise for few meters.

**FIGURE-6**

![Global Sea Level Drops 6mm in 2010](image_url)

Source: WTO-UNEP-WMO (2008) Climate Change and Tourism: Responding to Global Challenges
Reduction Of Water Availability
Depletion of Himalayan Glaciers means more water for the glacier-dependent perennial rivers. More ice melting means higher silt loads that reduces the life of dams and reservoirs, and may cause floods to various regions and destroying the crops cultivated in the Indo-Ganges plain. Thus long-standing flood waters ruin the plant’s metabolism and adversely affecting their growth.

If this situation will remain to continue, it will decrease the water level and will create serious environmental problems. Many wells have already dried up and various major states like Maharashtra, Delhi, NCR, and others are facing the reduced supply of water for drinking as well as for agriculture.

Erratic Monsoons
Depletion of glaciers, Increasing global warming and sea level is creating an unnecessary pressure on the Earth’s crust and causing various extreme geological disturbances such as, landslides, earthquakes, tsunamis, and other volcanic eruptions. Another consequence of climate change is the severe droughts and high intensity flood which is recently faced by India, Pakistan, Nepal and Bangladesh with unprecedented magnitude[14]. We can not forget the most severe and longest drought of 1997-2002, which was faced by the various parts of the Pakistan.

Glacial Lake Outburst
Another problem caused by the retreat of the glaciers is the outburst of glacial lakes which is formed due to the melting of the ice which is increasing the volume of the water and making it difficult for the moraine to support or when events like melting of ice-cores and rock/ice avalanches occurs, these moraines fail and the water burst out. Statistics vindicate that within the past 200 years around 35 outburst has been occurred in the upper Indus River System and have created a lot of problem for the ecological balance of the regions.

Strategies To Protect The Tourism-Industry From Harmful Effect Of Climate Change
People-Participation In Decision-Making
Responsible or sustainable tourism is the best key to protect the world from the harmful effect of global warming and climate change. People participation in environment related decision and policy making can prove as a boon to tourism industry as they are the prime stakeholder. They should be involved in all the decisions involved in the development of any tourism product, as it will impact their lives directly and also they are entitled to get economic benefit from that project while ensuring, that it will not create any threat to their natural and cultural environment.

Employ The Local Community
As local people are well aware of their natural and cultural resources developers should try to employ maximum of them in their project. If it is not possible to find trained staff in the surrounding villages, they should arrange some training and exposure programme to train them and to have a trained team for the effective accomplishment of their project.

Source: lifefofearth.org/environment/natural-resource-depletion
Construct In A Planned Way

Tourism Industry requires a lot of infrastructure development in order to accommodate maximum number of tourists. They have to construct hotels, tourist bungalow and other rest houses to tap the maximum output from this sector. It is required to do construction in such a way that it should not create excess pressure on natural resources and host community. To reduce pressure on power resources, inbuilt temperature control system can be installed during construction which will lead to a huge savings in energy. Solar energy and wind energy can be used as a substitute to reduce the extra burden on electricity & power.

Low Pressure On Water – Bodies

Water is an integral part of human life. No life can sustain without water, so we should consume water in a very cost effective way. It is the duty of all tour-operators and travel companies to tell their tourist about not to waste the water and they should given the option of reusing sheets and linen and using thin towels. Hoteliers should install the recycle plant to recycle the waste water, which can be reused in swimming pool and for other purposes to reduce the unnecessary pressures on natural water bodies. Tourist should be advised to swim in clean and safe natural water bodies if they are really keen to swim.

Ban On Plastic- Use

Tourism Industry is prone to promote the use of plastic in different forms, directly or indirectly. Tourism Ministry has to take some measure to stop or to ban the use of plastic in any form. The influx of urban guests often leads to a problem of waste creation and disposal. We should follow the principle of zero-waste and must ensure that plastic use is kept to a minimum. Travel tour planners must ensure that travellers are informed about not to carry the polythene bags, bottles and others in order to protect the site from soil pollution. Many tour companies are coming forward to persuade their tourists for the use of cloth made shopping bags and souvenirs. Further Guests are given the option of clean drinking water that is not in plastic bottles and a chance to refill their own plastic bottles. India is very much inclined to water-borne disease so special efforts need to go into ensuring that they carry water, but with minimal environmental impact. Various national and international hotel chain has taken the positive step of setting up their own bottling plant and waste recycling plant and ensuring the use of glass bottles in their hotels. This is a step in the right direction and needs to be widely followed.

Use Of Secondary-Sources Of Energy

To reduce the pressure on primary natural sources of power, tourism industry must encourage the use of secondary source of light and energy. The use of solar lights must be encouraged instead of bulbs and CFL lamps to face the problem of power cut in the interiors of the country because it is very much frequent in these areas. Some organizations are trying to replace the battery-operated torches with solar powered torches and are considering pedal pumps for lifting water to the overhead tanks and solar-powered fans. In western India potters are trying to made a fridge made up of mud. Thus use of alternate energy will certainly help in reducing the impact of climate change on the planet and will assist in reducing the pressure on grid for erratic supply of electricity.

Reduction In Pollution

Government of India must take strict actions to protect any tourist destination from pollution. They should impose penalty for using polythene and plastic and one should be liable for imprison if violating the environmental rule and regulations. Travel planners should encourage their guest to use the bicycles to enjoy the goodness of green environment. Entry of private vehicle to every tourist destination should be stopped at least 2 or 3 kilometers before to protect them from the harmful effect of noise, air and lead pollution. CNG fitted vehicles should be used to carry the tourist to the final destination.

Encourage Local- Businesses

Promotion of Local –Business will help the government in maintaining the ecological-balance of any tourist place. Because local people are well aware of their environment, and they will run their business in accordance to the carrying capacity of their natural resources and environment. They can make better use of their resources for example a restaurant owner can serve food on leaf plates instead of plastic disposable plates (which can’t be recycled or decomposed off and can pollute the environment), and can impress their client by offering them food in a very traditional style which is one of the main feature of Indian Culture. Local artisans can make beautiful souvenirs with spare materials and flowers of pine trees and can contribute towards spreading our culture in the whole world without damaging the environment.
All Trips Should Be Responsible

All travel planners should design responsible trips and communicate their client to respect the environment by stating

Apply The Concept Of Recycling

Recycling means processing of used materials into new products in order to prevent waste of potentially useful materials like glass, paper, metal, plastic, textiles and other electronics. It helps in reducing the consumption of fresh raw materials, increased use of energy, and decreasing the rate of pollution by reducing the need for conventional waste and lowering the greenhouse gas emissions as compared to virgin production. Even other biodegradable waste such as food or garden waste can be recycled but this doesn’t come in the recycling terminology. Materials to be recycled are either brought to a collection center or picked up from the curbside, then sorted, cleaned, and reprocessed into new materials bound for manufacturing[15].

TABLE-6
POSSIBLE ADAPTATION MEASURES FOR TOURISM AND BARRIERS TO IMPLEMENTATION

<table>
<thead>
<tr>
<th>Adaptation measures</th>
<th>Relevance to tourism Barriers to implementation</th>
<th>Measures to remove barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mainstreaming adaptation in planning</td>
<td>Currently adaptation is not mainstreamed in tourism planning</td>
<td>Lack of information on which to base policy initiatives</td>
</tr>
<tr>
<td>Include climate risk in tourism regulations, codes</td>
<td>Currently such risks are not reflected in tourism-related regulations</td>
<td>Lack of information on which to base regulatory strengthening</td>
</tr>
<tr>
<td>Institutional strengthening</td>
<td>Shortfall in institutional capacity to coordinate climate responses across tourism related sectors</td>
<td>Lack of clarity as to the Institutional strengthening required to improve sustainability of tourism</td>
</tr>
<tr>
<td>Education/awareness raising</td>
<td>Need to motivate and mobilise tourism staff and also tourists</td>
<td>Lack of education and resources that support behavioural change</td>
</tr>
<tr>
<td>Shade provision and crop Diversification</td>
<td>Additional shade increases tourist comfort</td>
<td>Lack of awareness of growing heat stress for people and crops</td>
</tr>
<tr>
<td>Reduce tourism pressures on Coral Reefs are a major tourist Attraction</td>
<td>Reducing pressures without degrading tourist experience</td>
<td>Improve off-island tourism waste management</td>
</tr>
<tr>
<td>Reduce tourism pressures on other marine resources</td>
<td>Increased productivity of marine resources increases well-being of tourismdependent communities</td>
<td>Unsustainable harvesting practices and lack of enforcement of regulations and laws</td>
</tr>
<tr>
<td>‘Soft’ coastal protection</td>
<td>Many valuable tourism assets at growing risk from coastal erosion</td>
<td>Lack of credible options that have been demonstrated and Accepted</td>
</tr>
<tr>
<td>Improved insurance cover</td>
<td>Growing likelihood that tourists and operators will make</td>
<td>Lack of access to affordable insurance</td>
</tr>
</tbody>
</table>
insurance claims

<table>
<thead>
<tr>
<th>Desalination, rainwater catchments and storage</th>
<th>Tourist resorts are major consumers of fresh water</th>
<th>Lack of information on future security of freshwater supplies</th>
<th>Provide and ensure utilization of targeted information, based on climate risk profile.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drainage and pumping systems</td>
<td>Important services for tourist resorts and for tourism dependent communities</td>
<td>Wasteful practices; lack of information to design Adequate systems</td>
<td>Provide and ensure utilization of targeted information, based on climate risk profile.</td>
</tr>
<tr>
<td>Enhanced design and sitting Standards</td>
<td>Many valuable tourism assets at growing risk from climate extremes</td>
<td>Lack of information needed to strengthen design and sitting standards.</td>
<td>Provide and ensure utilization of targeted information.</td>
</tr>
<tr>
<td>Tourism activity/product Diversification</td>
<td>Need to reduce dependency of tourism on ‘sun, sea and sand’</td>
<td>Lack of credible alternatives that have been demonstrated and accepted</td>
<td>Identify and evaluate alternative activities and demonstrate their feasibility.</td>
</tr>
</tbody>
</table>

Source: Becken and Hay (2007), *Tourism and Climate Change*

**Conclusion**

Climate change and Global Warming is thus creating a lots of problem for environment and as well as for the human beings. Tourism Industry is playing a vital role in shaking the balance between the environment and living and nonliving organisms. This global problem can only be solved with the cumulative efforts of Media, Government, National and International Tourism & various Environment friendly Organizations. Even the host community can contribute a lot towards maintaining the sustainability and reducing the impacts of pollution by applying some do’s and don’ts in their own life. Production of Eco-friendly herbal products and installation of recycling plant by the tourism related organizations and hotel companies can reduce the over stress of tourism industry on the primary natural resources and emission of dangerous greenhouse gases into the environment.

**Recommendations**

On the basis of the above discussion following recommendation can be given to protect the environment from the adverse effects of climate change and global warming caused by problematic relationship of tourism industry with the environment.

1. Government should regulate the flow of tourist traffic in the area so that it does not exceed the tourist carrying capacity of the area.
2. Promotion of Eco-tourism, Sustainable-tourism, Responsible –tourism and Alternative-tourism in order to protect the tourism industry from the harmful effect of climate-change.
3. Encourage the use of secondary sources of energy like biomass, solar energy and wind-energy to reduce the pressure of tourism industry on forest wealth and natural water-bodies to meet the demand of increased tourist traffic.
4. Encourage the tourism planners to promote industrialist to install the recycling plant to make best use of their waste material in order to reduce the pressure on natural resources for supplying the virgin raw material.
5. Impose penalties and imprison them who are found engaged in violating the environmental law and spreading pollution and littering all around the tourist destination.
6. Strict check on those people trying to damage cultural heritage sites and valuable historical monuments.
7. Planned development & management of environmental sites.
8. Tour planners should make provisions to aware their travelers about the environmental attributes and heritage value of any tourist destination. Tourism has the potential to increase public appreciation of the environment and to spread awareness of environment problems when it brings people closer contact with nature and the environment.
9. Establish a large number of wild-life sanctuaries, national-parks, biosphere reserves, tiger reserves, bird-sanctuaries and other gene banks and breeding farms to increase the population of rare and valuable species, to protect them from the human intervention and to conserve them for the coming generations.
10. Display kiosks and LCD’s on airport, bus-stops and railway-stations to disseminate information about the cultural and environmental
value of the tourist destination and to make them aware about the tourism ethics to be follow, to protect the site from the harmful effects of the pollution and over-crowdedness.

11. Entry of private and public vehicles should be banned 2-3 Km before the main tourist site, it will definitely reduce the emission of dangerous greenhouse gases in the atmosphere. Allow only Fuel-efficient or CNG fitted cars and coaches to carry the passengers.

12. Maximize the use of public transport instead of private.

13. Hotel and restaurant owner should use the power and energy sources in an efficient manner. They should tell strictly to their staff to Switch off the lights, fans and air conditioners, televisions, geysers, and laptops when not in use.

14. Replace the tube lights and bulbs with fluorescent lights to reduce the consumption of electricity. It will certainly reduce your monthly electricity bill.

15. Minimize the use of deodorants, refrigerators and air conditioners because they are the major source of spreading CFC which contributes to the ozone depletion. CFC refrigerators and air-conditioners can be used.

16. Ban the use of non-recyclable polythene and plastic to carry the vegetables and other items. Reusable cloth bag, jut bag or paper bag can be used.

17. Encourage aorestation instead of deforestation.

18. Encourage local products and local market instead of importing products from far distances that requires lots of energy consumption. On the one hand it will reduce the load on energy sources and on the other side it will promote the local cultural products.

19. Buy fresh and organic foods instead of frozen foods. Frozen foods require 10 times more energy to produce, whereas organic foods store high levels of carbon dioxide.

20. Encourage local community, tourism companies and others to contribute recyclable things like recyclable plastic, paper glass, aluminum cans, newspapers, card-boards or anything to the recycling center near you.

21. Educate everyone about the harmful effects of climate change and global warming.

22. Every individual should plant at least one tree every year.

References


