

# Identification of the Tourism Risks for Z-Value Based Risk Assessment

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## Abstract

The growing importance of the tourism sector to the global economy contributes to the increase of research in tourism risks assessment. In view of this tendency, the results of research in the field of the risk analysis on tourists' travels in various countries during the last decades have been analyzed. Commonly used in these studies statistical methods allow to reveal and identify country-specific tourism risks and threats. But it is necessary to underline that relevant statistical data on risks are available not in all cases and countries. Moreover, in most cases, the reliability of the information available is questionable. In order to improve the reliability and quality of the tourist risk assessment, it is proposed to consider tourist travel as a project. The proposed project approach to tourist risk analysis provides an opportunity to go beyond assessment based on available country-specific inferior statistical data and allows to develop a more flexible and versatile method for risk evaluation. Common risk factors and sub-factors for tourists were identified for further risk assessment using suggested by L. Zadeh Z-number. A bi-component Z-number  $Z = (A, B)$  with perception-based and imprecise parts A and B, allows taking into account the reliability of the information. Risk experts deal with the prediction like this one "very likely that the level of threat N is medium" or "extremely likely that this factor is very important". This prediction can be formalized as a Z-number based evaluation and a pack of Z-valuations is considered as Z-information. Experts evaluate identified risk factors and sub-factors and their importance weight using Z-numbers.

**Keywords:** project approach, travel risk factors, tourism risk assessment, Z-number-based evaluation

## Introduction

Humanity is surrounded by a large number of potential threats and uncertain events. Absolute security and safety do not exist in nature and cannot be achieved in any activity.

Risk, being the most comprehensive integrating concept, actually serves as a measure of the threat/danger perceived by a person or existed in his life and activity.

Traveling like any other human activity is potentially dangerous and despite the protective measures taken, there is always some level of risk.

In literature risk assessment study in tourism first of all related to the activity of tourism firm. Much fewer research papers related to the journey risk analysis. However, single tourism is becoming increasingly popular in the world, especially such types as extreme, leisure, etc. Moreover, the development of digital technologies does not preclude the organization of tourist trips in the future through the use of products similar to Uber, E-tourism etc.

Regardless of the way travel is organized, risk analysis, especially for security, will always be relevant. Studies of recent years are aimed at improving the methodology for analyzing tourism risks.

It should be noted that questionnaires are widely used for risk analysis in the tourism sector (Ragavan, Subramonian&Sharif, 2014; Chew&Jahari, 2014; Chahal&Devi, 2015; Yağmur&Doğan, 2017). At the same time, researchers give less consideration to the issues of compiling the questionnaires (questions, sub-question, etc.).

In our work, we have studied the threats to tourists, identified the travel risks and have compiled a register of risk factor son ground of expediency (suitability) of application a project approach and Z-information for the tourist trip risks analysis and assessment.

### **Risks in tourism sector: literature review**

According to Wilks, Jeff & Moore (2004) and COMCEC (2017) the World Tourism Organization identifies risks to the safety and security of visitors, host communities and tourism employees from four sources: *the human and institutional environment* – when visitors fall victim to common delinquency, terrorism, wars, social unrest and a lack of public and institutional protection services; *tourism and sectors related to tourism* such as transport, sports and retail trade, can endanger visitors' personal security, physical integrity and economic interests; *individual travelers or visitors* can endanger their own safety and security (practicing unsafe activities, inadequate conflict behavior, losing personal documents and money through carelessness); *physical and environmental risks* – travelers are unaware of the natural characteristics of the destination's flora and fauna, have not vaccinations, prophylaxis, do not take the necessary precautions in their personal hygiene, etc.

The effectiveness of institutions related to safety and security sectors (police, medical, emergency, etc.) does not mean absolute security and safety for travelers. Many problems related to safety have weather and nature conditions. For example, many countries with effective security sector have inappropriate or insecure nature conditions

(for many reasons it is not suitable to note the names of countries). But it does not mean that these countries are insecure for travelers. Many problems of travelers are related with themselves. Travelers can have bad habits/health problem can reduce the level of personal security.

In (Abukhattab, Al-Maslamani& Al-Khal,2018) the example of tourists from Qatar the pre-travel assessment risks of acquiring infectious diseases associated with food and water, arthropod bites, environmental conditions, sexual behavior is conducted. During research the patient demographics (gender, age, nationality), travel characteristics (timing of pre-travel consultation, travel destination, number of countries to be visited, departure date, travel duration, reason for travel, and type of accommodation) and medical conditions (chronic diseases, treatments, and pregnancy) and travel purposes were taken into account.

In other work (Nair, 2013) research focuses on the Risk Assessment Factors (RAF) to be considered in tourism with specific context to Qatar. For the tourism industry among risk assessment factors the tourist-based, relationship (interaction between participants) and general risk factors play a major role and have a significant influence on tourism performance. Each type of factors may be in several forms (for example tourist-based factors of risks - environmental, financial, security and etc.)

The importance of climate and weather conditions for the tourism industry and tourists is studied by Scotta&Lemieuxa (2010). Conducted research shows that climate is important limiting factor that generate risks to be managed. Moreover, in paper underlined that "climate also has an important influence on environmental conditions that can deter tourists, including infectious disease, wildfires, insect or water-borne pests and extreme events such as tropical cyclones. Many outdoor events are held at certain times of the year in order to take advantage of certain climatic conditions or reduce climate risk". Researches underline that in the destination choice the image of destination is a key determinant (among other macro scale influencing factors, such as travel distance, time, holiday cost, travel motivation etc.) and that climate is dominant attribute of destination image along with scenery and cost. Coastal flood risks are analyzed in (Kellens et al, 2012). In paper mentioned that coastal tourism has variations according to climate, holiday seasons and seasonal traditions. The relationship between tourist behavior and weather conditions is not straightforward and for example, storms may not necessarily keep tourists away. This occurrence often attracts "storm watchers" or "storm chasers."

In (Herron et al, 2016) disaster and climate change risks assessment process focuses on the direct and indirect risks to different types of projects from three climate-induced hazards: sea-level rise, hurricanes (including storm surge), and flooding (both coastal and riverain) because these hazards are considered to pose the greatest threat to the Caribbean region.

In order to determine the factors affecting on the risk management of the travel agencies, exploratory factor analysis has been used and crime, cost of transport, airline safety, airport safety and security, natural disasters, political instability in neighboring countries, lack of proper financial systems, too high prices in tourism industry and etc. are mentioned as commonalities of risk factors (Nayebzadeh&Harandi, 2014)

Disasters can cause serious property and safety loss to tourists (Sun, Yang& Chen, 2018). A disaster risk evaluation model is suggested by authors use selected 17 economic and social indicators (for example - age ratio of visitors, number of shelters, insurance completeness) from tourist destinations in Jilin Province based on the four-factor (hazard, exposure, vulnerability, recover capacity) theory of natural disaster risk formation.

Hazard for tourism such as atmospheric (frosts, floods, storms and etc.), geological (earthquakes, tsunamis, erosion and etc.), biologic (epidemics, fires), human (crime, terrorism, traffic accidents and etc.) are presented in (Fotiou, 2013). Among risks for tourists the environmental, diseases, financial, socio-cultural, product liability, property damage, security are outlined.

Based on the weights and scores of tourism safety risk indicators such as hazard (*slope altitude and precipitation levels, type of surface vegetation cover, management standard indicator, visitor behavior variability indicator*), exposure (*visitor ratio, facility ratio, tourism income ratio, tourism resource amount*), vulnerability of the hazard-bearing body (*visitor vulnerability indicator, tourism capacity, tourism resource level*), and the ability of disaster prevention and reduction (*visitor safety awareness, safety management ability, medical rescue ability, general rescue ability, convenience of transportation*) the level of risks of Changbai Mountain scenic areas are evaluated (Zhou& Liu,2017)

Environmental risk, business and human resource risk are the most important and the influencing factors on resort business and operation (Puteh Salin, 2017)

The article (Ruan, Li & Liu, 2017) indicates that the perception of the tourist destination consists of the accumulated travel experience, information from print sources and media. Perceptions change over time. Individual's mental representation of knowledge, feelings, and impressions will influence their destination choice and their order of priorities when planning to promote tourism destination. Factors such as certain disease control measures in the airport, culture, and tradition, the accuracy of travel information affect the choice of travel destinations. Moreover, the quality of service may improve the original negative images of destination.

Presented in (Chang TY et al., 2018) the literature review indicates risk factors for travelers. Studied risks for tourist guides related to travel should be taken into consideration - natural disaster risk, traffic safety, food safety, accommodation safety, personal health problems, infectious diseases, dietary irregularity. Moreover, operation

problems of travel agencies, the quality problems of local service agencies, and even the neglect of service by suppliers, such as cars, ships, hotels, restaurants, scenic spots and so on, it is easy will lead to risk situations.

According to the literature review presented in (Biswakarma, 2017) we can conclude that the travel risks include diseases, crime, natural disasters, problems with hygiene, transportation, culture/language barriers, uncertainty related to destination-specific laws and regulations, terrorism, epidemics and health, political instability, crimes against tourists. The perceived risk by the tourist (Nepal example) calculated from perceived risk, health risk, terrorism, violence.

Factors (socio-psychological risk, physical risk, financial risk, health risk, disaster risk, and radiation risk) of perceived risk are studied in (Chew & Jahari, 2014). In the paper mentioned that the tourism industry has the intangible nature of its product. Images of destination are formed according to the perception rather than reality. So, the relationship between perceived risks and destination image is significant. In the next paper of these researchers (Chew & Jahari, 2014) the analysis of perceived risks and destination images in relation to revisit intention are presented. The target population of this study was Malaysian tourists who had been to Japan prior to this study. Data collected from the questionnaire. The survey instrument comprised of scales measuring perceived physical risk, socio-psychological risk, financial risk, cognitive image, affective image, and intention to revisit.

The impact of tourist perceptions, destination image and tourist satisfaction on tourist loyalty was studied and perceived risks were mentioned as attributes and determinants of tourist satisfaction and loyalty in (Rajesh, 2013).

In (Yağmur & Doğan, 2017) mentioned that tourists often prefer destinations with low cost and low-security risk. Despite absolute (real) risk which is objective assessment the perceived risk can be described as a subjective expectation of potential loss. In study the destination risk perceptions scale (DRS) was used and questionnaire included 29 items based on physical (*food, diseases, disasters, car accident, crime, terrorism, political unrest, tourist behavior*), financial (*money, extra expenses and etc.*), performance (*hotel, site, food, attitude of locals*), socio-psychological (*personal satisfaction, thinks and etc.*), time (*vacation time, trip time*) risk factors was implemented.

Risk influence, tourist behavior and tourism is an intangible service that is exposed to potential risks and threats (Hashim et al., 2018). Differences among tourists in their risk perception exist and the importance of every risk factor differs according to the person and their particular situation. Moreover, in the paper, the 13 types (crime, cultural, physical and etc.) of perceived risk related to tourism are shown and a framework of 6 types of risk for travel intention is proposed.

Travelers have limited knowledge about the new destinations and make choice based on information from media and social groups (Ragavan, Subramonian & Sharif, 2014). The

travel destination is described by a set of attributes named travel attributes. Tourists evaluate travel attributes and different demographic groups of travelers have different perceptions of these attributes.

It should be noted that the types of risks associated with tourist trips are reflected in detail in works devoted to perceived travel risk. However, since the threats for tourists are common, the results of the literature review of perceived risks of travel destinations were also taken into account during the study.

## **2. Project approach to tourist trip risk assessment**

Today project management has moved from narrow professional spheres to all areas of business. Every day all of us carry out projects in our daily life: travelling, shopping, construction, etc. All these activities have a number of common features specific to projects. They are aimed at achieving specific goals; include coordination of related activities; have a limited time, with a certain beginning and end; unique and not repeatable.

Any tourist trip is aimed at achieving goals - adventure, excursions, treatment, etc. To achieve the goals, coordinated implementation of interrelated actions is necessary - preparation, solving the travel documents problem, temporary absence issues, etc? Travel has terms of departure and return. Each journey is different from the other, even if the same country was committed (different years, changing circumstances, etc.).

Therefore, it is advisable to use the project risk analysis methodology for risk analysis of a tourist trip/travel.

Project management always occurs under the influence of many factors that are changing in the process of project implementation. These factors may be the result of internal and external project processes. Uncertainty is the integral feature of the project and refers to the incompleteness or inaccuracy of information about the internal and external environment of the project. Consequently, one of the main processes in project management is the management of project risks, which present at all stages of the project life cycle.

The application of the project approach allows us to expand the scope of research. In the project approach, threat analysis does not have critical significance. Only the risks are important. When taking into account project risks, not only the absolute losses or benefits themselves are important, but also the consideration of their influence on the final result of the project.

Using a project approach to risk analysis allows to go beyond the framework of the researcher's own country-oriented assessment and allows to develop more flexible and universal methods for assessing tourism risks.

## **Tourism (travel) risks identification and analysis**

### **3.1. Travel risk factors and threats for tourists**

Risk assessment in the tourism sector is used for evaluation of the level of danger to human life and activity. People, involved in the tourism business and responsible for the prevention of adverse outcomes, need a detailed and clear structuring of the possible undesired outcomes. The problem of classifying tourism risks has not been resolved completely due to the variety of conditions and factors leading to situations of different levels of risk. Risks in the tourism sector can conditionally be divided into two groups: risks to the life/health of tourists and business risks. Since the business in the tourism sector is based on travel and the risks to life/health are primary, then in our work, we will consider the safety risks of travelers.

The conditions for the occurrence of risks to the life/health of travelers are the existence of risk sources and emergency of a risk factor at a level that is dangerous to humans.

In most research publications the term a perceived risk is used. In the case of perceived risk analysis, studies are usually carried out among tourists who have visited a particular country (object of study). This is possible for researchers conducting an analysis of the situation in their home country/partner country or when it is possible to work with tourists who have visited/are visiting the country - the object of the study. To do this, there must be an appropriate flow of tourists to the country under study (Björk & Kauppinen-Räsänen, 2013; Chew & Jahari, 2014) and only after that statistical processing of information is possible - examples of Nepal, Malaysia, Turkey, India (Biswakarma, 2017; Hashim et al., 2018; Ragavan, Subramonian & Sharif, 2014; Yang, Sharif & Khoo-Lattimore, 2015; Yağmur & Doğan, 2017; Gupta, Gupta & Arora, 2010)

But how to assess the risks of visiting a country located on another continent, or if the flow of tourists to the studied country for one reason or another is very small? In practice, situations often arise when it is necessary to assess the risks of traveling to a particular country, based on insufficient information (Internet data, impressions of individual tourists, etc.).

Given these circumstances, in this paper it is proposed to consider a tourist trip as a project and, accordingly, to assess risks as risks of the project.

When considering a trip as a project, the specific types of risks themselves are not as important as the mechanism and methods for assessing them and calculating risks. At the initial stage of risk identification, the main threats to travelers have been identified.

After the detailed study of the subject area, the following groups of threats to the personal safety of the tourist have been identified:

- Threats at the planning stage of a tourist trip
- Threats during the journey
- Threats associated with inappropriate activities of tourism service providers



- Threats related to the incorrect tourist behavior or non-compliance with safety rules
- Transport threats when traveling to / returning from the country of destination (travel/transportation)

Based on this grouping, the register of threats has been compiled.

### **3.2. Risk analysis**

It is necessary to take into account that the threat registry, in contrast to the risk registry, is to a certain extent more extensive. It includes almost all potential (real and imaginary) threats. The authors do not claim that the compiled register is the most complete or perfect. Into the presented register of threats were included those threats which, in our opinion, deserved attention.

At the next stage, for the final identification of risks and compiling a register of risks, determining the main risk factors and their sub-factors, a Delphi analysis was carried out with the involvement of both local and foreign experts. We do not go into details of Delphi analysis rounds because this method is widely used in the tourism sector research (Kaynak&Marandy, 2006; Chang, Shen&Li, 2018; Knowles, 2019). After two rounds of the Delphi analysis, in order to avoid unnecessary complexity, the factors with relatively small likelihood and factors, impractical for other reasons, were excluded from the list of threats. So, when assessing the security risks of the trip, it should be taken into account that the likelihood of realizing threats, associated with the inability to travel due to force majeure circumstances, is negligible.

In the case of emergency events related to a potential tourist, the trip becomes impossible and further analysis becomes meaningless because losses from travel abroad and losses associated with force majeure circumstances are not comparable. When analyzing the risks of camping trips, the risks associated with transport accidents/accidents are not of practical importance. This area belongs to the competence of the management of transport companies. Tourism experts do not have key information for risk analysis of the activities of transport companies (for example, the level of training of the airline's flight personnel, the degree of preparedness of the airport controllers of the destination country, etc.) and will not be able to conduct it. In addition, from further consideration, the dangers of occurrence risks that bear a pronounced country-oriented specificity - (for example, radiation risk - since it is not very relevant for most tourist routes) were excluded.

The resulting risk register can be used to select a safe trip among several alternatives, as well as to assess the risks of a safe trip to a specific country. It should be noted that the question of whether it is safe or not to travel to a particular country should be considered as a more psychological one, because, in most cases selection of a specific country with an extreme risk environment is adventure driven.



After conducting a detailed study of potential threats/factors main risk factors and risk sub-factors that should be taken into account when assessing the generalized risk of travel safety in a given country have been identified. Table 1 lists the main tourist travel risk factors.

Table 1. Tourist travel risk factors

Risk factors	
1	Destination country's risks
2	Natural environment's risks
3	Tour operator's risks
4	Transportation risks
5	Traveler's risks (personality based)

The compiled list of risk factors for a tourist trip is not complete and universal. Necessary changes can be made to it, it can be expanded or shortened, other subfactors can be added. It is necessary to underline one specific feature of Delphi analysis as applied to the framework of our study. Since in the future research we are intending to use not only statistical information but also fuzzy estimates for risk assessment, the resulting list of factors allows using the Z-number based approach. The compiled list of factors was used to assess risks in (Nuriyev&Jabbarova, 2019)

### Z-number based travel risk assessment

Various mathematical tools such as probability theory, the theory of possibilities, fuzzy approach, etc are used for risk assessment. The first tool of formalization of the uncertainties was a probability. Among other tools, it should be noted the imprecise (interval) probability and representations based on the theories of possibility and evidence, as well as qualitative approaches (Aven, 2016; Zhang, Li & Zhang, 2016; Ghasemi, Hossein Mahmoudi Sari, Yousefi, Falsafi & Tamosaitiene, 2018). A lot of literature has been devoted to the application of these methods for risk analysis, and we will not dwell on them.

Tools of risk assessment based on traditional probabilistic or possibility models have a limited capacity of description and processing project-related uncertain information and not in all cases are relevant for the risk assessment. The reliability of relevant information unaccounted in mentioned approaches and this circumstance limits their power of description.

Zadeh (2011 p.1) noted that "In the real world, uncertainty is a pervasive phenomenon. Much of the information on which decisions are based is uncertain. Humans have a remarkable capability to make rational decisions based on information which is uncertain, imprecise and/or incomplete. Formalization of this capability, at least to some

degree, is a challenge that is hard to meet. It is this challenge that motivates the concepts and ideas outlined in this note”. Zadeh suggested a bi-component Z-number  $Z=(A,B)$  to represent a restriction on the values of the uncertain variable (A) and its certainty. Z-number  $Z = (A, B)$  allows to take into account the reliability of the information. Usually, A and B are sense-based and in effect are imprecise. Recent advances in computation with Z-numbers allows to conceptualize and process uncertain information by using perception-based and linguistically expressed fuzzy numbers, describing both restrictions on the value of the uncertain variable and reliability of the value.

Since its introduction, the concept of Z-numbers has been successfully applied as a new direction in the analysis of uncertain and complex systems in various areas of science and technology. Aliev and colleagues suggested a general and computationally effective approach to computation with Z-numbers. The approach is applied to the computation of arithmetic and algebraic operations, t-norms and s-norms, and construction of typical functions (Aliev, Huseynov&Zeinalova, 2016; Aliev et al., 2015; Aliev, Huseynov&Aliyev, 2017; Aliev, Huseynov&Alieva, 2016).

The work of Zadeh (2012) discusses different methods, applications, and systems based on the Z-number concept. Zadeh (2013) indicated risk assessment as one of the main areas of application of Z numbers.

It should be noted than in many areas, risk experts deal with the prediction like this one “*very likely that the level of threat N is medium*” or “*extremely likely that this factor is very important*”. This prediction can be formalized as a Z-number based evaluation X is  $Z (A, B)$  (Aliev, Alizadeh&Huseynov, 2015). A pack of Z-valuations is considered as Z-information. In suggested approach experts evaluate risk factors and sub-factors (Table 1) and their importance weight using Z-numbers. So we have **Z-value based risk** or risk factors for each alternative (country). Using Z-numbers to calculate the level of risk or risk factors for project risk assessment in case of tourist travel shown in (Nuriyev&Jabbarova, 2019). Arithmetic operations on Z-numbers as well as the ranking of Z-numbers (Aliev, Huseynov&Serdaroglu, 2016) and aggregation of Z-information allow using Multi-Criteria Decision Analysis (MCDA) for the solving decision-making problem which can be utilized for risk factors estimation (Nuriyev, 2019). And as for next step the (MCDA) can be used for the solving decision-making problem of choosing a safe travel destination. The example of tourist travel risk Z-evaluation using risk factors and sub-factors given in Table 2.

Table 2. Tourist travel risk Z-evaluation

Item	Country A1	Country A2
Risk factors&sub-factors	evaluation of threats	evaluation of threats
	evaluation of importance	evaluation of importance weights

weights

weights						
1	Destination country's risks					
1.1	Terrorist threats	(Low, Very Likely)	Very	(High, Very Likely)	(Low, Very Likely)	(High, Very Likely)
1.2	Crime situation	(Medium, Extremely Likely)		(High, Very Likely)	(Medium, Likely)	(High, Very Likely)
1.3	Cultural/mental differences	(Low, Very Likely)	Very	(Low, Very Likely)	(Medium, Likely)	(High, Very Likely)
1.4	Level of local sanitation	(Medium, Very Likely)		(Medium, Likely)	(Medium, Very Likely)	(Medium, Likely)
1.5	Level of local emergency services	(Medium, Very Likely)		(Medium, Likely)	(Medium, Likely)	(Medium, Likely)
1.6	mobile communications / Internet	(Very Likely)	Low,	(Medium, Likely)	(Low, Very Likely)	(Medium, Very Likely)

**Conclusion and further researches**

Potential risks of traveling to various countries have been studied and based on analysis most common risks that travelers can encounter (almost in all countries, in any season, on any means of travel, etc.) are identified.

Tourist trip is studied as a project and based on the project approach travel risks have been identified and a generalized risks register for the tourist trip is developed. Identified risk factors are independent of the data processing tools (statistical, expert opinion study, fuzzy approach, etc.) and can be used for the comparative analysis of the trip risks in various countries.

The use of Z-value based risk assessment in combination with the project approach allows us to develop a more universal methodology for assessing tourism risks. Such assessment methods are not directly dependent on the country being studied. Application of the project approach allows establishing more general risk factors for a tourist trip, which are independent of the country and the amount of statistical information. In some cases, in addition, comparative analysis can be carried out and, based on the results of the study, country-specific factors can be added.

Based on the Z-Value Based Risk Assessment, it is possible to more effectively compare the risks of tourist trips to a particular country using perception-based predictions of risk experts. The results obtained creates necessary prerequisites for the use of the Z-number in future studies not only for assessment of the tourism risks but also for assessment of project risks in other areas of human activity. The provided methodology allows compiling a register of project risk factors and sub-factors for further Z-Value Based Risk Assessment.

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