

EFFECTS OF GLOBAL WARMING ON TOURISM

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Keywords: Tourism, mobility, climate change, extreme weather, travel, safety, health

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1. Introduction

Tourism is a very important branch of the economy, but it is important also for human entertainment, relaxation, and recreation. Without doubt, climate is one of the essential parameters influencing tourism. Changes in global climate are beyond the control of the tourism industry and may have far-reaching consequences for many current tourist destinations as well as for places contemplating involvement in tourism. Understanding how climate and weather influence tourism is necessary if we want to estimate the impacts of climate change on tourism.

Despite the evident close interrelationship between vacation choice (type, destination, and duration) and climate and weather conditions, the published literature does not reveal sustained attention to deriving consensus on the measures of interdependency (Fagance, Kevan, 1997). Some consistency is evident in the assessment of the sensitivity to weather of particular tourism and recreation activities, and in the concentration on the measures of comfort levels; but beyond that there is idiosyncrasy in purpose, method, and region studied. We should mention at least three approaches:

- Tourism climate indices and climate-derived tourism activity zones
- Attempts to determine suitable days for particular recreations or activity
- Assessments of weather sensitivity for tourism activity

We expect that climate change will have some effect on:

- Desire of and necessity for people to travel in places with different climates;
- Mobility, which concerns available transport means, transport safety, and

- convenience;
- Safety: weather extremes are expected to become more frequent and intense (natural disasters are likely to endanger tourists more than local populations, and there is the potential spread of vector-borne diseases);
- Appeal of tourist destinations: some new destinations may appear, and some traditional destinations may lose their present appeal, or could even disappear (for example, some islands in the Pacific Ocean);
- Offers at tourist destinations.

Needs and desires to travel can be divided from the point of view of climate change into:

- Impacts on the home climate: people will like to spend some time in more pleasant climates or they will want to avoid oppressive weather conditions (for example, heat waves);
- Travel with the purpose of enhancing health in places known to have a healthy climate;
- Searching for climate features that allow selected recreation forms and sports.

The impact of climate change on mobility and transport can be roughly divided into:

- Impacts on infrastructure (roads, airports, etc.);
- Speed, convenience, and safety.

There is no doubt that climate change is going to affect the economy and the environment, but also human health. Our scope in this article is to describe some of the most important relationships between tourism and climate change, and to point out the potential changes in the patterns of mass tourism due to climate change. Due attention will be paid to expected increased risks for the tourism industry, individual travelers, and the environment at the tourist destinations. Projected climate change resulting from greenhouse gas global warming is likely to provide new opportunities for the tourism industry in some areas, but will restrict both the supply and demand for outdoor recreational facilities in others.

Tourist destinations will be forced to respond and adapt to the impacts of climate change on infrastructure and programs. It could be that some of the present destinations will lose appeal, and some others will increase their potential to attract masses of tourist. Some of the presently popular places could become dangerous or associated with a high health risk. Climate change could possibly affect also the availability of vital resources, for example drinking water, and will have some impact on propagation of diseases like malaria, dengue fever, etc. But already now fashions are forcing the tourist industry to develop and adapt constantly.

2. Tourism in the Future

Every year more than half a billion people cross international frontiers. In Europe, the number of international travelers grew tremendously in the last few years of the twentieth century, and the growth is expected to continue. This enormous mobility of people brings an increase in health risks for travelers and host populations, together with greater risks for the environment and for the cultural identity of the world's population

(Pasini, 1999).

What are the motivations of travelers and temporary migrants to go away? They are different, very numerous, and often combined. Traditionally it could have been—and it is the same today—the search for more resources, more food, more security, and more pleasant and comfortable climates. It could have been the search for commercial profit, or the conquest of more attractive places, but also a flight from war or other frightening situations. And what about the curiosity, the pleasure of discovering new landscapes, new people, and new cultures? People travel so that they can narrate, write, or film, urged on by the thrill of adventure. People can also travel for reasons of work, looking for different markets offering different treasures. Others travel to escape, looking for freedom in unreachable exotic climates. Some people travel for motives of faith, on pilgrimages, or on visits to see sanctuaries or oracles. Another reason for travel can be study and research; it is also possible to travel out of sheer curiosity. What about the spirit of adventure? We can assume that the motivation for traveling remain the same, but the possibilities and opportunities will increase in the near future.

The World Tourism Organization (WTO) predicts that twenty-first century tourism will be the antidote to high-tech living. The year 2020 will see the penetration of technology into all aspects of life (Pasini, 1999). People in the high-tech future will crave the human touch and tourism will be the principal means to achieve this. Upscale, luxury services that pamper and spoil their customers have a bright future in the twenty-first century. At the same time there are good prospects for low-budget destinations and packages like self-catering holiday facilities that offer plenty of opportunities for socializing among families and friends. WTO predicts that 1.5 billion tourists will be visiting foreign countries annually by the year 2020, spending more than US\$5 billion every day. Tourist arrivals are expected to grow by an average 4.3% per year over the first two decades of the twenty-first century, while receipts from international tourism will climb by 6.7% per year. In domestic tourism, WTO estimates multiply arrivals by 10 and quadruple receipts, which brings us to the grand total of 16 billion tourists spending US\$8 trillion in 2020. Tourism in the twenty-first century will not only be the world's biggest industry, it will be the largest by far that the world has ever seen. Along with its phenomenal growth and size, the tourism industry will also have to take on more responsibility for its extensive impacts—and not only its economic impact, but also its impact on the environment, on societies, and on cultural sites.

Environmental values, economic well-being, and tourist health are interdependent. Many actual and potential tourist destinations are concerned or associated with safety and security problems derived from social unrest, delinquency, terrorism, natural disasters, and health hazards. Natural disasters and health hazards, at least, are closely related to climate variability and climate change.

Global climate and regional geographic environments are evolving. These changes can create situations and conditions that favor or support new or different disease presentation. A classic example is the change in the habitat or location of vectors of human disease as a consequence of climatic or geographic change. If changes to the distribution of vectors or disease hosts take place in regions affected by or subject to population movements, we can witness the introduction or reemergence of non-

traditional diseases. Examples include the spread of malaria into areas previously malaria free.

Given the enormous increase in international travel, doctors today find themselves being increasingly asked to advise their patients on vaccinations and chemoprophylaxis and having to diagnose exotic diseases. With climate change we expect some diseases to spread even more, so it is reasonable to expect an increase in the need for information on preventive measures and to learn what personal behavior should be adopted in order to avoid diseases transmitted by arthropods, food or sexual contacts, and what health documentation or medicines to carry.

There are several risks from travel:

- Accidents occur on roads, in public places, during travel
- Disturbances of biorhythms are caused by shifts of time zone, sleep deprivation during the journey
- Natural disasters and severe weather can represent a threat to the health, property, and lives of tourists
- Disturbances with change of pressure
- Exposure to different kind of diseases
- With change of environmental temperatures we have to consider problems of thermoregulatory mechanisms and hydrogen balance, and adaptation of those balances and acclimatization to be kept in mind

Many of the abovementioned risks are closely related to climate and weather.

3. Climate and Its Components

3.1. Solar Radiation

Solar radiation is the main source of energy in the atmosphere; the amount of solar energy reaching ground level depends among other things on the amount of cloud cover. It is not clear yet what changes in cloudiness and consequently in the amount of solar radiation reaching ground level we could expect in the future, if any at all. Solar radiation is an important natural factor because it forms the earth's climate and has a significant influence on the environment. Visible solar radiation has a significant impact on the human mood, which is why for people "nice weather" is synonymous with "sunny weather." Sunny weather is still a very important factor determining how attractive a place seems to an average tourist. But in recent years the public has been paying more attention to ultraviolet (U.V.) radiation. The U.V. part of the solar spectrum plays an important role in many processes in the biosphere. It has several beneficial effects but may also be very harmful if U.V. exceeds safe limits. If the amount of U.V. radiation is sufficiently high, the self-protective ability of some biological species is exhausted and the subject may be severely damaged. This also happens with the human organism, in particular the skin and the eyes. To avoid damage from high U.V. exposures, both acute and chronic, people should limit their exposure to solar radiation by using protective measures.

Most of the UV-B radiation is absorbed in the stratosphere by ozone molecules and only

a small proportion reaches the surface of the earth. Therefore, at the surface of the earth solar radiation is composed of a large amount of UV-A radiation and only a very small amount of UV-B radiation. UV-B radiation is known to be biologically damaging, whereas UV-A radiation is much less damaging but is known for its ability to tan the human skin. As ozone is the main absorber of UV-B radiation, the amount of UV-B radiation at the earth's surface very much depends on the total amount of ozone in the atmosphere, thus on the thickness of the ozone layer.

U.V. solar radiation is a highly variable environmental parameter that differs widely in time and space. The need to reach the public with simple-to-understand information about U.V. and its possible determinant effects has led scientists to define a parameter that can be used as an indicator of U.V. exposures. This parameter is called the U.V. Index. It is related to the well-known erythematous (abnormal redness of the skin) effects of U.V. radiation on human skin and it has been defined and standardized under the umbrella of several international institutions, including the World Meteorological Organization (WMO), the World Health Organization (WHO), the United Nations Environment Programme (UNEP), and the International Commission on Non-Ionizing Radiation Protection (ICNIRP) (Vanicek et al., 2000).

Under cloudless conditions, each 1% reduction in ozone results in an increase of about 1.3% in the UV-B that affects skin tissue reaching the surface of the earth. It is very difficult to predict with any certainty when the ozone layer may recover. It is estimated that the peak global ozone losses have already been achieved, but the recovery of the ozone layer will be slow. The international measures to safeguard the ozone layer seem to be efficient, but because chlorofluorocarbons (CFCs) are quite stable and long-lived, throughout the first decades of the twenty-first century we still expect the ozone hole to appear, more extensively in some years than in others, mainly depending on climatic conditions. Thus the need will remain for understandable and standardized information about U.V. solar radiation. Tourists should be informed about the variability of the U.V. Index in Europe and throughout the world. Such information will also remain among the most important pieces of biometeorological information in the twenty-first century.

U.V. radiation increases with altitude because the amount of absorption in the overlying atmosphere decreases with altitude. Measurements show that U.V. radiation increases by 6%–8% per 1000 m increase in altitude. Thus all tourists visiting destinations at high elevations should be aware of the fact that the exposure to U.V. solar radiation is much higher there than on low-lying land. Tourists should be informed that sometimes, for example in the presence of fresh snow or sandy beaches, reflected U.V. radiation noticeably increases the dose of U.V. radiation. Information about the U.V. Index should be upgraded with descriptions of protective measures and healthy ways of sun bathing.

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