Studying the Effect of Climate Change on the Conditions of Isfahan's Province Tourism

A.Gandomkar, F. Khorasanizadeh

Abstract—Tourism is a phenomenon respected by the human communities since a long time ago. It has been evolving continually based on a variety of social and economic needs and with respect to increasingly development of communication and considerable increase of tourist's number and resulted exchange income has attained much out come such as employment for the communities. For the purpose of tourism development in this zone suitable times and locations need to be specified in the zone for the tourist's attendance. One of the most important needs of the tourists is the knowledge of climate conditions and suitable times for sightseeing. In this survey, the climate trend condition has been identified for attending the tourists in Isfahan province using the modified tourism climate index (TCI) as well as SPSS, GIS, excel, surfer softwares. This index evoluates systematically the climate conditions for tourism affairs and activities using the monthly maximum mean parameters of daily temperature, daily mean temperature, minimum relative humidity, daily mean relative humidity, precipitation (mm), total sunny hours, wind speed and dust. The results obtaind using kendal's correlation test show that the months January, February, March, April, May, June, July, August, September, October, November and December are significant and have an increasing trend that indicates the best condition for attending the tourists. S, P, T mean , T max and dust are estimated from 1976-2005 and do kendal's correlation test again to see which parameter has been effective. Based on the test, we also observed on the effective parameters that the rate of dust in February, March, April, May, June, July, August, October and November is decreasing and precipitation in September and January is increasing and also the radiation rate in May and August is increasing that indicate a better condition of convenience. Maximum temperature in June is also decreasing. Isfahan province has two spring and fall peaks and the best places for tourism are in the north and western areas.

Keywords—Climate, Tourism, Correlation Test, Tourism Climate Index, Isfahan Province

I. Introduction

NOWADAYS, tourism industry is beyond an industry and as a world s dynamic and social phenomenon has own special complications. A phenomenon with an integrated and hidden mechanism takes a variety of forms at different times and places and consequently leaves different impacts on the human communities. Amelong and Winer [1] studied the worlds future climate change, Mediterranean zone and the possibility of over warming the Mediterranean sea in the summer and suggested that the north of Europe is more suitable in this season form the view of the weather and also some typical parts of Mediterranean sea are appropriate and pleasant in spring and fall so that these local and time changes in tourism attraction are important factors in spatial distribution of the tourism development. Hin and colleagues [2] have studied the condition of tourism convenience in Spain using TCI method and case studes on this country.

A. Gandomkar, Najafabad Branch, Islamic Azad University, Najafabad, Iran (phone: +989133254097 e-mail: aagandomkar@yahoo.com).

F. Khorasanizadeh, Najafabad Branch, Islamic Azad University, (e-mail: Farnooshkh1365@gmail.com)

They have forecasted that condition will have the least difference by 2060 and referred to the summer form the view of the tourism favorable convenience. It may referred to PRECH-NIELSON 2008 about climate changes and tourism using TCI index in Europe as well as CISCAR book which studies the Europe climate convenience in the present and future using TCI index regarding the climate changes.

A recent development was to extend the model to include domestic tourism, expenditures on tourism and the length of stay [3]. It is this version of the model that will be discussed here. Subsequent developments of the model have focussed on examining the effects of various climate policies on the flows of tourists [4]. Scott and McBoyle [5] apply the tourism index approach to the impact of climate change on city tourism in several North American cities. Cities are ranked according to their climatic appropriateness for tourism and the relationship between tourist accommodation expenditures is examined. Then this ranking is recalculated using data fromscenarios of (the lower and middle bounds of) climate change for the 2050s and the 2080s. Climate change has the potential to alter weather conditions and landscapes at tourist destinations, and is therefore likely to modify tourist demand and travel patterns [6]. They may alter the ecological systems of an area, which may in turn alter the quality of the recreation experience [7]. Gössling and Peeters [8] conclude that in an average holiday or short break involving air travel, 60–95% of its contribution to global warming will be caused by the flight. The growth, and predicted future growth, in international tourism is a major concern. International tourist arrivals grew to 903 million in 2007 and are forecast to increase to 1.6 billion in 2020 [9]. International tourism is largely dominated by developed countries. The current tourism trend in these industrialised countries has been described as hyper-mobility [10] and is characterised by the taking of several short-breaks and longer holidays every year. Estimates suggest that carbon dioxide emissions from air travel could rise to more than 15% of total carbon dioxide emissions from all sources by 2050 [11]. Several studies report low awareness of the impact of air travel on climate change [12]. In the UK a number of quantitative studies have examined public attitudes towards air travel [13]. In the most recent [14] study, 66% of total respondents said they believed that air travel harms the environment, with 44% of these respondents specifically mentioning climate change and 64% saying they would be willing to pay more for air travel in order to reflect the environmental harm. In a quantitative study, that asked directly about climate change, 62% would take fewer flights to reduce impacts [15]. Outside tourism, there are issues generally with climate change action and people have little faith their actions will make a difference, most individuals finding it difficult to disentangle themselves from high carbon lifestyles [16]. This could be because people feel they have earned the right to fly and take holidays [17].

II. METHODOLOGY

As the survey has been provided to study the conditions of climate convenience applying TCI modified index for planning the tourism in Isfahan province. First ,we collected the data from 20 Synoptical stations involving Ardestan, Daran, Isfahan, Golpayegan, Kabootarabad, Kashan, Khoor and Biabanak, Meymeh, Naein, Natanz, Shahreza, the east of Isfahan, Borojen, Sharekord, Koohrang, Abadeh, Qom, Yasooj, Aligoodarz and Robat Poshtbadam from 1976-2005.
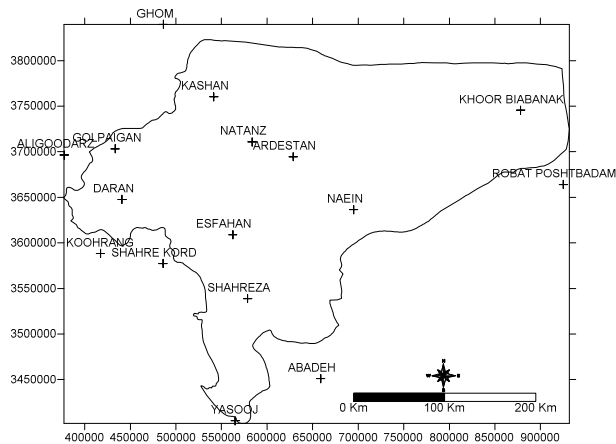

Fig. 1 Location of synoptic stations in Isfahan province

The data required (radiation, wind, relative humidity, temperature, precipitation and dust) was gotten from the meterology site as monthly and estimated using TCI modified index and then the required calculations and analyses conducted .In this regard , CID is the convenience index during the day involving daily maximum mean temperature (Tmax)and mean relative humidity (RH). CIA is the daily convenience index involving daily mean temperature and mean relative humidity .R is the precipitation rate in mm ,S is the duration of sunny hours, W is the mean wind speed in km/s and .Dust the rate of dust.

$$TCI=2(4CID+2R+2S+W)- Dust \qquad (1)$$

CID-The convenience index during the day: It consists of the daily maximum temperature and minimum relative humidity.

CIA-The convenience index of night and day: It consists of mean dry temperature and mean relative humidity.

R-The rate of precipitation in mm.

S-The shinning hours

W-wind speed in km/s

Dust-dust

After getting the monthly tci rates from the data ,we averaged using surfer software.

III. DISCUSSION

On below diagrams, an increasing trend is observed in all month that are a suitable time for attending the tourists.
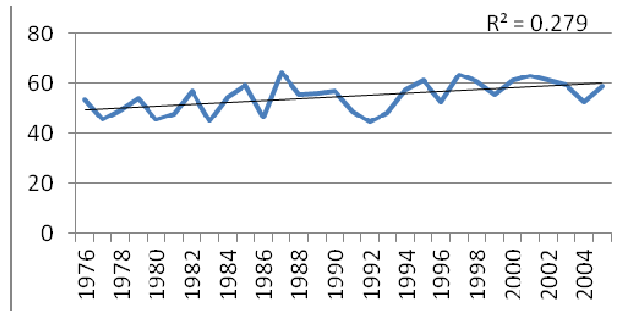

Fig. 2 The time series of January tci index in Isfahan province
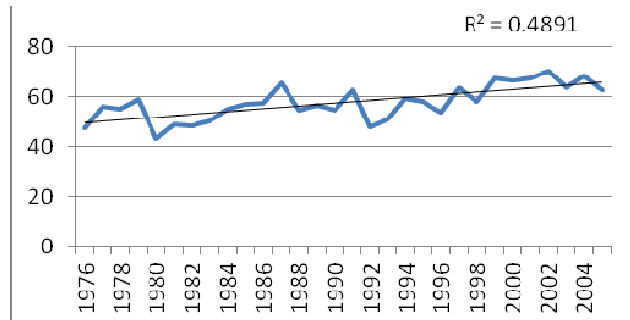

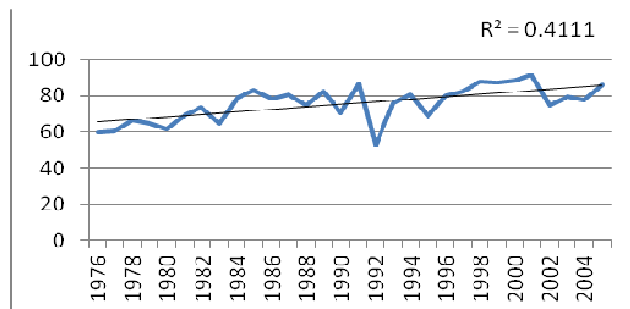Fig. 3 The time series of February tci index in Isfahan province

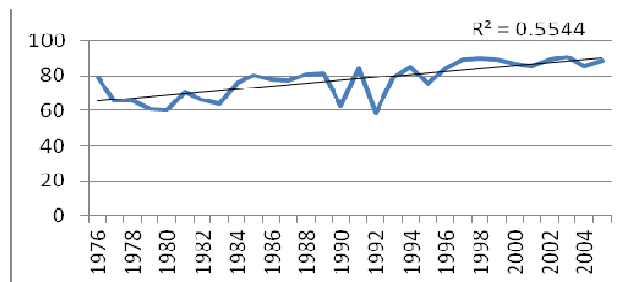Fig. 4 The time series of April tci index in Isfahan province

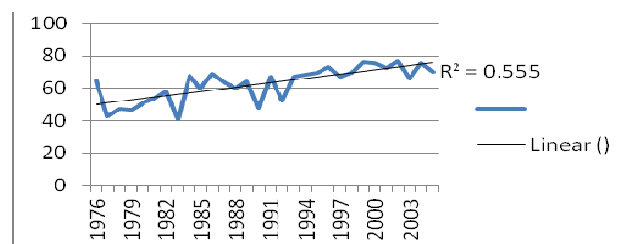Fig. 5 The time series of May tci index in Isfahan province

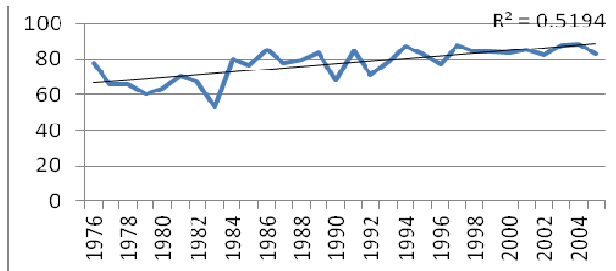Fig. 6 The time series of July tci index in Isfahan province

Fig. 7 The time series of September tci index in Isfahan province

IV. CONCLUSION

Its better for a tourist to look for a climate which do not feel worry and upset on that, and this factor is very important to make a decision of this destination and duration of his journey so it's necessary to rely on the methods and modern scientific models like TCI (tourist climate index) to check the TCI of months considering temperature rest.in this study TCI of Isfahan province is calculated by using 30 years old data (1976-2005) and the needed parameters are average minimum and maximum of temperature ,average and minimum and maximum of relative moisture ,rainfall ,sunshine ,wind ,dust.in this study the surfer ,spss,excel,gis software are used.and the data test is done by using Kendal correlation test .the obtained result show that the month are meaningful and their processes are ascending show the best position for tourists.by testing on impressive parameters it also show that the dust rate is descending in February, March, April, May, June, July, August, September, October, November. Precipitation is ascending in January and September, and sunshine rate is ascending in may and august which shows the developed rest position, and the high temperature is ascending in June, too. Isfahan province has two spring and fall peaks and the best places for tourism are in the north and western areas.
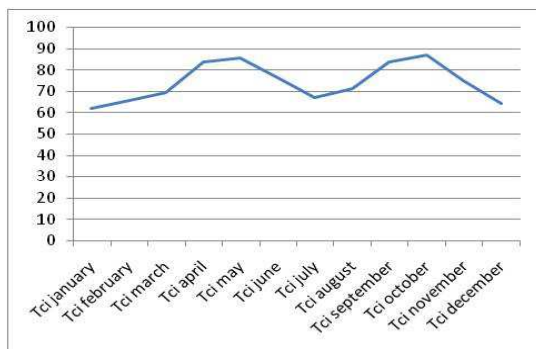

Fig. 8 The time series of mean tci index in Isfahan province

REFERENCES

[1] B. Amelung , D. Winer, "Mediterranean tourism: Exploring the future with the tourism climatic index", *Journal of sustainable tourism*, 14, 2006, pp 349-366.

[2] L. Hein, M.J. Metzger and A. Moveno, "Potential impacts of climate change on tourism, a case study for study for spain", *Carrent opinion in Environmental sustainability* ,Volume 10, 2009, pp 170-178.

[3] A. Bigano, J.M. Hamilton and R.S.J. Tol, "The Impact of Climate Change on Domestic and International Tourism: A Simulation Study", *Integrated Assessment Journal*, 7 (1), 2007, pp 25-49.

[4] K. Mayor and R.S.J. Tol, "The Impact of the UK Aviation Tax on Carbon Dioxide Emissions and Visitor Numbers", *Transport Policy*, 14 (6), 2007, pp 407-513.

[5] D. Scott and G. McBoyle, "Using a Tourism Climate Index to examine the implications of climate change for Climate as a Tourism Resource", *In International Society of BiometeorologyProceedings of the First International Workshop on Climate, Tourism and Recreation*, 2001,. ed. A. Matzarakis and C. de Freitas. Retrieved from http://www.mif.uni-freiburg.de/isb/ws/report.htm

[6] D. Scott, G. McBoyle and M. Schwartzentruber, "Climate change and the distribution of climatic resources for tourism in North America", *Climate Research*, 27, 2007, pp 105–117.

[7] M. C. Uyarra, J.A. Gill, R. Tinch, D. Viner and A. R. Watkinson, "Islandspecific preferences of tourists for environmental features: implications of climate change for tourism-dependent states", *Environmental Conservation*, 32, 2005, pp 11–19.

[8] S. Gössling and P. Peeters, "It does not harm the environment! An analysis of industry discourses on tourism, air travel and the environment", *Journal of Sustainable Tourism*, 15 (4), 2007, pp 402–417.

[9] United Nation World Tourism Organization, "Tourism highlights 2008" <http://www.unwto.org/facts/eng/pdf/highlights/UNWTO_Highlights08_en_LR.pdf> (accessed 12.02.2009).

[10] K. Høyer,"Sustainable tourism or sustainable mobility? The Norwegian case", *Journal of Sustainable Tourism*, 8 (2), 2008, pp 147–160.

[11] G. Dubois and J.P. Ceron, "Tourism/leisure greenhouse gas emissions forecasts for 2050: factors for change in France", *Journal of Sustainable Tourism*, 14 (2), 2006, pp 172–191.

[12] S. Becken, "Tourists' perception of international air travel's impact on the global climate and potential climate change policies", *Journal of Sustainable Tourism*, 15 (4), 2007, pp 351 368.

[13] Department for Transport, "Public experiences of and attitudes to air travel",<http://www.dft.gov.uk/pgr/statistics/datatablespublications/trsnstatsatt/publicexperiencesofandattitu1824> (accessed 28.01.2008).

[14] Department for Transport, "Public experiences of and attitudes to air trave",<http://www.dft.gov.uk/pgr/statistics/datatablespublications/trsnstatsatt/airtravel> (accessed 12.02.2009).

[15] I. Lorenzoni and N. F. Pidgeon, "Public views on climate change: European and USA perspectives", Climatic Change, 77, 2006,pp 73–95.

[16] K. Bickerstaff, P. Simmons and N. Pidgeon, "Constructing responsibilities for risk: negotiating citizen-state relationships", *Environment and Planning* A, 40, 2008, pp 1312–1330.

[17] S. Barr, T. Coles, G. Shaw and J. Prillwitz, "A holiday is a holiday: practicing sustainability, home and away", in: *Royal Geographical Society Annual Conference*, August 2008, London.