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Evaluation of Climate Suitability for Nature-Based Tourism (NBT) in Arid Regions of Isfahan Province (Iran)

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Abstract: This article applies the weather types method to assess the climate suitability for nature-based tourism (NBT) in the arid and hyper-arid climate zones of the province of Isfahan (Iran) based on bioclimatic criteria and the preferences of Iranian domestic tourists identified by means of a survey. To date, there are no climate potential assessments for the practice of nature tourism based on an analysis of climate preferences in the study area. According to the results, the distribution of favorable weather types in the study area between March and November during the period 1998–2017 showed that there is a low season in summer and two high seasons corresponding to autumn and spring. The highest frequencies of weather types conducive to NBT were recorded between the second half of September to the first half of November and between the second half of April until the end of May. The calendars resulting from application of the weather types method will serve as an efficient tool for providing tourists and the region's main tourist stakeholders with information; in the case of the latter, they will be particularly useful for destination planning and activity scheduling.

Keywords: tourism; climate; weather types method; tourists preferences; tourism management; Iran

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1. Introduction

Tourism is one of the world's most important economic sectors and is strongly influenced by climate conditions [1–3]. Understanding the suitability of climates for tourism is particularly beneficial for effective tourism planning and destination management [4,5]. In the scientific literature, fewer publications have focused on the suitability of arid climates for different forms of tourism than have focused on temperate climates and humid tropical climates. This reduced coverage could be explained by the low relative weight of tourism in regions and destinations exposed to extreme climates. Although regions with arid climates have remained on the fringes of mass tourism for a long time, the democratization of long-distance travel and the desire among travelers to discover new destinations or engage in unique tourist experiences have led to a rise in tourist flows towards such regions [6]. This trend underlines the need to broaden the spectrum of research on tourism climatology to include regions with extremely arid climates.

Tourists and tourist destination planners and managers must adapt to unfavorable climate conditions [7–11]. Arid climates present certain characteristics that help guarantee tourists' enjoyment but can also somewhat compromise their needs in terms of comfort and safety. The lack of cloud cover, the high levels of daily sunshine and the low rainfall that define these climates have a major impact on human physiology and behavior that, in the case of tourists, is reflected in enhanced feelings of pleasure, happiness and satisfaction [12,13]. Although, in principle, these characteristics are highly favorable, they are compromised by extreme heat, low relative humidity and significant wind, all of which can jeopardize the comfort and safety of visitors. Thus, the extreme thermal conditions are reflected in the average annual temperatures, extreme absolute temperatures and major fluctuations in daily values, circumstances that challenge the physiological mechanisms regulating the body's internal temperature [14]. Often, this heat is not attenuated by the

wind, which barely cools the air and often carries dust and airborne particles that hinder tourism and make it an unpleasant experience [15,16]. In addition, this drying effect is exacerbated by the humidity conditions, which can increase the risk of dehydration and overheating.

The specific characteristics of arid climates underline the benefits of analyzing climate suitability for tourism based on different spatial scales and temporal resolutions. From a spatial point of view, local climates involve a mere refinement of the scale of regional climates [14,17,18]. The atmospheric environment in resorts depends on the local climate, which stems from geographical factors that modify the regional climate. Regional and local climate conditions are the factors considered by tourists when choosing a destination and planning their holidays and are taken into account by tour operators when planning activity schedules at destinations and forecasting attendance [19]. However, it is important to bear in mind that tourist experience is situated on the fine scale of microclimates and environments [20–23], an aspect that must be taken into careful consideration in the design of strategies for adapting to the unpleasant and extreme conditions of arid climates.

With respect to temporal resolution, the characteristics of arid climates underscore the need for a dual approach, i.e., daily and hourly resolution. Daily resolution is the most widely used and recommended approach in research on the suitability of climates for tourism. Studies conducted in warm temperate areas of the Mediterranean [24–28] and humid tropical areas of the Caribbean and Asia [29–32], to name just a few examples, have routinely used daily data grouped into periods of 30, 10 or 5 days based on the inter-day variability of destinations, the characteristics of the method or index used in the evaluation and the level of detail of the research. The hourly approach is less common in tourism climatology [33,34], although it is crucially important when planning leisure and recreational activities in destinations with extreme climates. Not surprisingly, it is common for activities at these resorts to be scheduled outside what is considered the standard period for recreational activities, which is generally between 10 a.m. and 6 p.m.

Traditionally, studies on climate suitability for tourism have used climate indices such as the Tourism Climate Index [35,36], the Climate Index for Tourism [37], the Climate Tourism Information Scheme [27,38,39], the Beach Climate Index [31], the Holiday Climate Index [40] and the Beach Utility Index [41], or the weather types method [25,29,42–44]. The results of applying the different evaluation tools have also depended on the procedures used to determine suitability thresholds in the different weather variables (either for tourism in general or for a certain type of tourism). These procedures have sometimes been based on expert judgement [36,45] and, at other times, on bioclimatic criteria, preferences expressed through surveys [42,43,46–49] and/or preferences revealed based on behavior [50,51]. In the case of arid climates, most suitability analyses carried out have used the Tourism Climate Index [52], the Climate Tourism Information Scheme [28] and the Holiday Climate Index [53]; however, we are not aware of any studies based on the weather types method. Likewise, the most common benchmarks used have been expert judgement and bioclimatic criteria, which are much more widespread than preferences expressed through surveys or revealed through tourist behavior.

This study quantifies, for the first time, the suitability of the climate for nature-based tourism (NBT) in the arid and hyper-arid regions of the Iranian province of Isfahan based on the weather types method (at daily resolution). The analysis takes account of the preferences of Iran's domestic tourists, determined through a survey. The calendars resulting from application of the weather types method will serve as an effective tool for providing tourists and the region's main tourist stakeholders with information; in the case of the latter, they will be particularly beneficial for destination planning and activity scheduling.

2. Materials and Methods

This research assesses, adapting the weather types method of Besancenot [14], the suitability of the climate in the province of Isfahan (Iran) for the practice of nature-based tourism (NTB). The method takes into account bioclimatic criteria and the preferences of

Iranian domestic tourists identified by means of a survey. The period taken as a reference for this evaluation is 1998–2017; the analysis is performed at daily resolution.

2.1. Study Area and Tourist Climate Assessment in Iran

Climate studies on Iran show that the country is located on the world's desert belt [54]. Sixty percent of the country is arid or semi-arid. The province of Isfahan is located in Central Iran. The altitude in the province ranges from 500 m on the plains to 4000 m in the mountainous areas. The eastern part of Isfahan province is located on the western margins of the country's arid and semi-arid areas, while the western part is located on the eastern slopes of the Zagros Mountains. More than 30% of the province is covered by desert [55]. According to Nasri and Modarres [56] (p. 1431), "the mean annual rainfall of western region is 800 mm, while it is about 75 mm in eastern arid region. Winter and fall rainfall consist of 48.4 and 27.6% of total annual rainfall, whereas it is 23 and 1% for spring and summer season, respectively. The average maximum temperature in the province varies from 16.2 to 28.2 °C and the average minimum temperature varies from 6.3 to 1.1 °C. July and August are the warmest and January and February are the coldest months of the province".

Traditionally, the urban areas of historical, religious and cultural heritage have founded the tourist activity in the province of Isfahan. However, the region's natural heritage also provides a solid foundation for the development of nature tourism. In recent years, nature-based tourism (NBT) has acquired great interest both for the international clientele that visits the region and for the Iranians themselves (tourist segment of interest in this research) as a result of the greater environmental awareness of the population and also as a consequence of the need to reconnect with nature. The spectacular and diverse natural heritage of the province has allowed responding to the tourist motivations of this market segment, which has allowed this modality to become a new source of economic activity in the region.

Studies on the climate potential for tourism carried out in Iran (Table 1) have covered different areas of tourist interest in the country, including some with arid climates. Many of these studies have applied to general tourism, without considering segmentation of the market by types of tourism. The most widespread methods are the Tourism Climate Index (TCI), the Climate Tourism Information Scheme (CTIS) and the Holiday Climate Index (HCI). Studies using the TCI have not been based on climate preferences expressed through surveys or revealed through behavior but rather on expert judgement determined by its creator, Mieczkowski [36], so they lack empirical verification. With respect to studies based on the CTIS, most use bioclimatic criteria, while those based on the HCI use declared tourist preferences (although these are not specific to the geographical frame of reference). Our analysis of the literature also revealed contributions that have focused solely on the study of bioclimatic comfort associated with tourism practices; in their analyses, these studies have used complex indices such as the PET (physiologically equivalent temperature), SET (standard effective temperature) and PMV (predicted mean vote). Our review of the scientific literature relating to Iran highlighted a lack of climate tourism potential studies based on the weather types of method that have considered the climate preferences of Iranian tourists for the practice of a certain form of tourism (in this case, NBT).

Table 1. Studies evaluating climate tourism potential in Iran.

Type of Tourism	Region	Climate Zone	Resolution	Period (Years)	Method and Comfort Index	Favorable Months or Seasons	Unfavorable Months or Seasons	Reference
Ecotourism (picnic, swimming, sailing)	Bushehr	Coastal and Subtropical desert climate	Daily (18:30)	29	PET, SET	Picnic: My, Jn, Oct. Swimming: My, S. Sailing: My, S.		[57]

Table 1. *Cont.*

Type of Tourism	Region	Climate Zone	Resolution	Period (Years)	Method and Comfort Index	Favorable Months or Seasons	Unfavorable Months or Seasons	Reference
General	Lorestan Province	Mountainous area semi-arid climate	Monthly	15	TCI	Ap, My, Oct	January, February, June	[58]
General	Northwestern	Mediterranean climate (Csa)	Monthly	26	TCI	Sept	January	[59]
General	Baluchistan Region (Iran)	Dry, Semi-arid and warm temperate	Monthly	20	TCI	January, February	July, August	[60]
General	West of Iran (Lorestan, Kermanshah, Hamedan and Kurdistan Provinces)	Mountainous and cold	Monthly	15	TCI	May, June, July, September, October, and November	December, January, February	[61]
General	Iran	Mostly arid or semi-arid, Mountainous, subtropical along Caspian coast	Monthly	15	TCI	SpringAutumn		[62]
Cities—sightseeing and shopping	Northwest Iran	Mediterranean climate	Monthly	20	TCI, PET	TCI: My, Jn, Jl, Ag, S. PET: Jl, Ag	Winter and autumn	[63]
Sport tourism	Anzali-Rezvanshahr Coastal Belt	Subtropical humid climate	Monthly	10	CPI, Kay and Vamplet method, Olgay Climogram	June, July, August, and September	Rest of the year	[64]
Urban tourism	Isfahan City	Arid and warm climate	Daily and Hourly 12–21st of July	10	Questionnaire, ENVI-met and PET	18–24 PM	14–16 PM	[65]
General	Isfahan Province	Arid, Mediterranean Climate to humid	Monthly	30	TCI	October, May, September, April	December January and February	[54]
General	Cities of Isfahan and Rasht	Isfahan: Arid moderate; Rasht: humid subtropical	Daily	10	HCI	Isfahan: Ap, My, Oct; Rasht: Ap, My.	Isfahan: January; Rasht: Dc, January.	[53]
General	City of Isfahan	Arid moderate	Daily	14	PMV, PET, SET	April and October	July, August, December, January	[66]
General	Isfahan province	Arid, Mediterranean Climate to humid	Daily	5	TCI, PMV, PET, CPI	TCI, CPI: Ap, My, Sep, Oct. PET, PMV: Sept.	January, February, and December	[67]
Ecotourism and agritourism	Kerman province	Arid and semiarid climates	Monthly	Established to 2015	TCI	March, April, May, October, and November	June, July, and August	[68]
Ecotourism and geotourism	West and Northwest of Iran	Mountainous, cold, semi-arid, humid moderate, Mediterranean climate (Csa)	Daily	25	PET	Northern: Jn, Sept	January, February, December	[69]

Table 1. *Cont.*

Type of Tourism	Region	Climate Zone	Resolution	Period (Years)	Method and Comfort Index	Favorable Months or Seasons	Unfavorable Months or Seasons	Reference
General	Chaharmahal va Bakhtiari Province	Semi-mountainous and semi-wet; Mountainous and wet; Warm, wet and moderate cold.	Daily	Established to 2005	PET	May	January, February, December	[70]
General	Desert regions and Makran Coast of Iran	Dry regions to the desert	Daily	30	HCI, TCI	October, September, and April		[71]
General	Iran	Mostly arid or semi-arid, Mountainous, subtropical along Caspian coast	Monthly	50	TCI	Spring and summer	Winter	[72]
General	Iran	Mostly arid or semi-arid, Mountainous, subtropical along Caspian coast	Daily	20	PET, UTCI	Late winter and spring	Summer	[73]
Sightseeing and shopping	Fars province	Arid, semi-arid, dry, Mediterranean, semi-humid, and humid	Monthly	10	TCI, IDW	May, April, October, and November	January, February	[74]
General	Ourmieh Lake	Cold and Mountainous	Monthly	20	PET, CTIS, CPI	June, August, September, July	February	[75]
General	Zayandeh-Rood River	Arid, Mediterranean Climate to humid	Daily	31	PET, CTIS	May, April	January, February, December	[76]

CTIS: climate tourism information scheme; PET: physiologically equivalent temperature; PMV: predicted mean vote; SET: standard effective temperature; HCI: Holiday Climate Index; CPI: Cooling Power Index (Baker); IDW: inverse distance weighting; UTCI: Universal Thermal Climate Index.

2.2. The Weather Types Method

The method applied involves establishing various types of daily weather that are favorable and unfavorable for NBT in arid and hyper-arid climates. In the present research, these types of weather were defined based on the climate characteristics of the study area, bioclimatic criteria and the preferences of Iranian domestic tourists, expressed through a survey [77].

The weather types established in the context of the arid and hyper-arid climates of the study area took account of tourist requirements in terms of comfort (thermal aspect), enjoyment (aesthetic aspect) and safety (physical aspect) [8,78] and were defined based on a combination of the following variables: daily sunshine (hours), daily precipitation (mm), maximum daily temperature (°C), wind speed at 12 noon (m/s) and, finally, the PET (°C), calculated every day at the hottest time of day. The PET was calculated using the RayMan model 1.2 according to Matzarakis et al. [79], but we used the special PET scale adapted to Iran (Table 2) [80,81]. The weather type classification was applied to every single day and every year in the time series measured by a total of nine synoptic observatories belonging to the Iran Meteorological Organization (IRIMO) (Figure 1 and Table 3). The matrix created

in each one, every year for the period 1998–2017, based on the collection of daily data, constituted the numerical baseline for the evaluation.

Table 2. Physiologically equivalent temperature (PET) for different grades of thermal sensation and physiological stress on human beings in Iran.

PET (°C) in Iran	Thermal Sensation	Physiological Stress Level
<−10.7	Very cold	Extreme cold stress
−10.7 to −0.7	Cold	Strong cold stress
−0.7–8.8	Cool	Moderate cold stress
8.8–17.7	Slightly cool	Slight cold stress
17.8–27	Comfortable	No thermal stress
27–35.1	Slightly warm	Slight heat stress
35.1–43	Warm	Moderate heat stress
43–50.8	Hot	Strong heat stress
>50.8	Very hot	Extreme heat stress

Sources: [80,81].

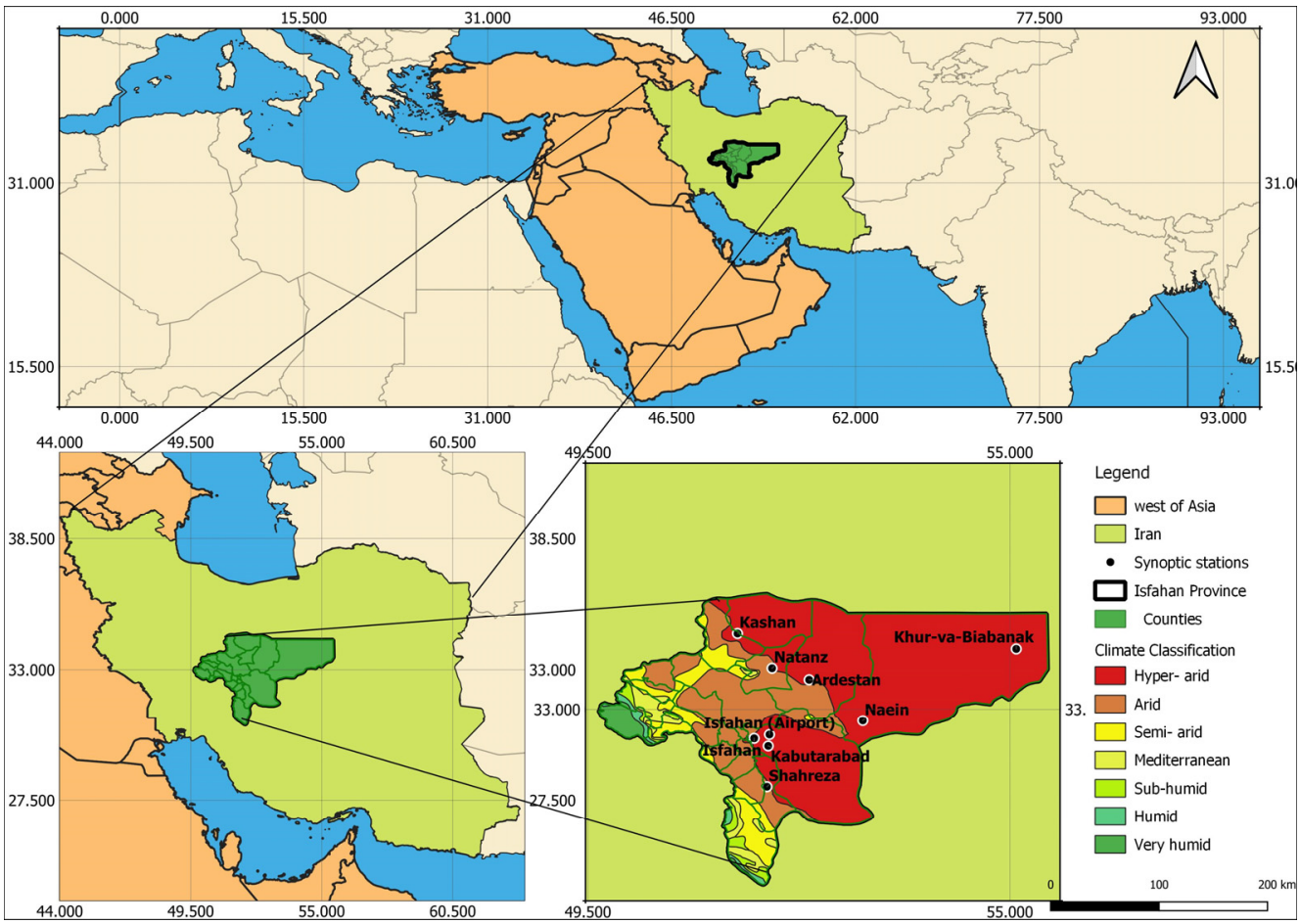

Figure 1. Distribution of the classification of the De Martonne aridity climate and location of synoptic observatories in Isfahan Province (Iran). Source: prepared by the authors from the Iran Meteorological Organization and [82].

Table 3. Synoptic observatories included in the study.

Synoptic Observatories	Latitude	Longitude	Elevation
Isfahan	32°51′67″ N	51°70′56″ E	1551.9 m
Ardestan	33°35′55″ N	52°37′55″ E	1255.5 m
Isfahan Airport	32°74′41″ N	51°86′30″ E	1550 m
Kabutarabad	32°51′66″ N	51°83′33″ E	1542.5 m
Kashan	33°96′69″ N	51°48′08″ E	955 m
Khur-Va-Biabanak	33°77′00″ N	55°08′16″ E	842.2 m
Naein	32°85′16″ N	53°07′86″ E	1573.7 m
Natanz	33°53′33″ N	51°9′00″ E	1685 m
Shahreza	31°98′16″ N	51°81′05″ E	1858 m

Source: Iran Meteorological Organization.

Based on the specific characteristics of the climate of the study area and tourist preferences, two different weather type classifications were established (Table 4): one to be applied in summer (June, July and August) and the other in spring and autumn (March, April and May; September, October and November). The weather types method was applied on a daily basis, and its graphic presentation is grouped into five-day periods. This made it possible to reflect chronological variations in the weather in diagrams showing the frequency of the different daily weather types for the period 1998–2017. To make the presentation clearer, the different weather types were arranged from the most pleasant at the base (type 1) to the least favorable at the top (type 8).

Table 4. Weather types for NBT in the arid regions of Isfahan Province.

Spring–Autumn	Summer
Type 1 Very Good Sunny Weather $20 \leq T_{MAX} \leq 23$ °C $V_V < 3.3$ m/s $p = 0$ mm $5 \leq S \leq 10$ h $17.8 \leq PET < 27$ °C	Type 1 Very Good Weather $24 \leq T_{MAX} \leq 26$ °C $V_V < 3.3$ m/s $p = 0$ mm $S \geq 5$ h $17.8 \leq PET < 27$ °C
Type 2 Fine Weather with partial cloud cover $24 \leq T_{MAX} \leq 26$ °C $V_V < 3.3$ m/s $p = 0$ mm $S \geq 5$ h $17.8 \leq PET < 27$ °C	Type 2 Fine Weather $20 \leq T_{MAX} \leq 23$ °C $V_V < 3.3$ m/s $p = 0$ mm $5 \leq S \leq 10$ h $17.8 \leq PET < 27$ °C
Type 3 Fine hot weather $23.1 \leq T_{MAX} \leq 29$ °C $V_V < 3.3$ m/s $p = 0$ mm $S \geq 5$ h $27 \leq PET < 35.1$ °C	Type 3 Fine hot weather $23.1 \leq T_{MAX} \leq 29$ °C $V_V < 3.3$ m/s $p = 0$ mm $S \geq 5$ h $27 \leq PET < 35.1$ °C
Type 4 Fine hot and sultry weather $29.1 \leq T_{MAX} \leq 33$ °C $V_V < 3.3$ m/s $p = 0$ mm $S \geq 5$ h $35.1 \leq PET < 43$ °C	Type 4 Fine hot and sultry weather $29.1 \leq T_{MAX} \leq 33$ °C $V_V < 3.3$ m/s $p = 0$ mm $S \geq 5$ h $35.1 \leq PET < 43$ °C
Type 5 Fine cool weather $14 \leq T_{MAX} \leq 19.9$ °C $V_V < 3.3$ m/s $p = 0$ mm $S \geq 5$ h $-0.7 \leq PET \leq 17.7$ °C	Type 5 Fine cool weather $14 \leq T_{MAX} \leq 19.9$ °C $V_V < 3.3$ m/s $p = 0$ mm $S \geq 5$ h $-0.7 \leq PET \leq 17.7$ °C

Table 4. *Cont.*

Spring–Autumn	Summer
Type 6 Acceptable weather with strong winds $14 \leq T_{MAX} \leq 33$ °C $3.3 \leq V_V \leq 5.4$ m/s $p = 0$ mm $S \geq 5$ h $-0.7 \leq$ PET < 43 °C	Type 6 Acceptable weather with strong winds $14 \leq T_{MAX} \leq 33$ °C $3.3 \leq V_V \leq 5.4$ m/s $p = 0$ mm $S \geq 5$ h $-0.7 \leq$ PET < 43 °C
Type 7 Acceptable weather with a brief rain shower $14 \leq T_{MAX} \leq 33$ °C $V_V < 3.3$ m/s $0.01 \leq p \leq 5$ mm $S \geq 5$ h $-0.7 \leq$ PET < 43 °C	Type 7 Acceptable weather with a brief rain shower $14 \leq T_{MAX} \leq 33$ °C $V_V < 3.3$ m/s $0.01 \leq p \leq 5$ mm $S \geq 5$ h $-0.7 \leq$ PET < 43 °C
Type 8 Unfavorable/Bad weather All other kinds of weather	Type 8 Unfavorable/Bad weather All other kinds of weather

The method applied was a modified version of Besancenot's method [14], since it focused on a very specific segment of tourism and avoided expert judgement to establish suitability thresholds for the weather variables considered. Thus, the new classification system made it possible to evaluate the climate potential for NBT in the selected region, in light of the preferences of Iranian tourists who travel in their own country and bioclimatic criteria [83,84]. This version circumvented the limitations implicit in the original method, since it corrected for the lack of segmentation in the proposed weather types (the classification presented here was specific to NBT) and the absence of empirical verification (the ranking of the variables and the establishment of favorable and unfavorable thresholds in the types presented here refer to bioclimatic criteria and the weather preferences of Iranian nature tourists, as revealed in a survey).

2.3. Survey

In Iran, some authors have recognized the need to develop domestic tourism to address the low numbers of tourists from abroad [85]. Domestic tourists' preferences cover a wide spectrum [86], from traditional travel associated with religious pilgrimages to cultural tourism focused on historical cities and NBT in the country's arid and hyper-arid regions and other destinations.

An ex situ (online) survey was designed and administered to identify the weather preferences of Iranians in relation to NBT practiced in areas with arid and hyper-arid climates. The choice of this quantitative technique (p = q; sample size = 402; confidence margin = 95.5%; sample error = ±5%) made it possible to establish favorable and unfavorable thresholds in the different weather variables considered [77], which were used as the basis for evaluating the potential (comparison with the reality according to the weather types of method).

The results of the survey [77] indicated that these types of tourists take climate-/weather-related aspects into consideration when planning and scheduling their leisure and recreational activities. In their preferences, they stated that:

- They are particularly sensitive to temperatures, wind speed and precipitation.
- They have a higher tolerance to heat-related discomfort than to discomfort or lack of enjoyment due to excessive levels of other variables.
- Their maximum temperature thresholds for ideal and favorable weather types are higher than their thresholds for those categories in temperate or humid tropical environments.
- In relation to wind speed, their ideal thresholds are lower than thresholds determined in other geographical environments, thus indicating their discomfort with this element.

3. Results

The results of this regional analysis are a reflection of the restrictive thresholds established to define the different types of environments suitable for NBT. Incorporating the concept of quality in this study (environmental and climate quality) led us to set specific criteria to identify, from a climatological and meteorological perspective, places and days where the likelihood of meeting the comfort, enjoyment and safety-related requirements of Iranian nature tourists in the province of Isfahan is high.

Generally, the arid and hyper-arid climates of the province of Isfahan met the requirements of nature tourists for 14% to 40% of the period between March and November. The lowest values were recorded at Kashan and Kabutarabad (14%), while the highest were recorded at Natanz, Isfahan Airport and Isfahan (40%, 30% and 25%, respectively). It follows that unfavorable weather prevailed over favorable weather in all observatories in the study area, although the average records varied significantly between seasons (Table 5 and Figure 2); unfavorable weather was less frequent in spring (March, April and May) and autumn (September, October and November) than in summer (June, July and August).

Table 5. Average frequencies (in %) of weather unfavorable for NBT.

Synoptic Stations	March–November	Spring	Summer	Autumn
Isfahan	75%	63%	94%	67%
Ardestan	77%	69%	97%	66%
Isfahan Airport	70%	60%	94%	57%
Kabutarabad	83%	73%	97%	79%
Kashan	86%	77%	100%	82%
Khur-Va-Biabanak	86%	77%	99%	83%
Naein	76%	74%	91%	64%
Natanz	60%	63%	63%	55%
Shahreza	73%	75%	81%	64%

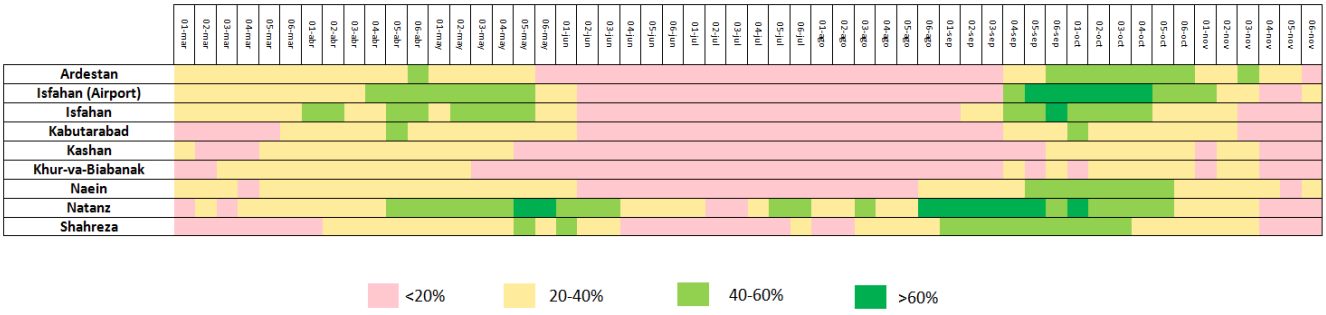

Figure 2. Climate conditions for NBT in the province of Isfahan (likelihood of recording days with favorable weather types).

In autumn, October was the most favorable month (except at Natanz and Shahreza, where it was September) and presented the most homogeneous values. The difference between the first and second halves of September was vast (the first was less favorable than the second). A similar situation occurred in November, although in reverse (the first half was more favorable than the second). In spring, the second half of April and the whole of May were revealed as the most favorable and homogeneous periods in terms of values, albeit with frequencies below those recorded in the best months of autumn.

Although these overall values offered an initial overview, they concealed the variations that occurred throughout the period from March to November. To demonstrate this, the information was broken down into five-day periods and weather types, and seasonal diagrams were drawn up for the different locations (Figure 3). A comparative analysis of all the diagrams quickly highlighted the fact that, although all the observatories revealed a bimodal profile that showed summer as unsuitable for NBT (with the exceptions of Natanz

and Shahreza) and spring and autumn as favorable periods, there were differences between the observatories.

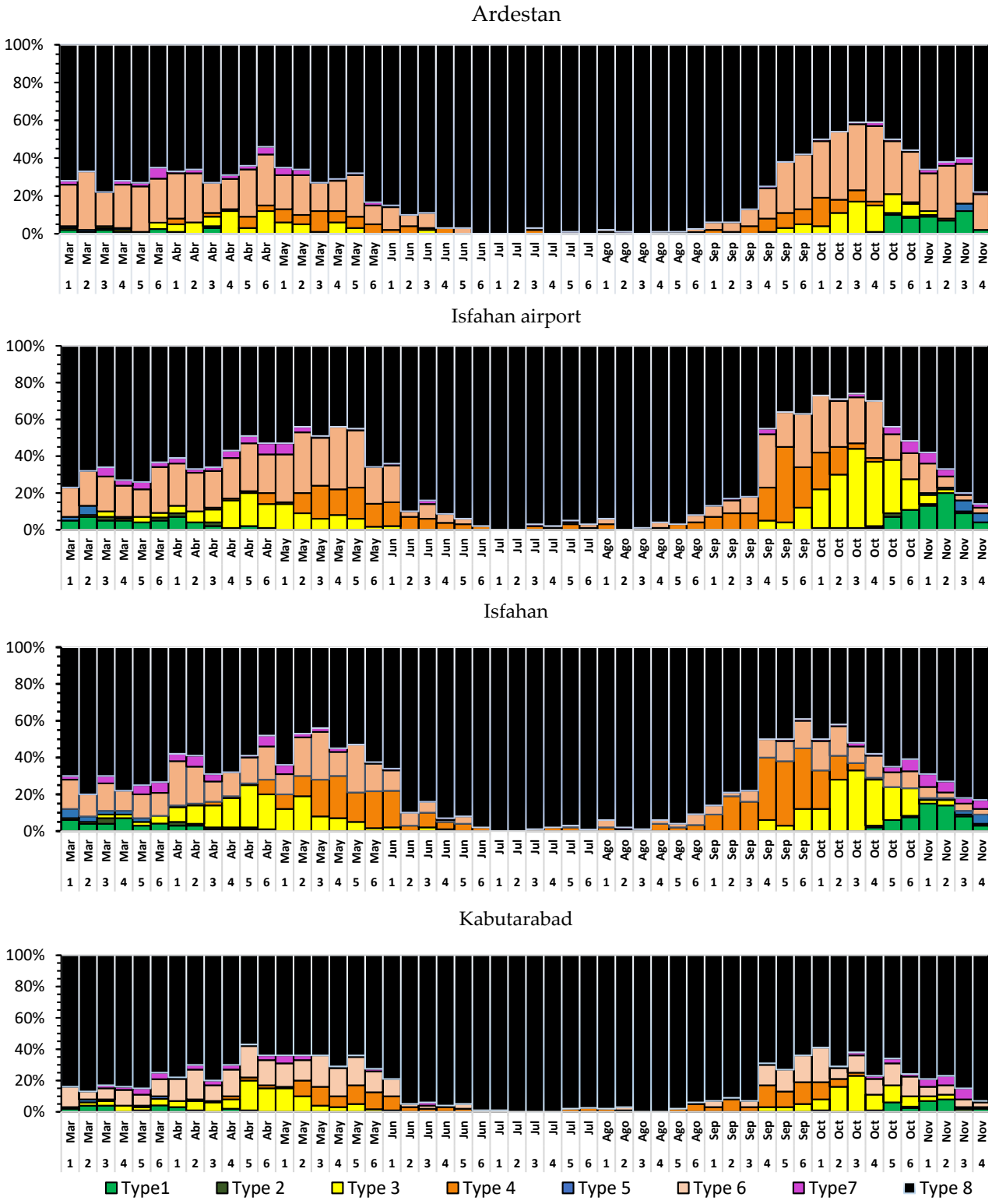

Figure 3. *Cont.*

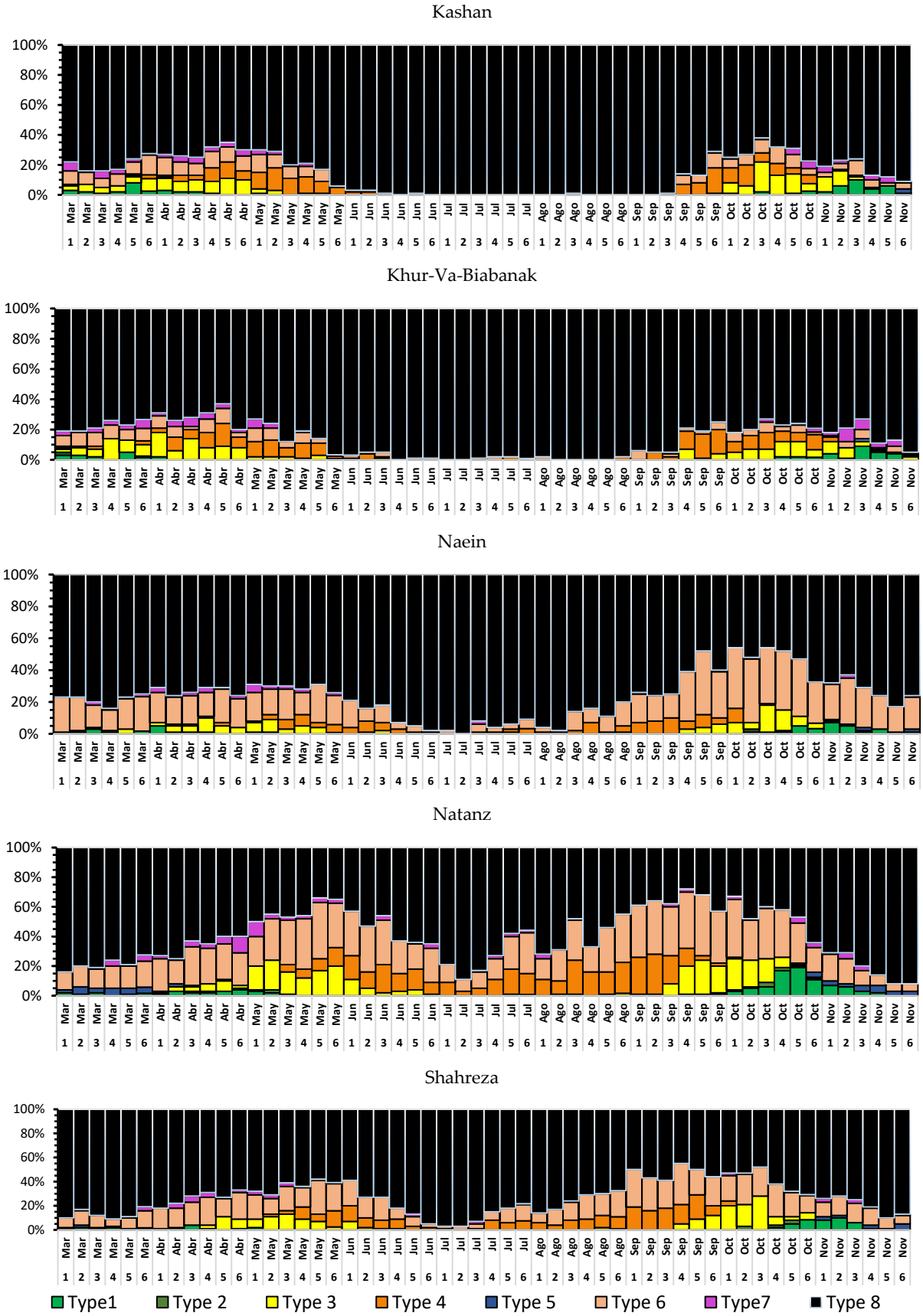

Figure 3. Percentage distribution calendars for weather types at synoptic observatories in Isfahan Province.

The distribution of favorable days between the different weather types (1, 2, 3, 4, 5, 6 and 7) showed that acceptable weather with strong winds (type 6), good hot close weather (type 4) and fine hot weather (type 3) dominated at almost all the observatories, as reflected in their global average frequencies (12%, 4.1% and 4.1%, respectively). The highest average values for type 6 were recorded between March and November (between 15% and 23%) by the observatories at Natanz, Naein, Isfahan Airport and Ardestan; the highest values were usually recorded in the months of autumn (from the last 10 days of September to the first 10 days of November), with frequencies between 20% and 41%. Type 4 presented the highest average frequencies (between 4% and 7%) at Natanz, Khur-Va-Biabanak, Isfahan and Isfahan Airport; the highest values were usually recorded in autumn (from early September to late October), with frequencies between 15% and 35%. Type 3 had the highest average annual percentages (between 4% and 6%) at Natanz, Khur-Va-Biabanak, Kabutarabad, Isfahan and Isfahan Airport. Type 3 occurred in both spring and autumn, with frequencies of around 20% in May and October; the most striking values were recorded at the Isfahan Airport observatory, where the values for this weather type ranged from 20% to 43% in October.

Weather types 1 and 2, the most favorable types, were more frequent in the autumn months than in the spring months and reached their highest values around the last 10 days of October and the first 20 days of November (values between 10% and 20%). Ardestan, Isfahan, Isfahan Airport and Natanz presented the highest frequencies of these favorable types. At Isfahan Airport and Natanz, the average frequencies of these weather types between March and November stood at 2%; however, during the second half of October and the first 10 days of November, the values ranged from 10% to 20%.

Very low frequencies were recorded for weather types 5 and 7. Type 7 (acceptable weather with a brief rain shower) was recorded in both spring and autumn, while type 5 (fine cool weather) usually occurred more in the second half of November and the first half of March.

4. Discussion

The weather types method was used as an alternative and a complement to the climate tourism indices normally used in climate tourism potential studies carried out in Iran. From a methodological point of view, the proposed weather type classification made it possible to work with daily combinations of the various climate variables that constitute the weather experienced by visitors. Thus, tourists are able to recognize the proposed weather types as actual situations that have been recorded or will be recorded at the destination, so they are aware of how often they occur (the values can easily be interpreted by all audiences). This is a differential fact with respect to the climatic–tourist indices referenced in Table 1 (especially those who apply the TCI and HCI [53,54,58–63,67,68,71–74]), since, although these present global values of an aptitude for easy interpretation, they are abstract and are not identified with real atmospheric situations.

From a methodological point of view, the proposed weather type classification also made it possible to work with a detailed temporal resolution. The daily calculations and the fact that the graphs presented weather type frequencies for five-day periods made it easier to interpret the results and provided more detailed information. According to Table 1, a good part of the research carried out to date in Iran has worked with a monthly resolution [54,58–64,68,72,74], a resolution that is not adequate in the evaluations of the tourist potential of the climates [31,49].

The classification of weather type allowed contextualizing the proposed weather types within a regional climate framework and, thus, to reflect the main defining characteristics of the climate of the study area in the weather types. It also allowed to consider tourists' requirements in terms of enjoyment, comfort and safety in the weather type classification, either through selection of the weather variables to be included in the classification or by differentiating between and ranking the favorable and unfavorable types. A part of the research referenced in Table 1 (especially those that apply just the PET, SET, PMV, etc.)

only takes into account the requirement of climatic comfort that is fundamentally related to the thermal facet of the climate [57,63–66,69,70,73], neglecting two dimensions that are important for the tourist (enjoyment and safety).

The weather types method provided the opportunity to take tourism market segmentation into account—in this case, reflected in the choice of tourism type to be studied (NBT) and the origin of the visitors (Iranians visiting their own country). This research considered empirical verification in the order of the weather types and in the thresholds established for the weather variables considered for the different types. This was based on the results of a survey on weather preferences carried out in the first phase of the research [77]. The method lends itself to more detailed segmentation, a key requirement in the current context of tourism market hyper-segmentation. This represents a crucial avenue for future research in the field of tourism climatology. A part of the studies referenced in Table 1 [53,54,58–62,66,67,70–73,75,76] have not applied any type of segmentation, erroneously considering that the climatic requirements of the tourist are always the same, regardless of the tourist modality practiced and regardless of the origin of the tourist.

The analysis carried out was based on daily values or values recorded at the hottest time of day, since the latter coincides with the middle of the recreational activity period. Applying an hourly resolution would offer a different, complementary perspective of the tourism potential of the arid climates of Isfahan Province, so it would be useful to apply this approach in future works.

5. Conclusions

The classification of weather types, applied to the period 1998–2017 at daily resolution, offered an insight into the climate suitability for NBT in the province of Isfahan (Iran). The results of applying the proposed weather type classification provided valuable knowledge that clearly points to periods suitable for the development of tourism. The first, corresponding to the summer (June, July and August), emerged as a critical period for NBT due to the discomfort generated by high temperatures, low relative humidity and strong winds. The observatories at Natanz and Shahreza were the only exceptions. The second period, comprising autumn and spring, emerged as a favorable period for NBT in the region, albeit with moderate average values. When the data were studied in greater detail, October, together with the second half of September and the first half of November, was revealed as the period most conducive to NBT, with favorable weather frequencies exceeding 50% and 60%. This was followed by May, together with the second half of April, with values between 40% and 50%.

Assessments of climate tourism potential represent useful tools for offering knowledge to support decision-making in tourist destination management [5,29]. The results of the analysis will make it possible to design activity schedules at the resorts studied. The diagrams and daily results will serve as effective tools for providing tourists and the region's main tourism stakeholders with information. In the future, it would be convenient to carry out climate–tourism suitability analyses for other tourism modalities practiced in the Isfahan region and segments of tourists. This could make it possible to establish the necessary complementarities between modalities to design calendars that avoid tourist seasonality in this arid region.

The planning and tourism management of destinations and their promotion must be based on a deep knowledge of (a) tourism resources (including climate) and (b) the motivations and characteristics that determine the behaviors of different segments of tourists. In this sense, knowing the suitability of the climate in a destination, identifying its optimal periods and its unfavorable periods, can allow the design of actions to attract customers at times of maximum potential. Although climate–tourism calendars do not always coincide with work and school calendars, government institutions dedicated to tourism and tourism companies must anticipate this issue to design market studies and establish strategies to attract niche customers among Iranian tourists interested in nature tourism. These strategies can be in line with price modulation, attracting short-term tourists

(2 or 3 days) or attracting niche markets not subjected to work or school calendars; this is the case of premium market niches (scientific tourism and luxury travelers) or market niches related to social tourism (the elderly, study trips, business trips, etc.).

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