ASSESSMENT OF BIOCLIMATIC COMFORT ZONES USING THE RAYMAN MODEL: A CASE STUDY OF SULAIMANI – IRAQ

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**RAYMAN MODELİ İLE BİYOKLİMATİK KONFOR ZONLARININ BELİRLENMESİ: SÜLEYMANİYE-IRAK ÖRNEĞI**

**ÖZET:** Tek paragraf halinde yaazılmalı ve özet 300 sözcüğü geçmemelidir. Biçimlendirmeyi bozmadan bu kısmı silip yerine kendi özetinizi yazabilirsiniz. Özet 300 sözcüğü geçmemelidir. Biçimlendirmeyi bozmadan bu kısmı silip yerine kendi özetinizi yazabilirsiniz. Özet 300 sözcüğü geçmemelidir.

**Anahtar kelimeler:** Kelime1, kelime2, kelime3, kelime4, kelime5. (Anahtar kelimeler küçük harflerle yazılmalı ve 5 taneden fazla olmamalıdır)

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Table 1. Table Captions Should Be First Letters Capitalized

|  |  |  |
| --- | --- | --- |
| Variables | N | X |
| Group | 1. | 47 | 30.3 |
| 2. | 60 | 38.7 |
| 3. | 48 | 31.0 |
|  Age | 18-21 | 150 | 96.8 |
| other | 5 | 3.2 |
| Gender | F | 117 | 75.5 |
| M | 38 | 24.5 |
| TOTAL |  | 155 | 100 |

MATERIALS AND METHODS

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***Equations***

Each equation should be presented on a separate line from the text with a blank space above and below. Equations should be clear and expressions used should be explained in the text. The equations should be numbered consecutively at the outer right margin, as shown in Eqs. (1) - (2) below. Here is one example.

In this case, the governing system of equations can be written as follows:

 (1)

 (2)

RESULTS

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**DISCUSSION**

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CONCLUSIONS

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**AUTHOR CONTRIBUTIONS**

This section is required if the number of authors are 2 or more. Please look at our journal’s Vol 4, Issues 1 and 2 for some examples.

**ACKNOWLEDGEMENTS**

An acknowledgement section can be written between the conclusion and the references. Sponsorship and financial support acknowledgments should be included here. Acknowledging the contributions of other colleagues who are not included in the authorship of this paper is also added in this section. If no acknowledgement is necessary, this section should not appear in the paper.

REFERENCES

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***Basic in-text reference examples****:* "We used the Cuzick and Edwards (1990) test... ... summed across all cases (Cuzick & Edwards, 1990)".

**List:** references should be arranged first alphabetically and then further sorted chronologically if necessary. More than one reference from the same author(s) in the same year must be identified by the letters 'a', 'b', 'c', etc., placed after the year of publication.

**Examples:**
Reference to a journal publication:

Van der Geer, J., Hanraads, J. A. J., & Lupton, R. A. (2010) The art of writing a scientific article. Journal of Scientific Communications, 163, 51–59.

Reference to a book:

Strunk, W., Jr., & White, E. B. (2000) The elements of style. (4th ed.). New York: Longman, (Chapter 4).

Reference to a chapter in an edited book:

Mettam, G. R., & Adams, L. B. (2009) How to prepare an electronic version of your article. In B. S. Jones, & R. Z. Smith (Eds.), Introduction to the electronic age (pp. 281–304). New York: E-Publishing Inc.

Reference to a website:

Cancer Research UK. Cancer statistics reports for the UK. (2003) http://www.cancerre-searchuk.org/aboutcancer/statistics/cancerstatsreport/ Accessed 13.03.03.

Reference to a dataset:

[dataset] Oguro, M., Imahiro, S., Saito, S., & Nakashizuka, T. (2015). Mortality data for Japanese oak wilt disease and surrounding forest compositions. Mendeley Data, v1. http://dx.doi.org/10.17632/xwj98nb39r.1.

Some more examples are given below:

Daneshvar, M. R. M., Bagherzadeh, A., & Tavousi, T. (2013) Assessment of bioclimatic comfort conditions based on Physiologically Equivalent Temperature (PET) using the RayMan Model in Iran, *Central European Journal of Geosciences*, 5(1), 53-60.

Farajzadeh H., & Matzarakis A. (2012) Evaluation of thermal comfort conditions in Ourmieh Lake, Iran. *Theoretical and Applied Climatology*, 107, 451–459.

Hamad, T. A., & Oguz, H. (2020) Determining thermal comfort zones for outdoor recreation planning: A case study of Erbil-Iraq, *Turkish Journal of Forest Science*, 4(1). 133-145.

Hoppe, P. R. (1999) The physiological equivalent temperature – a universal index for the biometeorological assessment of the thermal environment. *International Journal of Biometeorology*, 43, 71–75.

Knes, I. & Thorsson, S. (2006) Influences of culture and environmental attitude on thermal, emotional and perceptual evaluations of a public square. *International Journal of Biometeorology*, 50:258–268.

Lin, T. P. & Matzarakis, A. (2008) Tourism climate and thermal comfort in Sun Moon Lake, Taiwan. *International Journal of Biometeorology*, 52, 281–290.

Lin, T. P. & Matzarakis, A. (2011) Tourism–climate information based on human thermal perception in Eastern China and Taiwan. *Tourism Management*, 32, 492–500.

Lo, C. P. & Yeung, A. K.W. (2002) Concepts of Techniques of GIS. Prentice Hall, New Jersey.

Matallah, M. E., Alkama, D., Ahriz, A., & Attia, S. (2020) Assessment of the Outdoor Thermal Comfort in Oases Settlements, *Atmosphere*, 11(2), 185, 1-17

Matzarakis, A., Mayer, H. & Iziomon, M. G. (1999) Applications of a universal thermal index: physiological equivalent temperature. *International Journal of Biometeorology*, 43, 76–84.

Matzarakis, A. (2006) Weather and climate related information for tourism. Tourism and Hospitality Planning & Development, 3, 99–115.

Matzarakis, A., Rutz, F. & Mayer, H. (2010) Modelling Radiation fluxes in simple and complex environments – Basics of the Rayman model. *International Journal of Biometeorology*, 54, 131–139.

Matzarakis, A., Rutz, F. & Mayer, H. (2007) Modelling Radiation fluxes in easy and complex environments – Application of the Rayman model. *International Journal of Biometeorology*, 51, 323–334.

Matzarakis, A. & Mayer, H. (1996) Another kind of environmental stress: Thermal stress. WHO collaborating centre for Air Quality Management and Air pollution Control. *Newsletters*, 18, 7–10.

Mieczkowski, Z. (1985) The tourism climate index: a method for evaluating world climates for tourism. *Canadian Geographer*, 29, 220–233.

Morgan, R., Gatell, E., Junyent, R., Micallef, A., Özhan, E. & Williams, A. (2000) An improved user – based beach climate index. *Journal of Coastal Conservation*, 6, 41–50.

Nikolopoulou, M. & Steemers, K. (2003) Thermal comfort and psychological adaptation as a guide for designing urban spaces. *Energy and Buildings*, 35:95–101.

RIMP (2015) Republic of Iraq Ministry of Planning. Retrieved from: https://mop.gov.iq/en/

Stathopoulos, T., Wu, H., & Zacharias, J. (2004) Outdoor human comfort in an urban climate. *Building and Environment*, 39:297–305.

SWSD (2015) Sulaimani Weather Station Data. Retrieved from the office in Sulaimani-Iraq.

Topay, M. (2013) Mapping of thermal comfort for outdoor recreation planning using GIS: the case of Isparta Province (Turkey) *Turkish Journal of Agriculture and Forestry*, 37: 110-120.

Toy, S., Yılmaz, S., & Yılmaz, H. (2005) Determination of bioclimatic comfort in three different land uses in the city of Erzurum, Turkey. *Building and Environment,* 42: 1315–1318.

VDI. (1998) Methods for the human biometeorological evaluation of climate and air quality for the urban and regional planning. Part I: Climate. Beuth, Berlin, VDI guideline 3787, Part 2.

Wikipedia (2015) Sulaimani Province. Retrieve from: https://en.wikipedia.org/wiki/Sulay-maniyah

Yılmaz, S., Akif, I. M. & Matzarakis, A. (2013) *Global NEST Journal*, 15(3), 408-420.

Zengin, M., Kopar, İ., & Karahan, F. (2010) Determination of bioclimatic comfort in Erzurum-Rize expressway using GIS. *Building and Environment*, 5, 158–164.