

Wind-Catchers: Tracing Their Historical Identity as Skyline Features and Cooling Solutions in Architecture

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Abstract

Wind catcher towers, known as Baad-geer in Farsi language, are a distinctive feature of the vernacular architecture in both hot-arid and hot-humid regions of Iran and in the middle East. Functioning as a passive cooling system, these structures regulate indoor temperatures during summer by harnessing natural airflow. Installed on the highest part of the buildings, mostly residential, wind catchers have been always exposed to fast deterioration, hence, tracing their exact date of origination and historical evolution seems challenging. This paper adopts a multidisciplinary approach, drawing on insights from archaeology, literature, and architectural studies to investigate the origins of wind catchers. The descriptive analytical methodology has been adopted for processing the data. Based on the available evidence, the research concludes that the origin of wind catchers goes back to pre-Islamic period in Iran.

Keywords: Wind-catcher, Baad-geer, Vernacular architecture, Persia

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Introduction

The wind catcher tower (Baad geer) is a prominent architectural element that embodies a climate-responsive approach in the design of many buildings throughout the middle east. These tall, vertical structures are typically installed at the highest point of buildings, contributing not only to their functional role in ventilation and cooling but also to shaping the skyline of certain cities (Bahadori, 1978). The architecture and design of wind catcher tower is a result of historical wisdom and precise engineering of Persian architects and craft men, developed during centuries as a response to the climatic situation of hot regions (Oliver, 2007). Wind catcher towers have been also used in the countries other than Iran, including Pakistan, United Arabs Emirates, India, and some north African countries like Egypt (Roaf, 2010). However, this paper through relying on evidence from literature and archaeology fields, suggests the hypothesis that the beginning of wind catcher tower goes back to the pre-Islamic era in Iran. This suggests that the wind catchers are fundamentally a Persian heritage, later influencing similar structures in other regions.

Methodology

This research employs a descriptive-analytical methodology to explore the origins and significance of wind catcher tower (Baad-geer). The required data were collected from a diverse range of sources, including poetry and literature, historical accounts, and archaeological texts and reports. The analysis involved synthesizing insights from these varied sources to identify patterns, trace historical developments, and validate the hypothesis regarding the pre-Islamic origins of wind catcher towers. The results were derived through meticulous examination and interpretation of the collected data, ensuring a comprehensive understanding of this architectural phenomenon.

Global Background and Early Examples of Wind Catchers

The wind catcher tower is a traditional ventilation system that has historically been present across the Middle East, spanning regions from Pakistan to North Africa, albeit with varying names and architectural forms (Roaf et al, 2012). In addition to Iran, wind catchers have been employed in various countries, including Egypt, Pakistan, Afghanistan, Iraq, and the UAE.

They have been also used in a limited number in Mediterranean regions like Syria, Lebanon, Palestine and Turkey (Roaf, 1988). This architectural element is known in Egypt with the name of ‘Mukalif’ and in Pakistan is called ‘Baad-khour’ (Mahmoudi, Mofidi, 2009). Throughout history, wind catcher towers have been constructed in various regions, with their design and structure varying significantly from one place to another, resulting in numerous adaptations. However, despite these diverse forms and designs, all wind catchers have served the same fundamental purpose: to capture the prevailing winds and channel them into the inhabited spaces (Fathy, 1986).

Despite extensive archaeological excavations, pinpointing the exact origin of the Baad-geer has proven challenging, as the remains of these structures typically consist only of the lower portions and foundations. In contrast, ancient paintings may offer more valuable insights, with some depictions suggesting the existence of wind catcher tower structures centuries before Christ. While the Moche civilization in Peru is known for its advanced architecture and engineering, including systems for managing airflow and temperature, the specific form of wind catchers as seen in Persian architecture is not widely documented in their structures. They used a modest version of wind catchers to ventilate their houses. The evidence of this fact is a pottery jar remaining from 600AD which is decorated with the image of a three-sided house containing multiple wind catchers (Mahyari, 1996). However, later on non-continuity of application of wind catchers in the construction of houses in Peru, creates a doubt regarding the origin of wind catchers.

On the Egyptian illustrations of 1500 BC on Papyrus, there are drawings which show some kind of a wind catcher (Roaf, 1988). In these maps, two triangular wind catchers are seen, which are located on top of a luxurious house belonging to a new king. Roaf (1988) also mentions that there are proofs that show a two-sided wind catcher behind the royal hall of Babylon dated 600 BC. The basic concept similar to the wind catcher can be seen on the primitive Sri Lankan tents which was containing of holes on the surface of tent. While the tent is set up on a single wooden stick which bares the load of the tent, the windward side of the tent is closed; where there is a small hole at the top that can direct airflow to the centre of the tent (Figure-1). Another example of wind catcher is seen in the painting of the walls of the tomb of Nebamun (1350 BC) of the Middle Egyptian sultans. According to Roaf (1988), perhaps these elements were attached to some kind of stairs leading to the rooftop. However, he states that the top triangular part of these structures was most probably performing as wind catchers (Figure-2).

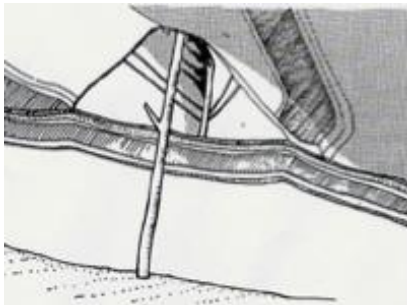


Figure-1: Primitive Sri Lankan tent (Roaf, 1988) Figure-2: Egyptian early wind catchers (Roaf, 1988)

The widespread use of wind catchers across various cultures, from the Middle East to North Africa, highlights a shared understanding of passive cooling and ventilation techniques adapted to hot and arid climates, however, the wind catcher as a fully integrated architectural element does not appear consistently across these cultures and regions.

Origins of wind-catchers in Iran

Determining the precise origin of wind catchers in architectural history is challenging, as the earliest signs of deterioration in buildings typically occur in roofs and particularly in elevated structures like wind catchers. The earliest wind-catchers in Iran are often attributed to the ancient city of Yazd, renowned for its adaptation to hot desert climates through innovative architectural techniques. The oldest surviving wind-catchers in Yazd, dating back to the 14th century (1300s AD), are located on structures like water reservoirs and ice houses (yakhchals) (Rahmati, 2024).

The earliest documented instances, such as wind-catchers on water reservoirs, date back to approximately 1300 CE. These structures were particularly effective in regions like Yazd due to the dry air, where evaporative cooling combined with qanat systems (underground water channels) created a natural cooling effect (UNESCO, 2017). Regarding the history of wind

catcher in the Citadel of Bam (Arg-e-Bam) there is no certain evidence found as the remaining of the constructions are only the lower walls and foundations of the buildings. According to the UNESCO World Heritage Centre (*n.d.*), the Citadel of Bam, located in Kerman Province, has significant historical and architectural value. However, the remains of the site do not provide conclusive evidence about the presence of wind catchers, with some historians suggesting the possibility that the concept of wind catchers could have originated from this region.

Exploring wind catchers through Literary Sources

Citing literary sources, particularly ancient texts in Farsi, offers valuable insight into the history of wind-catchers in Iran. These sources can be categorized into three main groups: travelogues, poetry, and dictionaries or encyclopaedias.

Wind catchers in Farsi travelogues

Several Farsi travelogues have mentioned the existence of wind catchers in Iranian cities where, there is no trace of wind catchers in them nowadays, hence, such travelogues are the only available evidence of the wind catcher's existence in cities like Shiraz, Laar, Bandar-e-Abaas and settlements near Boushehr. Without written accounts in travelogues documenting wind-catchers in these cities, there would be no evidence to support the presence of wind-catchers in these regions. For instance, many researchers reported that cities like Shiraz and Bushehr had no wind catchers in the past, however, in travelogues like Naser-khosrow's (11A.D) and Marco Pol's (13A.D) there have been a mention about wind catchers of Iran in these cities (Mahmoudi, Mofidi, 2009). In his 11th-century travelogue, Naser-Khosrow mentions the water reservoirs of Naeen, noting, "These buildings are designed to store rainwater, and their domes and wind-catchers are visible from afar" (Vazinpour, 2008, Nasiri, 2007). Marco Polo, a Venetian traveller who travelled to Iran in the 13th century A.D, reported the use of simple and primitive wind catchers in the city of Hormoz: "In Hormoz, the heat is so high that it is unbearable, so its residents have fan-like devices that brings wind flow from outside to their homes" (Marco Polo, 1982). Moreover, from the travelogues of 17th century tourists in which a description of Iranian wind catchers is provided; we can mention Thevenot, Chardin, Tavernier, John Fryer.

Baad-geer in poetry

One of the famous Egyptian poets called Ibrahim Ibn-e- Sharaf ul din (14th A.D) in his book 'Matla-ul-Nayireen' mentions wind catchers as 'Baad-Ahanj'. The poem is narrated by a wind catcher which describes itself as a joyful entity standing alone:

"I am a Baad-ahanj, full of joy and excitement, singing birds are standing on my top..."¹ (Holod, 1986)

Moreover, Abul Hasan Ali Ibn-e- Hasan Ibn-e- Tooba (11A.D), an Iranian poet and traveller in his poetry book has used the same word 'Baad-Ahanj' to recall the wind catchers of Iran:

¹ باد آهنگی هستم لبریز از حال و شور و شغف، بر فراز من کبوتران نغمه خوان...

“I came to see her on a hot summer day. She welcomed me coldly. I said: I do not have Baad-Ahanj in the house, however, her face turned to be my Baad-Ahanj.”² (Holod, 1986)

Ala uddin Abdullah al Ghoroli (19 A.D) in his book ‘Min Matali al Bodur fel Manzil al Sorur’ (1882) which is the collection of several Arabic poetry by various poets of his time and before, has consisted a section to wind catchers and he has used the word ‘Baaz-Ahanj’ for describing them³.

As it can be seen, even in ancient Arabic poems, for addressing and describing the wind catchers Persian words such as ‘Baa-Ahanj’ and ‘Baaz-Ahanj’ have been used. The use of Farsi words to address this architectural element even in ancient Arabic texts demonstrates its Persian origin. Even nowadays, in Arabian Gulf countries such as UAE they use ‘Baad-jir’ or ‘Baajir’ for calling the wind catchers, which is originally the same as ‘Baad-geer’ that due to elimination of ‘گ’ from Arabic alphabet and substitution with ‘ج’ it has been transformed.

Origins of wind catchers with reference to the field of Archaeology

Masouda (1974) in his report from archaeological excavation of West Teppah in the city of Bastam, Iran, mentions remaining of the square shaped channels which are filled by a layer of ash in the bottom. He, based on Carbon 14 test results, believes that these channels with the approximate dimension of 1.5 sqm, are most probably the remaining of a sort of wind catchers form 5000B.C (Chayichi, 2006).

This fact can be also verified from Giabaklou (1996) who believes: “Wet charcoal beds were sometimes used in the wind catchers, so that air after passing through these beds gets cool and then enters the room”.

Conclusion

Research into the history of wind catchers (Baad-geers) indicates that their origins may date back to antiquity, though pinpointing the exact moment of their invention remains challenging. Evidence from papyrus illustrations and archaeological studies, such as those by Masouda, suggest that the early use of wind catchers in Iran can be traced to around 4000 BCE. This early historical evidence strengthens the claim that Iran may be the birthplace of the wind catcher, as no comparable records of such structures exist elsewhere, even in the Middle East or Central Asia. Although the concept of the wind catchers likely originated in Persia, it has undergone significant evolution over time, adapting to diverse geographical and contextual needs.

² در روز گرم تابستان به دیدارش آمدم. به سردی پذیرای من شد. گفتم در خانه بادآهنج ندارم. رخسار دوست بادآهنج من شد...

³ وبادهنج علاء لکنه قدھوي هواء

References

1. Bahadori, M. N. (1978). "Passive Cooling Systems in Iranian Architecture." *Scientific American*, 238(2), 144-154.
2. Chayichi, A. (2006). *Goor Khomrehay-e- Iran*, Sameera press, Tehran, Iran.
3. Fathy, H. (1986). *Natural Energy and Vernacular Architecture: Principles and Examples with Reference to Hot Arid Climates*. Chicago: University of Chicago Press.
4. Fryer, J. (1912). "A New Account of East India and Persia Being Nine Years Travels"; London.
5. Ghiabaklou, Zahra. (1996). "A Passive Evaporative Cooling System for Residential Building"; Ph.D thesis; New South Wales university; Australia.
6. Holod, Renata. (1986). "Defining an Art of Architecture". In *Architectural Education in the Islamic World*, edited by Ahmet Evin. Singapore: Concept Media/Aga Khan Award for Architecture.
7. Mahmoudi, M. (2011). Understanding of Baad-geer's impact on thermal behaviour of buildings, Ph.D dissertation, Open University of Science and Research, Tehran, Iran.
8. Mahmoudi, M., Mofidi, M. (2009). The impact of climate on Baad-geers' of Yazd and Bandar-e-Lengeh, Conference proceedings of 3th International conference on Energy efficiency in buildings, Tehran, Iran.
9. Mahyari. A. (1996). "The Wind Catcher"; Ph.D thises; Sydney University; Australia.
10. Marco Polo. (1982). *Marco Polo Travelogue*, Trans. Sajadi, M., Gouyesh press, Tehran, Iran.
11. Masouda, S. (1984). "Teppe Sanghe-em Caxmaq; Archie fur oriatforschong". Vol 31, Austria.
12. Masouda. S. (1974). "Excavations at Tape sang-e cagmag": Proceeding of 2nd annual Symposium on Archaeological Research in Iran.
13. Nasiri, M. (2007). *Naesr-khosrow Travelogue*, Amir-Sadra Press, Tehran, Iran.
14. Oliver, P. (2007). *Dwellings: The Vernacular House Worldwide*. Oxford: Phaidon Press.
15. Rahmati, H. "Badgir Windcatcher." *Taste Iran*. Accessed December 2024. <https://www.tasteiran.net>
16. Roaf, S. (2010). *Ecohouse: A Design Guide*. Oxford: Architectural Press.
17. Roaf, S., Crichton, D., & Firth, S. (2012). *Ecohouse: A Design Guide (3rd ed.)*. Oxford: Architectural Press.
18. Roaf. S. (1988). "The Wind catcher of Yazd"; Ph.D thesis; Department of Architecture; oxford polytechnic.
19. UNESCO World Heritage Centre. (n.d.). *Historic city of Bam*. Retrieved December 2, 2024, from <https://whc.unesco.org/en/list/1078>
20. UNESCO. (2017). *Nomination file: Historic City of Yazd*. Retrieved from [\[https://whc.unesco.org/en/list/1544/\]](https://whc.unesco.org/en/list/1544/).

21. Vazinpour, N. (2008). Safarnameh Naser khosrow, Jeebi Books press, Tehran, Iran.