Rediscovering Traditional Knowledge Systems in Anatolia and Thrace: *Darüşşifa* (Hospitals) and their Potential Contribution to a Circular Economy

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Introduction and the Conceptual Background

Traditional Knowledge Systems (TKS) are "principles, processes, techniques, and tangible and intangible practices related to heritage and its continuity by the associated community over the centuries."[1] The role and significance of TKS in cultural and natural heritage have only recently been acknowledged. ICCROM's (International Centre for the Study of the Preservation and Restoration of Cultural Property) Living Heritage Program,[2] initiated in 2015, and based on people–centered approaches, emphasizes the importance of TKS in safeguarding heritage. Similarly, in the third forum of the 2020 conservation series, ICCROM discussed the adaptability and applicability of TKS in contemporary conservation practices in Asia.[3] However, the earliest discussion about TKS for the heritage sector at the international level was in the United Nation's Biological Diversity Convention in 1992, and it was mostly related to natural heritage.[4] It was only in 2005 that, for the first time, the UNESCO World Heritage Committee made reference to TKS in its operational guidelines.[5] Community–based TKS can include traditional construction techniques, an irrigation system, waste or clean water management, and living intangible heritage practices.

The 17 Sustainable Development Goals (SDG) of the United Nations (UN), in particular Goals 3, 7, 11, 12, and 13, and "SDGAction43153: Integrating Indigenous Knowledge Systems in 2030 UN Sustainable Development Goals"[6] are closely linked to ICCROM's TKS.[7] For example,

1 Gamini Wijesuriya and Sarah Court, eds., *Traditional Knowledge Systems for Conservation and Management of Asia's Heritage*, ICCROM-CHA Conservation Forum Series (Rome: ICCROM, 2020), 15.

2 ICCROM, "People-Centred Approaches to the Conservation of Cultural Heritage: Living Heritage," Rome: ICCROM, 2015, accessed April 9, 2025, https://www.iccrom.org/sites/default/files/PCA_Annexe-2.pdf.

3 Wijesuriya and Court, *Traditional Knowledge Systems.*

4 UN, "Convention on Biological Diversity," United Nations, New York, 1992, accessed April 9, 2025, www.cbd.int/doc/legal/cbd-en.pdf.

5 "Operational Guidelines for the Implementation of the World Heritage Convention," UNESCO World Heritage Centre, Paris, 2002, accessed April 9, 2025, https://whc.unesco.org/archive/opguide05-en.pdf.

6 UN, Department of Economic and Social Affairs Sustainable Development, "SDGAction43153: Integrating Indigenous Knowledge Systems In 2030 UN Sustainable Development Goals," United Nations, accessed February 1, 2025, https://sdgs.un.org/partnerships/integrating-indigenous-knowledge-systems-2030-un-sustainable-development-goals.

7 For other SDG links with ICRROM TKS, see WIPO, "Documenting Traditional Knowledge—AA Toolkit," Switzerland: World Intellectual Property Organization, 2017, accessed February 1, 2025, https://ocm.iccrom.org/documents/wipo-documenting-traditional-knowledge-toolkit.

SDG 3[8] aims to "ensure healthy lives and promote well–being for all at all ages," just as TKS can contribute to well–being and community empowerment."[9] Another example: SDG 7[10] aims to "ensure access to affordable, reliable, sustainable and modern energy for all," which is also one of the main objectives of TKS. As Umezu noted,[11] traditional knowledge systems and construction techniques in Japan such as natural ventilation, appropriate building orientation and sloping roof shapes contribute to the energy efficiency of buildings. Another example is the goal of SDG 11[12] to "make cities and human settlements inclusive, safe, resilient and sustainable." Similarly, Jigyasu[13] emphasizes the importance of traditional skills and practices of communities in rebuilding urban environments after disasters. In the same way, the aim of SDG 12[14] is to "ensure sustainable consumption and production patterns," which is also one of the aims of TKS.[15] Last but not least, SDG 13[16] aims to "take urgent action to combat climate change and its impacts" and, similarly, traditional knowledge in the field of urban heritage can be a useful tool to mitigate the effects of climate change with specific solutions for the conservation and use of natural resources in an environmentally sustainable way.[17]

Anatolian Seljuk and Classical Ottoman era *darüşşifa* are among the heritage buildings where tangible evidence exists of the traditional knowledge systems practiced from the twelfth through the seventeenth centuries; the earliest example is the Mardin Emineddin *Darüşşifa*, constructed in 1108/1109–1122/23, and the last, the Sultanahmed *Darüşşifa*, built in 1609–1617.[18] Special ventilation, illumination, heating, and cooling solutions, traditional construction details, and special spatial arrangements for the patients and healers are among the various components of TKS that have been retained and can be seen today in the historic *darüşşifa* of Anatolia and Thrace. In this chapter, the TKS of these *darüşşifa* are investigated, along with their relationships to the circular economy.

The circular economy has been defined by Korhopnen et al. as a practice in which a cyclical use of resources, practices, and techniques

8 UN, Department of Economic and Social Affairs Sustainable Development, "SDG 3: Ensure Healthy Lives and Promote Well-Being for All at All Ages," United Nations, 2015, accessed February 1, 2025, https://sdgs.un.org/goals/goal3.

9 Wijesuriya and Court, *Traditional Knowledge Systems*, 266.

10 UN, Department of Economic and Social Affairs Sustainable Development, "SDG 7: Ensure Access to Affordable, Reliable, Sustainable and Modern Energy for All," United Nations, 2015, accessed February 1, 2025, https://sdgs.un.org/goals/goal7.

11 Akiko Umezu, "Introduction: the Conservation of Traditional Buildings in Japan," in *Traditional Knowledge Systems for Conservation and Management of Asia's Heritage*, eds. Gamini Wijesuriya and Sarah Court, ICCROM-CHA Conservation Forum Series (Rome: ICCROM, 2020), 194–195.

12 UN, Department of Economic and Social Affairs Sustainable Development, "SDG 11: Make Cities and Human Settlements Inclusive, Safe, Resilient and Sustainable," United Nations, 2015, accessed February 1, 2025, https://sdgs.un.org/goals/goal11.

13 Rohit Jigyasu, "Traditional Knowledge Systems for Reducing Disaster Risk and Building Resilience in India," in *Traditional Knowledge Systems for Conservation and Management of Asia's Heritage*, eds. Gamini Wijesuriya and Sarah Court, ICCROM-CHA Conservation Forum Series (Rome: ICCROM, 2020), 169, 175.

14 UN, Department of Economic and Social Affairs Sustainable Development, "SDG 12: Ensure Sustainable Consumption and Production Patterns," United Nations, 2015, accessed February 1, 2025, https://sdgs.un.org/goals/goal12.

15 Sangeeta Bais, "From Karkhanas to the Modern Conservation Management System in India," in *Traditional Knowledge Systems for Conservation and Management of Asia's Heritage*, eds. Gamini Wijesuriya and Sarah Court, ICCROM-CHA Conservation Forum Series (Rome: ICCROM, 2020), 71, 72, 79.

16 UN, Department of Economic and Social Affairs Sustainable Development, "SDG 13: Take Urgent Action to Combat Climate Change and its Impacts," United Nations, 2015, accessed February 1, 2025, https://sdgs.un.org/goals/goal13.

17 Jigyasu, "Reducing Disaster Risk," 166, 170; Akiko Umezu, "Introduction," 194, 197; Wijesuriya and Court, *Traditional Knowledge Systems*, 267.

18 Gönül Cantay, *Anadolu Selçuklu ve Osmanlı Darüşşifaları* (Ankara: Atatürk Kültür Merkezi Yayınları, 1992), 15–16.

contribute to sustainable development and management.[19] The concept of the circular economy has been used to assess historic architecture and its reusage in other countries,[20] but it is still a relatively rare approach for analyzing heritage architecture in Türkiye.

Potting et al. identify nine circularity strategies: Refuse (R0), Rethink (R1), Reduce (R2), Reuse (R3), Repair (R4), Refurbish (R5), Remanufacture (R6), Repurpose (R7), Recycle (R8), and Recover (R9).[21] All these strategies are part of the concept of *passive survivability*, which[22] is defined as a way of life employing sustainable solutions that do not require artificial energy consumption and that help to increase the longevity of historic buildings. Other traditional architectural solutions used in *darüşşifa* and their adaptive reuse enable new uses and contribute to the circular economy and circularity strategies by minimizing the impact on the environment and promoting economic development. By applying a circular economy model to the conservation strategies used for built heritage, these practices increase their relevancy as they aim to rediscover the architectural solutions of the past and use these as inspiration in the present and future.

The 2018 Leeuwarden Declaration on Adaptive Re−use of the Built Heritage issued by Europa Nostra clearly emphasizes the importance of sustainable adaptive reuse of built heritage based on smart and quality−based processes, as these are believed to provide multiple cultural, social, environmental, and economic benefits.[23] In addition, as explained above, Goals 3, 7, 11, 12, and 13 of the 17 Sustainable Development Goals proclaimed in 2015 by the United Nations for the 2030 Agenda for Sustainable Development are closely related to TKS of ICCROM and address issues related to tangible and intangible heritage, their reuse, resiliency, and sustainability.[24] Today, several of the *darüşşifa* of Anatolia are used according to their original function as healthcare cen-

19 Joini Korhopnen, Antero Honkasalo, and Jyri Seppälä, "Circular Economy: The Concept and its Limitations," *Ecolog Econ.* 143 (2018): 39.

20 Antonia Gravagnuolo et al., "Evaluation Criteria for A Circular Adaptive Reuse of Cultural Heritage," *BDC Boll. Del Cent. Calza Bini* 17, no. 2 (2017): 185–216; Antonia Gravagnuolo, Roberta De Angelis, and Silvia Iodice, "Circular Economy Strategies in the Historic Built Environment: Cultural Heritage Adaptive Reuse," *18th Annual STS Conference, Critical Issues in Science, Technology and Society Studies*, 6–7 May 2019, Graz, Austria, 2019, 121–44; Gillian Foster, Halliki Kreinin, and Sigrid Stagl, "The Future of Circular Environmental Impact Indicators for Cultural Heritage Buildings in Europe," *ESEU* 32, no. 141 (2020); Satu Huuhka and Inge Vestergaard, "Building Conservation and the Circular Economy: A Theoretical Consideration," *JCHMSD* 10, no. 1 (2020): 29–40; Regitze Kjær Zimmermann et al., "LCA-Framework to Evaluate Circular Economy Strategies in Existing Buildings," *IOP Conference Series Earth and Environmental Science,* November 2020, 588, no. 4 (2020): 042044; Gillian Foster and Riba Saleh, "The Adaptive Reuse of Cultural Heritage in European Circular City Plans: A Systematic Review," *Sustainability* 13, no. 5 (2021): 2889; Francesca Nocca, Pasquale De Toro, and Viktoriya Voysekhovska, "Circular Economy and Cultural Heritage Conservation: A Proposal for Integrating Level(s) Evaluation Tool," *Aestimum* 78 (June 2021): 105–14; Cristiana Cellucci, "Circular Economy Strategies For Adaptive Reuse of Residential Building," *VITRUVIO* 6, no. 1 (2021): 110–21.

21 José Potting et al., *Circular Economy: Measuring Innovation in the Product Chain*, PBL Publication (The Hague: PBL Netherlands Environmental Assessment Agency, 2017), 5.

22 Betül Ankaralıgil and Gülşen Dişli, "Sustainable and Traditional Technologies in Kutahya Historic Houses and Their Contribution to Circularity: The Case of Lajos Kossuth house," *Vitruvio* 6, no. 1 (2021): 93–94; Gülşen Dişli, "Analysis of Ancient Ventilation and Illumination Practices in Anatolian Seljuk and Ottoman Hospitals and Suggestions for their Conservation Measures," *Int. J. Archit. Herit.* 2, no. 1 (2018): 174, 183; Gülşen Dişli and Aynur Duysak Mankır, "An Evaluation of Functional Systems in Traditional Akşehir Houses in Terms of Ecological and Energy Efficient Design Criteria," *JASTIC* 16, no. 32 (2021): 259.

23 Europe Nostra, "Leeuwarden Declaration Adaptive Re-use of the Built Heritage: Preserving and Enhancing the Values of our Built Heritage for Future Generations," accessed April 9, 2025, https://www.acecae.eu/uploads/tx_jidocumentsview/LEEUWARDEN_STATEMENT_FINAL_EN-NEW.pdf.

24 UN, Department of Economic and Social Affairs Sustainable Development, "The 17 Goals," United Nations, 2015, accessed February 1, 2025, https://sdgs.un.org/goals.

ters (e.g., Bursa, Yıldırım Bayezid Hospital), but many have been adapted to fulfill other needs (e.g., Edirne, II. Bayezid Hospital Museum).[25] Regardless of their current functions, all of these heritage structures have contributed in varying degrees to different aspects of the environment with their natural, durable, and local material selections, energy–efficient construction techniques, human–friendly and "healthy" architectural solutions, compatible new functions, and passive energy design. Thanks to their adaptive reuse, or use according to their original function, it has been possible to extend the lifespan of these structures rather than create entirely new buildings. As a result, the impact on the environment has been minimized, because ultimately, fewer new building materials have been consumed and less energy expended. In today's world of limited energy sources, it is not just a luxury but a necessity that we look to extant heritage structures and their sustainable features and try to adapt these to contemporary needs. Michael Murphy's experience designing the epidemic hospital in Butaro, Rwanda, the Kasungu District Hospital in Malawi, and the GHESKIO cholera treatment center in Haiti also support this assumption. There, local building materials for the medical facilities and strategies for managing water, light, air, and waste were used rather than mechanical systems and materials that were costly and needed to be imported.[26] Murphy emphasizes that the architecture of healthcare buildings can help to heal patients, and many design strategies that were used historically are sensitive to the environment and serve as instruments to promote health. For example, in the very basic designs and reusable materials used in the prefabricated Renkioi Emergency Hospital constructed in 1853 during the Crimean War in the Çanakkale region of Anatolia, "controlled access to light and air, separation and elimination of waste, and avoidance of overcrowding" were all key priorities which reduced the mortality rate of patients treated there to just 3%. Murphy criticizes the excessive use of machinery and mechanical systems used in many healthcare facilities today which has "changed the DNA of the hospital," endangering not only its form but also its function.[27]

As Healy and McKey state, "analyzing hospitals of the present requires understanding how they evolved in the past and the pressures that may shape the hospitals of the future."[28] Taking into account that hospital designs of many types and their traditional construction techniques, materials, and special architectural solutions influence the levels of satisfaction and healing process of patients, the focus of this chapter is

25 For more information on the conservation projects of Bursa, Yıldırım Bayezid Hospital, Edirne, II Bayezid Hospital, and other *darüşşifa*, please refer to the archives of the Directorate General of Foundations.

26 Michael Murphy, *The Architecture of Health: Hospital Design and the Construction of Dignity* (Cooper Hewitt, Smithsonian Design Museum, 2021), 12.

27 Murphy, *The Architecture of Health*, 78–79, 82–89, 213.

28 Judith Healy and Martin Mckee, "Improving Performance within the Hospitals," in *Hospitals in a Changing Europe*, eds. Martin McKee and Judith Healy, EOHCS Series (Buckingham and Philadelphia: Open University Press, 2002), 205–25; Zühal Özcan and Gülşen Dişli, "Refrigeration Technology in Anatolian Seljuk and Ottoman Period Hospitals," *GUJS* 27, no. 3 (April 2014): 1015–21; Gülşen Dişli and Zühal Özcan, "Waste and Clean Water Systems in Anatolian Seljuk and Ottoman Period Hospitals," *IJAR* 6, no. 3 (May 2014): 169–77; Gülşen Dişli and Gökçe Günel "Inventory and Technological Aspects of Historic Crimean Hamams," in *Proceedings of the 9th International Symposium on Conservation of Monuments in the Mediterranean Basin (MONUBASIN), METU, 3–5 June 2014*, MONUBASIN 9 (Ankara: METU, 2017), 181–94; Gülşen Dişli, "Sustainability of Historic Building Systems: Anatolian Seljuk and Ottoman Hospitals," *APT Bulletin* 45, no. 4 (2014): 45–51; Gülşen Dişli, "Planning of Functional Spaces in Ottoman Period Hospitals (Darüşşifa) of Anatolia," *Al-Masāq* 27, no. 3 (2015): 253–76; Gülşen Dişli and Nevin Çelik, "Heating System Evaluation of an Ancient Turkish Bath; the Bath of Süleymaniye Hospital," in *Proceedings of the 12th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics (HEFAT 2016), Costa del Sol, Malaga, Spain, 11–13 July 2016* (Malaga: HEFAT, 2016), 1649–53; Gülşen Dişli and Zühal Özcan, "An Evaluation of Heating Technology in Anatolian Seljuk Period Hospitals (Darüşşifa)," *METU JFA* 33, no. 2 (2016): 183–200; Gülşen Dişli, "Analysis of Ancient Ventilation," 174–85.

Table 1. Data on case study *darüşşifa*.

	Name of the Hospital	Location	Period Built/Date
1	Gevher Nesibe *Darüşşifa* and Medical Medrese	Kayseri	1205–1206
2	Izzeddin Keykavus I. *Darüşşifa*	Sivas	1217
3	Divriği Great Mosque and *Darüşşifa*	Sivas	1228
4	Anber bin Abdullah *Darüşşifa*	Amasya	1222–1232
5	Yıldırım Bayezid *Darüşşifa*	Bursa	1400
6	Fatih *Darüşşifa*	Istanbul	1470
7	Bayezid II. *Darüşşifa*	Edirne	1485
8	Hafsa Sultan *Darüşşifa*	Manisa	1539
9	Haseki Sultan *Darüşşifa*	Istanbul	1550
10	Süleymaniye *Darüşşifa* and Medical Medrese	Istanbul	1556
11	Atik Valide *Darüşşifa*	Istanbul	1583

on a selected group of *darüşşifa* of Anatolia and Thrace that were built in the Seljuk and Classical Ottoman period between 1205 and 1583 and which are still mostly intact and functioning in some capacity as healthcare facilities. This research expands the scholarly literature on Anatolian *darüşşifa* in two ways: by presenting an assessment of the TKS and circular economy and how these are related to these spaces of healing and by rereading familiar sources from a different angle. This study reveals a wider picture of what builders and workers in different parts of the Seljuk and Ottoman Empire did to sustain and recover patients' health while designing and constructing hospital spaces. It also examines how these structures contribute to the present−day circular economy.

Methods

From the thirteenth–sixteenth centuries, the Seljuk and Classical Ottoman eras witnessed a significant increase in healing spaces in Anatolia and Thrace.[29] The names, locations, and periods of hospitals examined in this chapter are given in Table 1.[30]

This chapter elucidates different traditional knowledge systems in *darüşşifa* and the contribution of these systems to the circular economy. Preliminary conclusions are presented along with reflections on directions for future research. This research is based on an archival and literature survey that was combined with field observations from 2011–2018. Foundation deeds (*vakfiye*) and other relevant documents such as historical photographs, plans, and drawings of the hospitals were examined at the Archives of the Directorate General of Foundations in Türkiye. Travelers' accounts, excavations, and restoration reports were also consulted and used to inform observations.[31] Of particular interest was evidence of hygienic practices in Seljuk and Ottoman hospitals,

29 Cantay, *Anadolu Selçuklu ve Osmanlı Darüşşifaları*, 9–19.

30 Dişli, "Sustainability of Historic Building Systems," 45

31 Seyit Ali Kahraman and Yücel Dağlı, eds., *Evliya Çelebi, Günümüz Türkçesiyle Evliya Çelebi Seyahatnamesi: Konya, Kayseri, Antakya, Sam, Urfa, Maras, Sivas, Gazze, Sofya, Edirne*, Vol. 3, no. 2 (Istanbul: YKY, 2006); Osman Çetin, *İlk Osmanlı Hastanesi Bursa Yıldırım Darüşşifası* (Bursa Mahkeme Sicillerine Göre, Istanbul: Göz Nurunu Koruma Vakfı, 2006); see also Archives of Directorate General of Foundations for the excavation/restoration reports of Süleymaniye Hospitals, Divriği

health–related spatial practices in hamams, or baths, and the availability of natural, organic, local material such as stone, brick, and wood for architectural constructions. Features of the *darüşşifa* related to illumination, ventilation, heating, and other design decisions were also investigated.

Traditional Knowledge Systems (TKS)

Although it is widely accepted that heritage places, properties, and values have been sustained through the centuries thanks to Traditional Knowledge Systems (TKS), only recently has the importance of TKS in heritage conservation and management been recognized as an effective tool for heritage conservation. According to ICCROM, "largely as a result of the introduction of modern conservation approaches, less and less attention has been paid to traditional approaches, resulting, in many cases, in their marginalization and gradual disappearance all over the world."[32] TKS are closely related to both the intangible knowledge and tangible built environment of a local community.[33] This knowledge is gained through experience, constant observation, trial, and modification over the centuries, and adapted to local cultures and climate conditions.[34] For example, heritage structures even in disaster–prone areas can survive for many centuries thanks to their traditional construction techniques and wise selection of materials well adapted to local conditions.[35]

In architecture, traditional knowledge is especially observable in the vernacular housing of a local community: design, land use, material selection/use, construction techniques, tools, building phases, management, energy–efficiency, and an environmentally–friendly approach to building, as well as the preservation of the marks made by stonemasons and workers, are among the TKS principles and examples recommended in sustainable cultural heritage practices by the Assam Science Technology and Environment Council (ASTEC).[36] The concept of TKS can also be applied to traditional healing and medicine practices.[37] Janska defines "traditional health knowledge" as "a dynamic and distinctive knowledge of health maintenance developed by indigenous communities over centuries through empirical observation, spiritual insight, and traditional teaching."[38] While some of the *darüşşifa* of Anatolia

Great Mosque and Hospital, Atik Valide Hospital, İzzettin Keykavus Hospital, Gevher Nesibe Hospital, and Hafsa Sultan Hospital and the Archives of Sivas Museum Directorate, "File on Divriği Great Mosque and Hospital East Side Land Excavations in 2011," Sivas.

32 Wijesuriya and Court, *Traditional Knowledge Systems,* 9–10.

33 "Integrating Traditional Knowledge Systems and Concern for Cultural and Natural Heritage into Risk Management Strategies. Proceedings from the Special Session organized by ICCROM and the World Heritage Centre for the International Disaster Reduction Conference (IDRC), Davos, Switzerland 31 August 2006," eds. Joseph King, Gamini Wijesuriya, and Jennifer Copithorne, last modified September 8, 2006, http://whc.unesco.org/uploads/events/documents/event-538-1.pdf, 7–9; Ashish Kothari, *Traditional Knowledge and Sustainable Development* (Winnipeg, Manitoba: IISD, 2007), 4; ASTEC, "Sub-Theme-V Traditional Knowledge System," The Assam Science Technology and Environment Council (ASTEC), 122, https://onlineasdma.assam.gov.in/kmp/pdf/1625629152agb_5_tks.pdf, accessed April 9, 2025; United Nations Decade on Biodiversity, Secretariat of the Convention on Biological Diversity, "Living in Harmony with Nature. Traditional Knowledge, Innovation and Practices," https://www.cbd.int/undb/media/factsheets/undb-factsheet-tk-en.pdf, accessed April 9, 2025.

34 Secretariat of the Convention on Biological Diversity, "Living in Harmony with Nature."

35 "Integrating Traditional Knowledge Systems," 7, 9; ASTEC, "Sub-Theme-V Traditional Knowledge System," 122–23. For more information on traditional construction techniques in Ottoman architectural monuments, see Gülsün Tanyeli, "*Hiçbir Üstâd Böyle Kâr Etmemişdir": Osmanlı İnşaat Teknolojisi Tarihi* (İstanbul: Akın Nalça Kitapları, 2017).

36 ASTEC, "Sub-Theme-V Traditional Knowledge System," 137.

37 Shelton H. Davis and Katrinka Ebbe, *Traditional Knowledge and Sustainable Development* (Washington D.C.: The World Back, 1995), 14–17.

38 Emilia Janska, "Health Knowledge, Traditional," in *Encyclopedia of Public Health.* Vol. 1, *A–H*, ed. Wilhelm Kirch (Dordrecht: Springer, 2008), 611–14.

still retain evidence of their initial function as places of traditional healing, it is increasingly difficult to observe these healing practices in situ.[39] Therefore it is important to identify and preserve the still-extant TKS embedded in these heritage sites.

Cultural Heritage and the Circular Economy

The circular economy is based on the optimization of use, productive repeated use, and longer life-span of locally sourced resources such as stone or wood. The use of locally sourced resources reduces waste and contributes to environmental, financial, and social well-being.[40] As opposed to the linear economy, which is based on a "take, make, and dispose policy," as well as consuming rather than conserving strategies,[41] the circular economy is closed-looped, innovative, waste-free, and energy-efficient.[42]

As Potting et al.[43] note, the use of local, environmentally-friendly construction material and design solutions, along with special architectural details, contribute to historic buildings being inherently green and sustainable, thereby creating a low-carbon economy. Considering that the complex and non-linear nature of cultural heritage management consists of various stakeholders, such as local community, public and private institutions, NGOs, and foundations, traditional linear management systems are inadequate for predicting and analyzing the complex nature of cultural heritage.[44] Therefore, using the concepts of the circular economy and circular thinking is advisable for an improved and more sustainable management. With cultural heritage management, the more traditional linear management systems are "too short-sighted to preserve all the values of the building stock and may cause destructive operations in the long term."[45]

Traditional Knowledge Systems in Anatolian *Darüşşifa*

Various TKS can be found in Anatolian *darüşşifa* and are briefly discussed below. The *vakıf* system is one of the important traditional institutions which reflects the value systems embedded in Anatolian *darüşşifa*. Yediyıldız defines the term *vakıf* as "a legal process of appropriation of movable or immovable property for a religious, charitable, and social purpose by a person to gain God's approval, along with a social and public service forever."[46] In both the Seljuk and Ottoman eras, the *vakıf* system was the most important institution for the protection and sustainability of historic structures such as hospitals. The Izzeddin Keykavus I. *Darüşşifa* in Sivas (1217) is the only hospital from the Seljuk period for which a *vakfiye* remains, but other hospitals would have also had these charters.[47] Thanks to their status as *vakıfs*, the repair and renewal work for Seljuk and Otto-

39 Traditional medicine, also considered alternative medicine today, is still used to a great extent in many countries (Secretariat of the Convention on Biological Diversity, "Living in Harmony with Nature"), including Türkiye.

40 Department for Environment, Food and Rural Affairs (Defra), "Circular Economy Package Policy Statement. Policy Paper," Welsh Government and the Scottish Government, published July 30, 2020, https://www.gov.uk/government/publications/circular-economy-package-policy-statement/circular-economy-package-policy-statement.

41 Huuhka and Vestergaard, "Building Conservation," 32, 36.

42 Camilla Tomasetta, "The Life Cycle Sustainability Assessment Approach Applied to Tangible Cultural Heritage Conservation" (PhD diss., DREAMT Doctorate School, 2017), 12.

43 Gillian Foster, "Circular Economy Strategies," *RCR* 152 (2020): 1–14.

44 Tomasetta, "Life Cycle Sustainability Assessment Approach," 9.

45 Uta Hassler, "Long-Term Building Stock Survival and Intergenerational Management: The Role of Institutional Regimes," *BRI* 37, no. 5–6 (2020): 552–68.

46 Bahaeddin Yediyıldız, "Vakıf," in *İslam Ansiklopedisi* 42 (Istanbul: TDV, 2012), 479–86.

47 Ahmet Acıduman, "Importance of Inscriptions and Waqf Registrations of Dar Al-Shifas (Hospitals) from Anatolian Seljuks Era in Respect of History of Medicine," *J Ankara Univ Fac Med* 63, no. 1 (2010): 9–15.



Fig. 1. Views from a) the courtyards of Süleymaniye Hospital, Istanbul, b) II. Bayezid Hospital, Edirne, c) Gevher Nesibe Hospital, Kayseri, and d) Hafsa Sultan Hospital, Manisa.

man historic structures was often organized together with the land donated for their upkeep, goods, materials, or labor allocated in perpetuity in the *vakfiye* for their support. The management and organization of many of these hospitals, along with the purpose of the foundation, different services to be performed, income, expenses, qualifications of the employees, and wages were often stipulated in the foundation deeds.[48] This type of philanthropic institution, while also serving to increase, or at least preserve, the presence and power of the elite, was intended for charitable giving and the welfare of the public.[49] At present, the Directorate General of Foundations in Türkiye administers, manages, and inspects all the *vakıf* institutions in the country and is responsible for the repairs of *vakıf*–based buildings. Charity and philanthropy are still part of this institution, but financial tools and management strategies have, of course, changed since Ottoman times.

Some Spatial Characteristics and Architectural Features of *Darüşşifa*

Darüşşifa have well–established networks of places for rest, including open, semi–open, and

48 Acıduman, "Importance of Inscriptions," 9–15.

49 Semanur Çelikbağ Ekinci and Aynur Atmaca Can, "Osmanlı Şehrinin Araştırılmasında Bir Kaynak: Vakfiyeler," *Urban Academy* 10, no. 29 (Spring 2017): 48–74.

closed space arrangements, e.g., open central courtyards, *eyvans*, and closed areas connected to those open/semi–open spaces (Fig. 1).[50] In the Gevher Nesibe Hospital and Medrese in Kayseri, the Süleymaniye Hospital in Istanbul, and II. Bayezid Hospital and Medrese in Edirne, there are also interconnected courtyards serving both the patients and medical students.

Moreover, these traditional buildings have strategically located water sources such as wells, fountains, water depots, pools in the courtyard, stone waterspouts, and central inner pools that served the patients and staff in the *darüşşifa* (Fig. 2). The spring water of the mountains, nearby lakes, rivers, rainwater, or snow were all important sources for the water supply of *darüşşifa*.[51] One important contribution made by the sixteenth-century Ottoman architect Sinan was the wells in the courtyards of the hospitals he designed. He built these to collect rainwater from the surrounding lands, courtyards, and buildings, and his designs ensured that the rainwater did not damage the building.[52] The strategic location of the hospitals[53] in the urban or rural topography also helped to take advantage of possible water resources available in the immediate environs.[54] Further, in the Süleymaniye, Sultan Ahmet, Atik Valide, and Gevher Nesibe *darüşşifa*, hamams were used for both hygienic and therapeutic functions (Fig. 3).[55] In those hamams, special architectural features and traditional construction techniques were used, such as vapor vents on the pendentives which helped to adjust indoor temperatures (e.g., the bath of the Atik Valide Hospital), hypocaust heating systems, vertical *tüteklik* pipes,[56] observation windows, roof lanterns, and oculi to light the interiors (Fig. 4). Architectural features for discharging and collecting rainwater were also created. For example, the top of the dome lanterns and roof chimneys were frequently covered with conical "hats" sitting on one or two layers of cornices.[57] Thus, rainwater penetration through the side openings was prevented. Rainwater was also directed to the waterspouts located at certain intervals along the walls of the hospitals; these spouts were then connected to the wells, cisterns, or pools via open channels or underground terracotta pipes. This system ensures that rainwater is either diverted to prevent water damage or collected for future use (Fig. 5).

In 2014, during the restoration work at the Atik Valide Complex in Istanbul, an elaborate

50 All images unless otherwise specified are from the author's archive. An *eyvan* (*iwan*) is a large vaulted space closed on three sides and open at one end.

51 Dişli and Özcan, "Waste and Clean Water Systems," 169–77.

52 Dişli and Özcan, "Waste and Clean Water Systems," 169–77.

53 For example, the Süleymaniye Hospital and the Atik Valide Hospital.

54 Zişan Yıldız, "Sağlık Yapılarının İstanbul'un Tarihsel Topoğrafyası ile İlişkisinin Süreklilik Bağlamında İncelenmesi" (MA thesis, Mimar Sinan University of Fine Arts, 2020), 32.

55 To learn more about how these hospitals operated and were financed, see the Hospital of the Queen (Valide) Mother, Nurbanu Valide Sultan, referred to by Ömer Düzbakar, "Charitable Women and Their Pious Foundations in the Ottoman Empire: The Hospital of the Senior Mother Nurbanu Valide Sultan," *JISHIM* 5, no. 10 (2006): 11–20; Pinar Kayaalp, *The Empress Nurbanu and Ottoman Politics in the Sixteenth Century: Building the Atik Valide* (New York: Routledge, 2018); Nina Ergin, "Taking Care of Imarets: Repairs and Renovations to the Atik Valide Imareti Istanbul, circa 1600–1700," in *Feeding People, Feeding Power: Imarets in the Ottoman Empire*, eds. Nina Ergin, Christoph K. Neumann, and Amy Singer (Istanbul: Eren Yayınları, 2007), 151–67; Pınar Kayaalp-Aktan, "The Endowment Deed of the Atik Valide Mosque Complex: A Textual Analysis," in *Feeding People, Feeding Power: Imarets in the Ottoman Empire*, eds. Nina Ergin, Christoph K. Neumann, and Amy Singer (Istanbul: Eren Yayınları, 2007), 261–73.

56 A *tüteklik* is a vertical pipe laid in the masonry walls of bath buildings, consisting of interconnected terracotta tubes extending from the bottom of the hypocaust section towards the height of the roof.

57 Ali Kaygısız and Gülşen Dişli, "Mimar Sinan'in Klasik Dönem Osmanlı Mimarisi Külliye Yapılarında İşlevsel Sistemler: Süleymaniye Külliyesi Örneği," *TOJDAC* 11, no. 3 (2021), 757.



Fig. 2. a–b) Fountains in the Süleymaniye Hospital), c–f) inner pool and interior views from the roof of the Divriği Great Mosque Hospital, and g–i) inner pool and wells in the courtyards of Edirne's II. Bayezid Hospital and Medrese.







Fig. 3. a) Firewood storage section of the bath at the Atik Valide Hospital in Istanbul, b) the bath of the Sultan Ahmet Hospital, Istanbul, and c) the bath of the Gevher Nesibe Hospital, Kayseri.

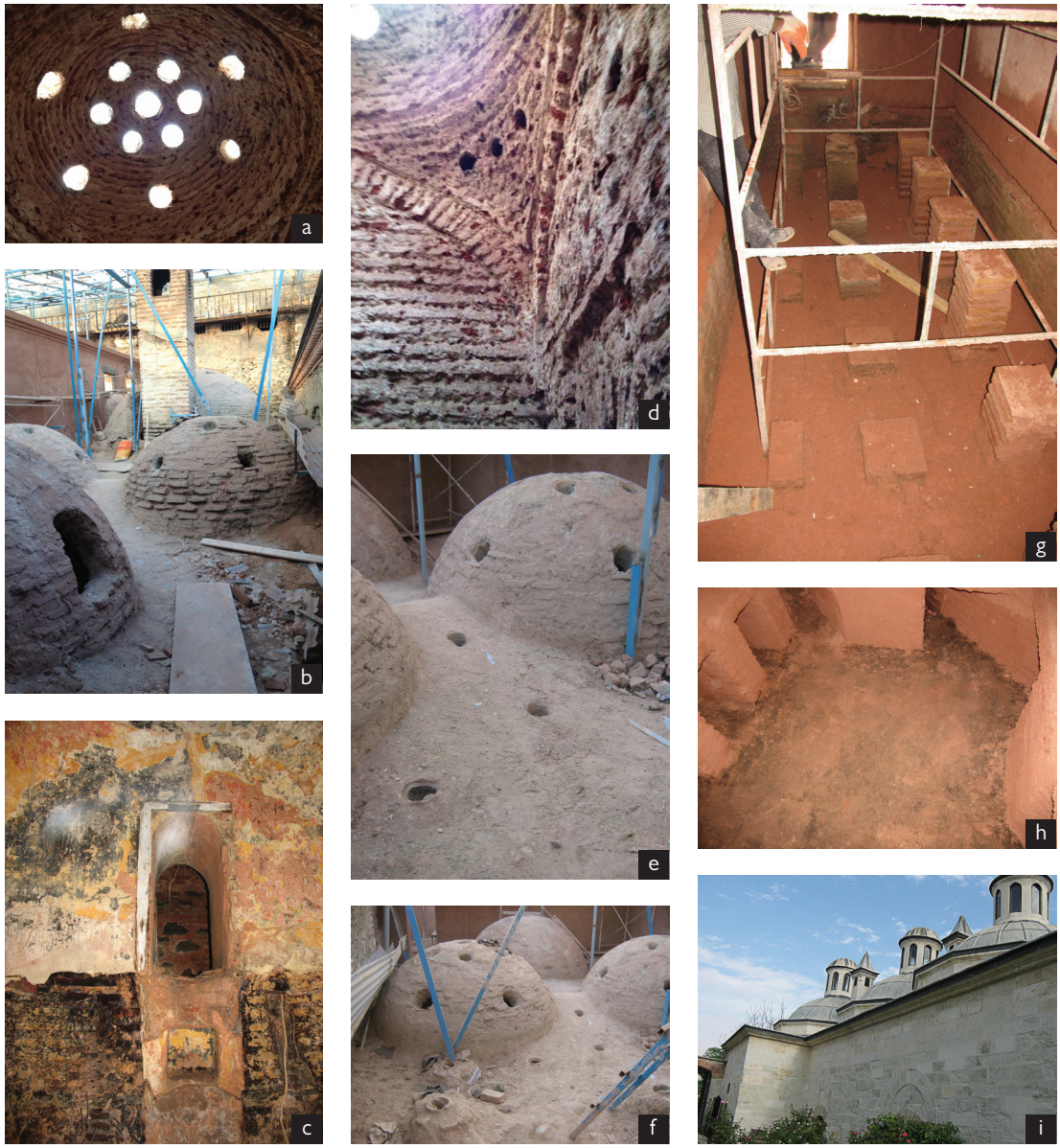


Fig. 4. The bath of the Atik Valide Hospital, Istanbul with views of its domes, including a) the oculi lighting window openings b) on the dome, c) the observation window in the heating section of the bath, d) vapor vents located in the pendentives of the bath section, e) extensions of the vapor vents at the roof level, and f) *tüteklik* pipe, g–h) hypocaust section of the bath in the Süleymaniye Hospital, Istanbul, and i) roof lanterns in II. Bayezid Hospital, Edirne.

water management system beneath the ground level of the complex was explored (Fig. 6). Two galleries with vaulted covers that were perpendicular to each other were identified; one was still intact and functioning. These galleries may have been used for the collection and discharge of groundwater and the disposal of wastewater. Another stone water channel, connected to the city sewage lines, was discovered beneath the stone floor of the *imaret* (soup kitchen) section.[58] In the Süleymaniye Complex, there were similar galleries beneath the raised floor of the mosque. These galleries are assumed to have been used for the collection of groundwater and to ventilate and cool the mosque on hot summer days.[59]

The open and semi–open resting places in the hospitals were also frequently used for the treatment of patients who were advised to get ample sunlight. These spaces, with their natural ventilation, helped to improve the air quality of the hospitals, while water sources from inner and outer pools were used for drinking water and passive cooling.[60] Listening to music was often part of the healing repertoire in several of these spaces, such as the Gevher Nesibe *Darüşşifa* and Medrese, Divriği Great Mosque and *Darüşşifa*, Anber bin Abdullah *Darüşşifa*, Fatih *Darüşşifa,* Bayezid II. *Darüşşifa,* and Süleymaniye *Darüşşifa* and medrese.[61]

The Living Heritage of *Darüşşifa*

Historic hospitals can also represent the living heritage of a local community. For example, the *mesir macunu* festivals in Manisa, which are still celebrated in Manisa's *Darüşşifa,* constitute an expression and continuation of the Ottoman cultural practices surrounding Nevruz Day.[62] The *mesir macunu* festival was inscribed in the UNESCO Representative List of the Intangible Cultural Heritage of Humanity in 2012. Every year from March 21–24, a special paste known as *mesir macunu* (which was alleged to have cured Hafsa Sultan, the mother of Sultan Süleyman) of a supposedly incurable disease, is prepared from 41 spices. During the festivities, 28 imams and apprentices distribute it in the buildings of the Hafsa Sultan Mosque Complex. It is believed that wishes for happy marriages, abundant children, and fruitful work will come true within a year.[63]

According to many of the *vakfiye* of these hospitals, there were special personnel appointed in historic hospitals to prepare different medicines[64]

58 Dişli and Özcan, "Waste and Clean Water Systems," 169–77.

59 All these architectural features constitute important aspects of TTK. For more information, see Naser Almughrabi, Josef Prijotomo, and Mohammad Faqih, "Süleymaniye Mosque: Space Construction and Technical Challenges," *IJER* 3, no. 6 (June 2015): 345–58; Feyza Aykutlu, "Şehzade ve Süleymaniye Külliyeleri'nde Su Mimarisi" (MA thesis, Fatih Sultan Mehmet Vakıf Üniversitesi, 2014); Kaygısız and Dişli, "Mimar Sinan," 750–68.

60 Dişli, "Sustainability of Historic Building Systems," 45–51.

61 Gülşen Erdal and İlknur Erbaş, "Darüşşifas Where Music Threapy Was Practiced During Anatolian Seljuks and Ottomans," *JHCAR* 2, no. 1 (March 2013): 1–20.

62 Ergün Veren, "Manisa Kültürel Belleğinde Mesir Macunu Festivali, 2018," in *Geçmişten Günümüze Manisa. Şehzade II. Mehmet ve Manisa Tarihi—Kültürü—Ekonomisi, Cilt 1*, eds. Muaffer Tepekaya and Zafer Atar (Manisa: MCBU Yayınları, 2018), 655–60.

63 UNESCO Intengible Cultural Heritage, "*Mesir Macunu* Festival," accessed December 18, 2022, https://ich.unesco.org/en/RL/mesir-macunu-festival-00642.

64 *Edviye-kub* (Süleymaniye Hospital and Edirne II. Bayezid Hospital—*edviyeci/eczacı*), *Tabbah-ı Eşribe* (Haseki Sultan, Fatih Hospital, Bursa Yıldırım Bayezid Hospital, Amasya Anber bin Abdullah Hospital, Manisa Hafsa Sultan, Süleymaniye Hospital, and Atik Valide Hospital), *aşşab* (Süleymaniye Hospital and Manisa Hafsa Sultan Hospital), *şerbetçiyan* (Bursa Yıldırım Bayezid Hospital), *şurupçu* (Manisa Hafsa Sultan), and *eczacı yamağı* (Manisa Hafsa Sultan Hospital). Gülşen Dişli, "Anadolu Selçuklu ve Osmanlı Darüşşifalarında İşlevsel Sistemlerin ve Koruma Ölçütlerinin İrdelenmesi" (PhD diss., Gazi University, 2014), 296, 303, 311, 318, 325, 332, 339, 346.











Fig. 5. a) The well in the courtyard of the Süleymaniye Hospital, Istanbul, b) waterspouts in the Anber Bin Abdullah Hospital, Amasya, c) waterspouts and pool, and d–e) terracotta pipes unearthed during the 2011 excavations in İzzeddin Keykavus Hospital, Sivas.



Fig. 6. a–c) Underground channels beneath the hospital and caravanserai of the Atik Valide Complex and d) beneath the floor of the *imaret*.

and to take care of the plants in the courtyard that were used for medicinal purposes.[65] There were also rooms in the hospitals for preparing, storing, and selling medicines (a drug house,[66] drug preparation room,[67] and drug storage room).[68] Evliya Çelebi, a seventeenth-century Ottoman traveler and chronicler, mentions the special flowers and plants grown in the courtyard of the II. Bayezid Hospital in Edirne and adds that their scent was helpful for the healing of patients.[69] According to Nemlioğlu, those flowers and plants were also used in the preparation of medicines necessary for the treatment of the patients, and she further asserts that the vast lands and gardens recorded as *akars,* from which the *darüşşifa* received some income via the *vakfiye*, might have been used for the same purpose.[70]

Building Materials and Design Features of *Darüşşifa*

In the historic *darüşşifa* of Anatolia, mostly organic materials such as stone, wood, brick, and earth were used for both construction and repairs. In most of these architectural projects, stone, the most common building material for monumental architecture at this time, was extracted from nearby quarries. There are many advantages to masonry construction. Even in extreme weather conditions, stone has proven to be resilient; stone walls allow for lateral openings for ventilation, and stone was generally quite easily procured from local quarries. Stone was also preferred as a building material because of its color, texture, and decorative qualities.[71]

Earthen roofs were frequently used in historic hospitals, as is evident in the early photographs of the Divriği Great Mosque and *Darüşşifa*, but many have been replaced with pitched roofs made from brick, lead, or stone in later restorations because of the challenges and specialized knowledge that the maintenance of earthen architecture requires (Fig. 7). Traditionally, earthen roof materials could be harvested easily from neighboring fields; these were water−resistant and contributed to insulation of heat in the winter and cooling in hot summer seasons.[72] Heating was provided by fireplaces (*ocak*) built into the patients' rooms (in Ottoman hospitals) or supplied by portable braziers. Thick stone walls and earthen roofs helped to regulate the extreme fluctuations in Anatolian temperatures during the winter and summer months.[73]

65 In the *vakfiye* of the Haseki Hospital, there was a gardener, which suggests the existence of many plants in the hospital courtyard when it was first constructed. Dişli, "Anadolu Selçuklu ve Osmanlı Darüşşifalarında," 331–32.

66 In the Anber bin Abdullah Hospital in Amasya and the Yıldırım Bayezid Hospital in Bursa, the rooms on one and sometimes two sides of the entrance portal are referred to as "drug" houses. For these three terms—drug house, drug preparation room and drug storage room—see Gönül Cantay, *Anadolu Selçuklu ve Osmanlı Darüşşifaları*, 71; Osman Çetin, İlk *Osmanlı Hastanesi Bursa Yıldırım Darüşşifası,* 36.

67 Köker describes the small, dark room located on the corridor in between the hospital and *medrese* section in the Gevher Nesibe Hospital as the space for preparing drugs that were sensitive to light. See Ahmet Hulusi Köker, "Gıyasiye ve Şifaiye Yapısının Mimarisi," in *Selçuklular Devrinde Kültür ve Medeniyet. Gevher Nesibe Sultan Adına Düzenlenen Selçuklu Gevher Nesibe Sultan Tıp Fakültesi (Tıp Mektebi) (1206) Kongresi Bildirileri (14 Mart 1991)*, ed. Ahmet Hulusi Köker (Kayseri: ERÜ Gevher Nesibe Tıp Tarihi Enstitüsü Yayınları, 1992), 17–30, 102–3.

68 Dişli, "Anadolu Selçuklu ve Osmanlı Darüşşifalarında," 32–34.

69 Kahraman and Dağlı, *Evliya Çelebi Seyahatnamesi*, 607–10.

70 Candan Nemlioğlu, "Osmanlı Dârüşşifâları'nın Bahçe Düzeni ve Tıp Bilimine Katkıları," *TDA* 183, special issue, "Prof. Dr. Oktay Aslanapa," ed. Yaşar Çoruhlu (November–December 2009): 1–19.

71 Erol Gürdal and Seden Acun Özgünler, "The Selection and Usage of the Natural Stones in the Restoration of Historical Buildings," *Restorasyon Konservasyon* 16 (2016): 27–35.

72 Ülger Bulut Karaca, "Suggestions for the Improvement of Soil-Covered Flat Roofs in Anatolian Traditional Rural Architecture," *AL* 6, no. 2 (2021): 447–58.

73 Dişli and Özcan, "An Evaluation of Heating Technology," 183–200.



Fig. 7. The earthen roof of the Divriği Great Mosque and Hospital, 1953 (Archives of Directorate General of Foundations, Department of Monuments and Construction Works, Archive of Antiquities, Ref. No.580301003-RE0010 and Ref. No.580301003-RE0034, 2007).

Apertures in the ceilings or walls of *darüşşifa* such as vents, windows, lanterns, splayed openings, chimneys of the wall fireplaces, *tütekliks* (vertical pipes inside the walls of the bathing sections), doors, and windows helped with ventilation, cooling, maintaining humidity, and creating a decay–resistant environment. Several scholars have noted that natural illumination in heritage architecture could have sensory and spiritual, as well as practical, impacts.[74] Here I address only the practical ways in which Ottoman hospitals were illuminated and ventilated, but the sensory and spiritual dimensions are also important to consider. In the courtyards of the hospitals' first–floor windows, upper windows (arched, flat, splayed, *içlik/dışlık*[75]), ceiling holes/oculi, and lanterns were frequently used. There were special ventilation and illumination solutions, such as the pipes in the wards which brough light for the mental patients in the Süleymaniye Hospital in Istanbul and the ventilation lantern located in the central part of the dome in the patients' quarters in the II Bayezid Hospital in Edirne.[76] In the Divriği Great Mosque and Hospital, there is a special ventilation feature in the conical dome in front of the *mihrab* which has a star–shaped interior design and an oval aperture at the roof level (Fig. 8).

Traditional artisan and craftsmanship skills, such as masonry techniques, ornamentation, tile works, and carpentry, used in historic *darüşşifa* also represent important contributions of TKS. For instance, the Divriği Great Mosque and *Darüşşifa*, inscribed on the UNESCO World Heritage List in 1985, represents a unique example of hospital architecture, with its exuberant stone decorations and stonemason marks. Gevher Nesibe Hospital and *medrese*, the Amber bin Abdullah Hospital, and the Sivas Izzeddin Keykavus Hospital exhibit unique examples of hospital architecture, with their entrance portals which have elaborate stone decorations (Fig. 9).

Circular Economy Strategies in Anatolian *Darüşşifa*

From an environmental and economic perspective, if these buildings can be used in ways which preserve their cultural, architectural, and technological values and the TKS which helped to create them, they have the potential to reduce waste and serve as examples of sustainable resource usage, thereby mitigating some of the negative impacts of climate change. Thanks to their long–lasting life cycles and potential for adaptive reuse, the need to extract new materials from the environment is decreased, and the original design features that supported natural ventilation, lighting, and drainage result in reduced energy consumption.

The renovation and adaptive reuse of historic *darüşşifa* also have the potential to create new job opportunities, because they often require more labor–intensive work compared to new constructions, and their new functions create income–generating possibilities for local communities. Depending on the type of labor required, the restoration of *darüşşifa* can increase the need for workers who have expertise in traditional building techniques and skills; this support of traditional labor markets can often enhance tourism. A historic *darüşşifa* restoration project can, therefore, help to develop a "spirit of place" while nurturing social networks and relationships that contribute to economic security in a local commu-

74 Nina Ergin, Bissera Pentcheva, and Emine Fetvacı, "Music, Light and Flowers: The Changing Aesthetics of Ottoman Architecture," *J. Turk. Stud.* 32, no. 1 (2000): 221–40; Nina Ergin, "The Fragrance of the Divine: Ottoman Incense Burners in their Context," *The Art Bulletin* 94 (1996): 70–97; Nina Ergin, "The Soundscapes of Sixteenth-Century Istanbul Mosques: Architecture and Qur'an Recital," *JSAH* 67, no. 2 (2008): 204–21; Bissera V. Pentcheva, "Hagia Sophia and Multisensory Aesthetics," *Gesta* 50, no. 2 (2011): 93–111.

75 A *dışlık* is a barred window, usually arched and made of plaster, located on the outside of main masonry walls. An *içlik*, also known as a *revzen*, is a plaster window with lattice glass facing the interior of the building.

76 Dişli, "Analysis of Ancient Ventilation and Illumination Practices," 174–85.



Fig. 8. a) The ceiling of the Anber bin Abdullah Hospital, Amasya, b–c) splayed opening and ceiling opening in the Gevher Nesibe Hospital and Medrese, Kayseri, and d–e) detail of ventilation window in Divriği Great Mosque and Hospital.

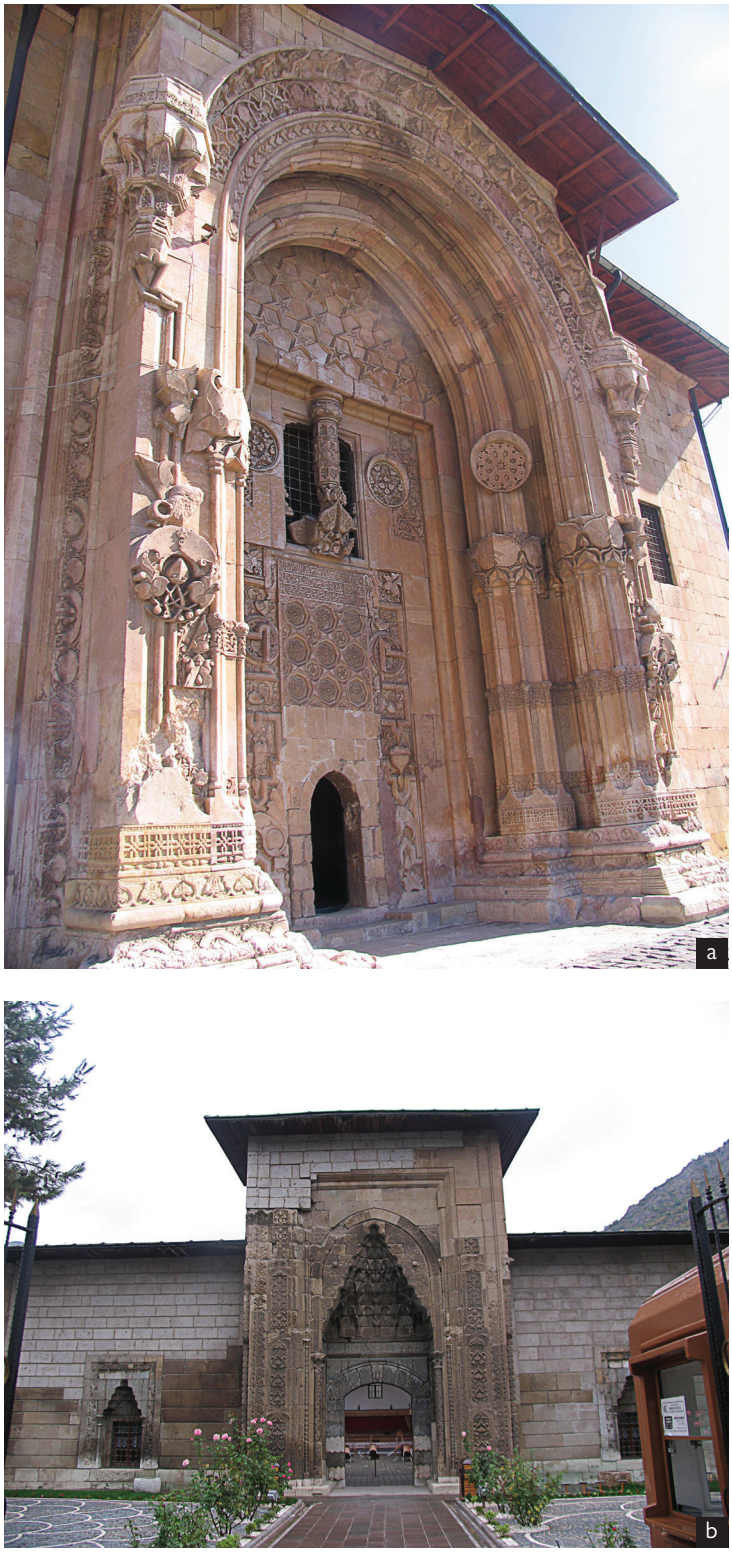


Fig. 9. Entrance portals of a) the Divriği Great Mosque and Hospital and b) the Amasya, Anber bin Abdullah Hospital.

nity.[77] For instance, the aforementioned *mesir macunu* festival is an important example of intangible heritage, and the location of this festival at the Manisa Hafsa Sultan Hospital has contributed to the social cohesion of the local community.[78] Another example, the Izzeddin Keykavus Hospital in Sivas, now functions as a café and has created new jobs for the local community since its restoration.[79] Due to the specific needs of the local community, the building was transformed into a café instead of a hospital; in this case, the adaptive reuse extended the life of this heritage building and added value to the community by generating employment opportunities while reducing its carbon footprint by avoiding demolition waste and decreasing the need to consume new materials.[80]

The Amber bin Abdullah Hospital in Amasya has been repurposed as a museum and has become a tourist attraction, enhancing the economic development of the region. The restoration of the Atik Valide Hospital in Istanbul has transformed a community by improving the safety of the neighborhood, which had become a center of illegal drug use.[81] The former hospital building has now been repurposed and is used as a university building[82] (Fig. 10). During the restoration of historic *darüşşifa*, the revival of traditional skills, practices, and local building and craft techniques, such as traditional masonry, tile, and woodworking, becomes possible and can open multiple ways to support a circular economy.

Conclusion

This chapter highlights existing literature about the architecture of healthcare in Anatolia during the Seljuk and Ottoman eras and analyses these buildings as part of the TKS of historic *darüşşifa* of Anatolia. It also explores these structures within the context of the circular economy. For this purpose, the literature on the circular economy and heritage buildings, as well as TKS, was reviewed. The potential for more climate–friendly restoration projects and the reuse of historic *darüşşifa* in ways which are environmentally sustainable were assessed with examples drawn from the author's field surveys. This approach to conservation and adaptive reuse is intended as a catalyst to develop creative technologies for contemporary construction systems while incorporating holistic and traditional building techniques and reusage strategies for *darüşşifa*.

Historic *darüşşifa* of Anatolia and Thrace, their TKS, and adaptive reuse partake in three

77 Historic England, "Heritage and the Economy 2020," https://historicengland.org.uk/content/heritage-counts/pub/2020/heritage-and-the-economy-2020/, 30, accessed April 9, 2025. For "spirit of place," see Quebec Declaration at https://www.icomos.org.tr/Dosyalar/ICOMOSTR_en0931825001587380615.pdf, accessed Nov. 17, 2025.

78 After being assigned to Celal Bayar University in 1996, it was opened as the Museum of the History of Medicine on November 30, 2013. The venue of the *mesir macunu* festival is the Sultan Mosque Complex, where traditional knowledge and skills related to the festival have been passed on and cultivated for centuries. For more information, see Manisa İl Kültür ve Turizm Müdürlüğü, "Şifa Şehri," https://manisa.ktb.gov.tr/TR-151860/sifa-sehri.html, accessed February 5, 2025.

79 The last restoration of the hospital was completed in 2012, and in 2013, it was approved for use as a café by the Sivas Monument Protection Authority. For more information, see Elif Yiğiter and Osman Kunduracı, "Sivas Izzeddin Keykavus Hospital (Darüşşifa) Restoration Interventions," *SEFAD* 49 (2023): 111–40.

80 Historic England, "Heritage and The Economy," 13.

81 Before the restoration of the hospital and its transformation into a university faculty building, it housed people who used illegal drugs. This information comes from an oral interview with the building's security guard conducted during field research in 2014.

82 After its restoration, it was assigned to Fatih Sultan Mehmet University's Faculty of Humanities and Social Sciences. During the restoration, the colonnades in the inner courtyard of the hospital were covered with glass and the interior walls were redesigned, which impaired the authenticity of the building. For more information, see Ahmet Sever and İzzettin Kutlu, "Geçmişten Günümüze Başı Beladan Kurtulamayan Mimar Sinan'ın Son Eseri: Valide-i Atik Külliyesi," *Prof. Dr. Gönül Tankut Anısına Sempozyum Koruma Geçmiş, Bugün, Gelecek Arasındaki Diyalog*, Poster Presentation, 26–29 October 2017, Ankara.



Fig. 10. a) I. İzzeddin Keykavus Hospital-café, Sivas, b) Anber bin Abdullah Hospital-museum, Amasya, c) Yıldırım Bayezid Hospital, eye treatment center, Bursa, and d) II. Bayezid Hospital-museum, Edirne.

spheres of sustainability: cultural, economic, and ecological. They have the potential to contribute to the circular economy by reducing waste and carbon footprints and mitigating the damage caused to the environment by climate change. Following a program of adaptive reuse, these *darüşşifa* buildings of Anatolia and Thrace can help to regenerate the urban fabric of the communities where they are located, create new job opportunities (both after their restoration and during the repair works), and preserve the character–defining features of the neighborhoods, along with much of the original fabric of historic *darüşşifa* architecture. Evaluating historic buildings with reference to the circular economy constitutes a way of thinking about restoration which can help improve sustainability and mitigate the negative effects of climate change.

During the construction of new hospitals in Türkiye, architects and designers are well advised to learn lessons from the solutions used in many of the historic hospitals of Anatolia and Thrace, from the well–lit courtyards, natural ventilation, and water circulation to the various connections these buildings have with their natural surroundings. As Murphy[83] suggests, we need to rethink contemporary hospitals by considering earlier solutions. In addition, as stated in the United Nations 17 Sustainable Development Goals and in Horizon 2020,[84] such an approach should be a stimulus for lower energy consumption and help us to more effectively combat the negative effects of climate change.

83 Murphy, *The Architecture of Health*, 12.

84 Horizon 2020, "Cultural Heritage," accessed December 21, 2022, https://www.reach-culture.eu/wp-content/uploads/2019/03/Horizon-2020-cultural-heritage-synopsis-2018.pdf, 156.