



ISSN 2645-7784

Journal of Urban Social Geography

© Department of Geography, Shahid Bahonar University of Kerman, Iran.



Thermal Comfort Evaluation in Urban Open Public Space with Emphasis on Strengthening Social Relations (Case Study: Quds Neighborhood, Zahedan)

Nazaripour, H^{a,1}, Tavosi, T^b

^a Assistant Professor of Climatology, Department of Physical Geography, University of Sistan and Baluchestan, Zahedan, Iran.

^b Professor of Climatology, Department of Physical Geography, University of Sistan and Baluchestan, Zahedan, Iran.

Research Article

Extended Abstract

Objective: Public open spaces in residential areas of cities are one of the fields for the social interactions. Hence, the climatic and geometric characteristics of urban open spaces must be harmonious and facilitate social relations. This is doubly important, especially in hot and arid environments. The number of indoor thermal comfort studies far outweighs the number performed outdoors such as urban park and sidewalks. However, many recreational and commercial activities, such as social interactions (e.g. cultural events, sporting events) and weather-sensitive businesses (e.g. restaurants and cafes) are taking advantage of outdoor environments. The presence of people in public open spaces, especially at the level of urban neighborhoods, can facilitate the formation of social interactions and spend a part of citizens' free time. In addition, this measure is crucial in order to reduce the problems of life in big cities and strengthen the physical and mental health of citizens. Urban open spaces provide physical, environmental, social, and economic benefits to citizens. Hence, old residential neighborhoods have long played a significant role in shaping social interactions. The purpose of this study is to investigate the thermal comfort of urban open space and its influential components in strengthening social relations in the old neighborhood of Quds in Zahedan.

Methods: The present paper is applied in terms of purpose and experimental-correlation in terms of method. The Statistical community of this study includes natural and human data of Quds neighborhood in Zahedan. Climatic data include meteorological variables such as temperature, relative humidity, wind speed, solar radiation, etc. Human data includes 70 residents of the neighborhood who were randomly selected based on the Cochran sampling method with a 95% confidence level. To evaluate the thermal comfort of the outdoor spaces, physiologically equivalent temperature (PET) and predicted mean votes (PMV) based RayMan model and universal thermal comfort index (UTCI) based on BioKlima model have been used. A new mathematical model is then proposed based on the correlation relations between environmental variables and individual subjective responses. Field studies including measuring meteorological parameters, thermal environment perception, and geometry of urban open space are the final part of this research. The city of Zahedan, the capital of Sistan and Baluchestan province, is located in the southeastern part of Iran. The city is located at latitude 29° 30' 45" N and longitude 60° 51' 25" E and is 1385 meters above sea level. The annual average of rainfall and temperature of this city are 75.5 mm and 18.7 Celsius, respectively. The climate of this city according to the Koppen-Geiger classification is the warm dry desert

¹ Corresponding author at: University of Sistan and Baluchestan, Zahedan, Iran, P.C: 98167-45845. E-mail address: h.nazaripour@gep.usb.ac.ir (Nazaripour, H).

climate (BWh) and according to De Martonne climatic classification, it has a warm extra arid climate (A1.1m4).

Results: Findings showed that the time range of urban outdoor thermal comfort in Quds neighborhood is abundant in the afternoon in summer. More than half of people feel comfortable (neutral) at these times and the percentage of feeling very hot is very limited. There are no cold or very cold feelings. A small percentage of people also feel a little cold. The afternoon microclimate is dependent on the fabric of the neighborhood and has the potential to enhance social interactions. The results of all three PET, PMV, and UTCI indices are almost the same. In general, the thermal comfort conditions in the study area are manifested from the end of winter and reach their maximum in spring. The evenings in April, May, and June have the best conditions for outdoor presence. During these times of the year, the conditions for hot and cold emotions are minimal. In summer, too, dominance is neutral (favorable). Gradually, from late summer, cold feelings appear and warm feelings disappear. In the second half of autumn, cold feelings are overcome and in early winter, the peak of cold feelings is found. The proposed mathematical model for estimating thermal comfort in hot and arid environments based on the correlation of environmental variables and actual sensation vote (ASV) is well able to express an actual thermal sensation of outdoor spaces.

Conclusion: The most obvious platform for the formation of social interactions in fame is public spaces. In the meantime, intra-neighborhood interactions in urban space are more important due to the high probability of the stability of social interactions. Numerous factors are involved in the tendency of neighborhood residents to use public spaces. Microclimate conditions suitable for outdoor thermal comfort seem to play a key role in inviting the environment to attend. In this study, the thermal comfort conditions of public spaces in Quds neighborhood in Zahedan city in order to promote social interactions have been evaluated. Findings showed that three factors of individual tendencies, physical-spatial structure, and microclimate of the neighborhood are effective factors in social interactions. The presence of people in public open spaces is highly dependent on the microclimate of the neighborhood. People prefer to be outdoors mainly in the evening. It is inferred that people do not directly seek to create social interactions by being outdoors and should strengthen this social sense through environmental and social interventions. Therefore, in order to take the necessary measures to develop and promote the social interactions of the neighborhood, physical infrastructure such as outdoor furniture development and neighborhood social institutions should be strengthened. The results of these measures can reduce the urban social harms.

Keywords: Thermal Comfort, Microclimate, Urban Open Space, Social Relations, Zahedan.

Received: October 26, 2020 *Reviewed:* January 04, 2021 *Accepted:* March 16, 2021 *Published online:* March 21, 2021

Citation: Nazaripour, H., Tavosi, T (2021). *Thermal Comfort Evaluation in Urban Open Public Space with Emphasis on Strengthening Social Relations (Case Study: Quds Neighborhood, Zahedan)*. Journal of Urban Social Geography, 8(1), 287-306. (In Persian)

DOI: [10.22103/JUSG.2021.2043](https://doi.org/10.22103/JUSG.2021.2043)

References:

- Abbaszadeh, Sh., Tamori, S (2012) *Analysis of Factors Affecting the Improvement of Pedestrian Walkway Spatial Quality and Pedestrian-oriented Spaces, in order to Increase the Social*

- Interactions Level of People (The case study: Tarbiat & Valiasr axis, Tabriz metropolitan).** Urban studies, 1(4), pp. 95-104. (In Persian)
- Ahmadpour, M.U., Tavosi, T., Nazaripour, H (2020). *Shifts in Köppen-Geiger climate zones over Balochistan plateau of Pakistan and its potential challenges to Iran.* Physical Geography Quarterly, 13(47), pp. 19-33. (In Persian)
- Anna, B., Milica, P., Błażejczyk, K., Olesya, S (2020). *Weather suitability for outdoor tourism in three European regions in first decades of the twenty-first century.* International Journal of Biometeorology, pp. 1-18.
- Błażejczyk, K (1994). *New climatological and physiological model of the Human Heat Balance outdoor (MENEX) and its applications in bioclimatological studies in different scales.* Zeszyty Instytutu Geografii i Przestrzennego Zagospodarowania PAN, (28), pp. 27-58.
- Błażejczyk, K., Bröde, P., Fiala, D., Havenith, G., Holmer, I., Jendritzky, G., Kampmann, B (2010). *'UTCI–new index for assessment of heat stress in man'.* Polish Geographical Review, 82(1), pp. 49-71.
- Bogdanović-Protić, I.S., Vukadinović, A.V., Radosavljević, J.M., Alizamirc, M., Mitković, M.P (2016). *Forecasting of outdoor thermal comfort index in urban open spaces: The Nis fortress case study.* Thermal Science, 20(suppl. 5), 99. 1531-1539.
- Dalman, M., Salleh, E., Sapian, A R., Tahir, O.M., Dola, K., Saadatian, O (2011). *Microclimate and thermal comfort of urban forms and canyons in traditional and modern residential fabrics in Bandar Abbas, Iran.* Modern Applied Science, 5(2), p. 43.
- Fanger, P.O (1973). *Assessment of man's thermal comfort in practice.* Occupational and Environmental Medicine, 30(4), pp. 313-324.
- Farajzadeh, H., Saligheh, M., Alijani, B (2016). *Application of universal thermal climate index in Iran from tourism perspective.* Journal of Natural Environmental Hazards, 5(7), pp. 117-138.
- Froehlich, D., Matzarakis, A (2015). *Estimation of human-biometeorological conditions in south west Germany for the assessment of mitigation and adaptation potential.* In ICUC9-9th international conference on urban climate jointly with 12th symposium on the urban environment.
- Ghaedrahmati, S., Rezaali, M., Hashemi Zehi, S., Javan, F. (2017). *Components influencing promotion of social interactions in urban parks (Case Study: Zabol City).* Human Geography Research, 49(4), 901-915. (In Persian)
- Ghanbaran, A.H., Jafari, M (2015) *Factors Affecting Promote Social Interaction Among Residents Residential Neighborhood (Case Study: Tehran Darake Neighborhood),* Iranian Architectural Association, Vol. 1, No. 7, pp. 57- 64. (In Persian)
- Heidari, S., Monam, A (2013). *Evaluation of Thermal Comfort Indices in Outdoor Space.* Journal of Geography and Regional Development, 11(1), pp. 197-216. (In Persian)
- Höppe, P (2002). *Different aspects of assessing indoor and outdoor thermal comfort. Energy and buildings,* 34(6), pp. 661-665.
- Jafari, M., Taban, M., Saffaripour, M (2019). *Thermal Comfort Evaluation in Urban Open Space (Case Study: Chamran Street in Kermanshah).* Journal of Environmental Studies, 45(4), pp. 589-603. (In Persian)
- Lai, D., Lian, Z., Liu, W., Guo, C., Liu, W., Liu, K., Chen, Q (2020). *A comprehensive review of thermal comfort studies in urban open spaces.* Science of the Total Environment, 140092.
- Lai, D., Liu, W., Gan, T., Liu, K., Chen, Q (2019). *A review of mitigating strategies to improve the thermal environment and thermal comfort in urban outdoor spaces.* Science of the Total Environment, 661, 337-353.
- Lenzholzer, S (2012). *Research and design for thermal comfort in Dutch urban squares.* Resources, Conservation and Recycling, 64, 39-48.
- Lucchese, J.R., Mikuri, L.P., de Freitas, N.V., Andreasi, W.A (2016). *Application of selected indices on outdoor thermal comfort assessment in Midwest Brazil.* International Journal of Energy and Environment, 7(4), 291.
- Majidi, F., Heidari, S., Ghalehnoee, M., Ghasemi Cichani, M (2020). *Assessment and Analysis of the Thermal Comfort Conditions in Open Spaces of Residential Neighborhoods Using Thermal Indicators (Case Study: Neighborhoods of Isfahan City).* Journal of Iranian Architecture & Urbanism, 10(2), 113-126. (In Persian)

- Matzarakis, A (2001). *Climate and bioclimate information for tourism in Greece. In Proceedings of the first international workshop on climate, tourism and recreation, ed. by A. Matzarakis and C. R. de Freitas*. International Society of Biometeorology, Commission on Climate Tourism and Recreation, pp. 171-183.
- Matzarakis, A., Rutz, F (2007). *RayMan: a tool for tourism and applied climatology*. Development in Tourism Climatology, 129-138.
- Najafi, S.M.A., Najafi, N (2012). *Evaluation of thermal comfort using the PMV and PPD methods (a case study of Bazar-e-Vakil, Shiraz)*. Haft Hesar journal of environmental studies, 1(1), pp. 61-70. (In Persian)
- Nasir, R.A., Ahmad, S.S., Ahmed, A. Z (2012). *Psychological adaptation of outdoor thermal comfort in shaded green spaces in Malaysia*. Procedia-Social and Behavioral Sciences, 68, pp. 865-878.
- Pajuhfar, M., Paknahad, H (2018). *Improve of urban parks quality to enhance the social interaction of citizens (Case study: Gorgan city parks)*. Geographical Planning of Space, 7(26), 183-198. (In Persian)
- Pantavou, K., Chatzi, E., Theoharatos, G (2014). *Case study of skin temperature and thermal perception in a hot outdoor environment*. International journal of biometeorology, 58(6), pp. 1163-1173.
- Rahimi, J., Ebrahimpour, M., Khalili, A (2013). *Spatial changes of extended De Martonne climatic zones affected by climate change in Iran*. Theoretical and applied climatology, 112(3), pp. 409-418.
- Rozati, S.H., Ghanbaran, A.H (2015). *Comfort evaluation in urban open spaces based on wind comfort criteria, (Case study: Isfahan City)*. Environmental Sciences, 12(4), pp. 45-64. (In Persian)
- Ruiz, M.A., Correa, E.N (2014). *Developing a thermal comfort index for vegetated open spaces in cities of arid zones*. Energy Procedia, 57, pp. 3130-3139.
- Sangkertadi, S., Syafriny, R (2014). *New Equation for Estimating Outdoor Thermal Comfort in Humid-Tropical Environment*. European Journal of Sustainable Development, 3(4), pp. 43-43.
- Setaih, K., Hamza, N., Townshend, T (2013). August). *Assessment of outdoor thermal comfort in urban microclimate in hot arid areas*. In 13th International Conference of International Building Performance Simulation Association, Chambéry, France.
- Spagnolo, J., De Dear, R (2003). *A field study of thermal comfort in outdoor and semi-outdoor environments in subtropical Sydney Australia*. Building and environment, 38(5), pp. 721-738.
- Urban, A., Kysely, J (2014). *Comparison of UTCI with other thermal indices in the assessment of heat and cold effects on cardiovascular mortality in the Czech Republic*. International journal of environmental research and public health, 11(1), pp. 952-967.
- Woolley, H., Lowe, A (2013). *Exploring the relationship between design approach and play value of outdoor play spaces*. Landscape Research, 38(1), pp. 53-74.
- Yahia, M.W., Johansson, E (2013). *Evaluating the behaviour of different thermal indices by investigating various outdoor urban environments in the hot dry city of Damascus, Syria*. International journal of biometeorology, 57(4), pp. 615-630.
- Zarabi, A., Rakhshanasab, H., Sargolzaei Javan, T (2017). *Spatial Analysis of the Indices of Life Quality in the Surrounding Neighborhoods of Zahedan City Using VIKOR Decision-Making Model*. Spatial Planning, 6(4), pp. 45-64. (In Persian)
- Zare, S., Hasheminejad, N., Shirvan, H.E., Hemmatjo, R., Sarebanzadeh, K., Ahmadi, S (2018). *Comparing Universal Thermal Climate Index (UTCI) with selected thermal indices/environmental parameters during 12 months of the year*. Weather and climate extremes, pp. 19, 49-57.