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Evaluating the Climate Adaptability of the Architectural Patterns in New Housing (Case Study: Abadeh City)

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Research Article

Extended Abstract

Objective: Climatic conditions and its impact on different aspects of human life, would respect the importance of environmental issues in the study of architecture, particularly in building and construction and housing. Thus, studying the effect of climate elements on architecture is very important to identify architecture principles which is compatible with climate in new housings and identifying the ability of climatic comfort in these buildings type. Considering the main goals of passive design in different climatic zones and predicting the items that would facilitate acquiring these goals may provide effective solutions for design-related challenges, such as the new housing programs, and the revitalization and reconstruction of deteriorated houses; furthermore, it may also encourage the use of renewable resources and energy-saving features for an optimum environmental adaptation, and eventually create a distinct architectural identity for each climate zone and provide for the welfare and human comfort in buildings.

Methods: This research is in survey method and it's aim is studying the effect of climate elements in Abadeh new housings architecture and defining thermal comfort boundaries in them using monthly data synoptic station in Abadeh (temperature, precipitation, moisture, wind and radiation) during (1363-1392) and taking Mahoney construction bioclimatic experimental method. Then, by using Cochran method, 170 new buildings has been selected as the sample and their adaptation with region climate comfort have been studied concerning whit orientation, building shape and form, applied materials, architectural elements and designing according to air flow and radiation. To achieve the research objective, which is the bioclimatic welfare assessment in the new houses of Abadeh, an analytical-descriptive method was used. As such, the monthly data (1363–1392 H. Sh./1984–2013) of Abadeh synoptic station was analyzed. Subsequently, to determine the range of new housing thermal comfort following the experimental Mahoney bioclimatic construction indexes method, 170 building units and their adaptation to the bioclimatic conditions were selected by the Cochran sampling technique.

Results: The results of this study indicate that since the temperature range of the months between Mehr and Ordibehesht (approximately, Oct-May) is in the drought index group (A3), and therefore, this environment has cold climate conditions, the optimum architectural orientation is the southeast—southwest direction. Moreover, the permanent thermal oscillation between day and night in all months of the year, being more than 10°c with a relative humidity of group (A1) drought index, suggests an average area of 10–20 percent of the wall's surface for the preferable opening size. However, during the month of

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Tir (July), due to the hot days and moderate nights and the thermal oscillation above 10°c, it is advised to consider an open sleeping space in the exterior.

Conclusion: The analysis of new residential architecture in Abadeh revealed a dominant northern-southern orientation, low value of wall thickness, inconsistent window size with the wall's surface area, and diminished presence of architectural elements (such as the courtyard, porch, balcony, pond, and garden) in these buildings. These factors may lead to a maladaptive architecture to the regional climates, thus the loss of human comfort in most times of the year for the building inhabitants. In the oher word, the role of climatic conditions in the construction of new housing is very low and rather overlooked, and causes major limitations in terms of heating and cooling in this housing.

Keywords: climate, architecture, construction pattern, Mahoney, Abadeh.

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References:

Alizadeh, A (2015). ***Principles of Applied Hydrology***. Imam Reza University. Mashhad, 942 p. ***(in Persian)***

Arvin, A.A (2014).***Climate and Architecture Aplplication of Energy in Buildings and Housing.*** Isfahan, Isfahan Jahād-e Dāneshgāhi. 215 p. ***(in Persian)***

Bashiri, A., Ghodrati, F., Heidari, A., Razvian, S.M.S (2009). ***Pattern of Rural Housing in Sistan and Baluchestan.*** 1st national conference on housing and rural development, Iran, Zahedan, 1-5. ***(in Persian)***

Chamani, M (2007). ***Indigenous Structures in Sustainable Architecture***. 1st conference on structure and architecture, Iran, Tehran, 1-11. ***(in Persian)***

Darban, A., Salehi, S.S (2020). ***Study of Climate Compatibility Architecture in Kashan Housing.*** Jornal of Architecture, 3(14), pp. 7-13. ***(In persian)***

Davoodpour, Z (2003). ***Definitions of Housing and Its Role in the Formation of Residential Environments.*** Mass Housing Builders, 1(9,10), pp. 18-22. ***(In persian)***

Faghaninia, A.R, Ghanbarian, B., Choobdar, N (2009). ***New Energy- Solar Energy.*** Sharif Mechanic Letter, 13(36), pp. 14-19. ***(In persian)***

Farajzadeh Asl, M., Ghorbani, A., Lashkari, H (2008). ***The Study of Architecture Fitting of Sanandaj City Buildings with Their Bioclimatic Conditions with Monthly Method.*** Human Sciences MODARES, 12(2), pp. 161-180. ***(In persian)***

Ghasemzadeh, M., Kari, B., Tahmasebi, F (2010). ***Rural Housing and Energy Efficiency Codes.*** Housing and Rural Environment, 29(131), pp. 51-60. ***(In persian)***

Gobadian, V (2000). ***Climatic Study of Traditional Iranian Buildings.*** Tehran, Tehran University, 264 p. ***(In persian)***

Heydarinejad, Q., Zangeneh, M.A., Delfani, S., Heydarinejad, M (2009). ***Thermal Comfort.*** Tehran, Building and Housing Research Center, 160 p. ***(In persian)***

Hui, S.C.M., Chung, K.P (1997). ***Climatic data for building energy design in Hong Kong and mainland China.*** In proc; of the CIBSE National Conference 1997, London. ***(In English)***

Kasmaei, M (2013). ***Climate and Architecture.*** Isfahan, Soil Publication, 310 p. ***(In persian)***

Kaviani, M.R., Alijani, B (2001). ***principle of Climatology***. Tehran, Samt Publication, 582 p. ***(In persian)***

Kefa, R (2004). ***Development of energy – efficient passive solar building design in Nicosia Cyprus***; Renewable Energy, 30(6),pp. 937-956. ***(In English)***

Knapp, E (1982). ***Housiny Problems in Third World***. University of Stutgrt. ***(In English)***

Koenigsberger, O.H (1989). ***Manual of tropical housing and building***; Translated by Kasmaei, M. Building and Housing Research Center, 508 p. ***(In persian)***

Lashkari, H., Mozarmi, S., Lotfi, K (2011). ***Comfort Outside and Inside, Based on the Peen Warden and Mahoney Index (case Study of Ahvaz).*** New Attitudes in Human Geography (Human Geography), 3(2), pp. 207-220. ***(In persian)***

Mehdizadeh, B., Dadres, H., Saeedi, S.M., Zafari, F (2015). ***New Energies in Architecture.*** National Conference on Civil Engineering and Architecture with Focus on sustainable development, Iran, Foman, 1-13. ***(In persian)***

Mehrdad, J (2020). ***The Role of Climate, Culture and Nature in the Architecture of Traditional Houses of Gilan Province.*** Journal of Architecture, 3(15), pp. 90-97. ***(In persian)***

Modiri, M., Zahab Nazuri, S., Ali Bakhshi, Z., Afsharmanesh, H., Abbasi, M (2012). ***Investigating the Proper Direction of Buildings based on Sunlight and Wind Direction (case Study: Gorgan).*** Geography (Regional Planning), 2(2), pp. 141-156. ***(In persian)***

Moradi, S (2007). ***Regulating Environmenta Conditions***. Tehran, Shahidi Publications, 268 p. ***(In persian)***

Negahban, S., Yamani, M., Maghsoudi, M., Azizi, Q (2013). ***Investigation of Morphodynamic Attractions and Climatic welfare Characteristics in Desert Ecosystems to Develop*** **Ecotourism** ***Case study: West Margin of Lut Desert, Shahdad,*** Tourism Planning and Development, 2(6), pp. 203-225. ***(In persian)***

Nikghadam, N (2015). ***Climatic Patterns of Functional Spaces in*** **Vernacular Houses** ***of Bushehr Using Grounded Theory.*** BAGH- E NAZAR, 12(32)**,** pp. 77-90. ***(In persian)***

Oikonomou, A., Bougiatioti, F (2011). ***Architectural structure and environmental performance of the traditional buildings in Florina***. NW Greece. Building and Environment, 46(3), pp. 669–689. ***(In English)***

Omidvar, K., Rostami Gorani, E., Beyranvandzadeh, M., Ebrahimi, S (2010). ***A survey of Climatic Impacts on the Indigenous Architecture of the Southern Coasts of Iran: Bandar Abbas.*** 4th International Congress of The Islamic World Geographers, Iran, Zahedan, 1-18. ***(In persian)***

Oral, G.K., Yilmaz, Z (2003). ***Building form cold climatic zons related to building envelop form building energy conservation point.*** Energy and building, 35(4), pp. 383-388. ***(In English)***

Perez, Y.V., Capeluto, I.G (2009). ***climatic considerations in school building design in the hot –humid climatic forreducing energy***. Applied energy, 86(3), pp. 340-348. ***(In English)***

Premrove, M., Zigart, M., Leskovar, V.Z (2018). ***Influence of the building shape on the energy performance of timberglass bulidings located in warm climatic region***. Energy, 149(15), pp. 496-504. ***(In English)***

priya, R.S., Sundarraja, M.C., Radhakrishnan, S., Vijayalakshmi, L (2012). ***Solar passive techniques in the vernacular buildings of coastal regions in Nagapattinam, TamilNadu-India– a qualitative and quantitative analysis***. Energy and Buildings, 49, pp. 50–61. ***(In English)***

Rahnamaei, M.T (2008). ***Collection of Topic and Methods of Urban Planning: Geography.*** Tehran, Shahidi Publication, 188 p. ***(In persian)***

Razjouyan, M (2000). ***Comfort in the Shelter of the Wind.*** Tehran, Shahid Beheshti University, 258 p. ***(In persian)***

Rezaei, F., Taghdiri, A., Khajeh, I (2020). ***Evaluation of Climate- Architectural Indicators in Native Houses in Gorgan for Achieve Thermal Comfort (Case Study: Bagheriha House and Fatemi House)***. Jornal of Architecture. 10(6), pp. 10-17. ***(In persian)***

Sabouri Nojehdehi, R., Shokouhi Tabrizi, S (2013). ***Analytical Study of Climatic Architecture of Historical Houses in Tabriz Case Study: Company House and Alavi House.*** Sympousium on advances in Science and Technology Commission- III from Vernacular Architecture to Sustainable city, Iran, Mashhad, 1-9. ***(In persian)***

Saleigeh, M (2004). ***Modelling of Housing Construction in Accordance with Climatic Factors of Chabahar***. Geography and development, 2(4), pp. 147-170. ***(In persian)***

Sedaghatzadegan, M., Hasheminasab, S., Ataei, H (2014). ***Assessing Conformity Climate and Architecture Old and New Bazaars Historic Modern of the Isfahan City by using Mahoney Method***. Urban Regional Studies and Research, 6(23), pp. 59-74. ***(In persian)***

Shams ,M., Khodakarami, M (2010). ***Study of Traditional Architecture Compatible with Cold Climate Case Study: Sanandaj***. Geographical Planning of Environmen, 3(10), pp. 91-114. ***(In persian)***

Steiner, F.R., Bulter, K (2006). ***Planning and Urban design standard***. John Wiley & Sons, New Jersy, 450 p. ***(In English)***

Shoaei, H.R., Arab Ismaeli, N (2013). ***Homogeneity of the Building with ClimaticFactors for Achieving Sustainable Design.*** Sympousium on advances in Science and Technology Commission- III from Vernacular Architecture to Sustainable city, Iran. Mashhad, 2-9. ***(In persian)***

Tahbaz, M., Jalilian, S (2011). ***The Role of Architectural Design in Reducing Energy Consumption in Buildings***. Rah Shahr Bulletins, 123, pp. 4-26. ***(In persian)***

Tahabaz, M., Jalilian, S (2016). ***Energy Efficiency in Vernacular Housing in Villages of Semnan Province.*** Housing and Rural Environment, 35(153), pp. 3-22. ***(In persian)***

Tao, L.w (2015). ***Compare the difference of architecture design in Hong Kong and Penang – Exterior wall.*** HBRC Journal, 11(3), pp. 363–367. ***(In English)***

Tavousi,T., Abdollahi, A (2010). ***Evaluation of Temperature Comfort and Architecture Indicators Compatible with Ravansar Climate***. Geography and Planning, 15(32), pp. 125-150. ***(In persian)***

Watson, D., Labes, K (2005). ***Climate Design: Theoretical and Practical Principles of Energy use in Buildings.*** Translated by Mohammad Faiz Mahdavi and Vahid Ghobadian, Tehran, University of Tehran, 266 p. ***(In persian)***

Zain-Ahmed, A., Sayigh, A., Surendran, P.N., Othman M.Y (1998). ***The bioclimatic design approach to low-energy buildings in the Kelang valley, Malaysia.*** Solar Energy, 15(1), pp. 437-440. ***(In English)***

Zhou, X., Yan, D., An, J., Hong, T., Shi, X., Jin, X (2018). ***Comparative study of air– conditioning energy use of four office buildings in China and USA***. Energy & Buildings, 169, pp. 344-352. ***(In English)***