

Beiträge zur Islamischen Kunst und Archäologie

Bd. 5





# Beiträge zur Islamischen Kunst und Archäologie

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## Band 5

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Markus Ritter und Ilse Sturkenboom  
mit Fernando Valdéz Fernández

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## The Norm of *Mādī*: Managing Water in Safavid Isfahan

*Safa Mahmoudian and Mehrdad Qayyoomi Bidhendi*

*Abstract:* The city of Safavid Isfahan can be understood from many different points of view, one of which is its urban water system. The water system in Safavid Isfahan has both material and non-material aspects: firstly, there is the constructed system of *mādīs* (streams) and water distribution in the city; secondly there is the water supply, its management, and the laws and their consequences. In this article, we consider the most important issues surrounding both aspects on the basis of Safavid histories, travelogues, and a document on water distribution from the Zāyanda-Rūd attributed to Shaikh Bahā'ī. We begin by introducing the document, then the *mādī* system, and the city's share of each *mādī*'s water. The last part of the article deals with some non-material issues such as the social status of water bailiffs (*mīrābs*), water laws, and economic aspects of the water supply in Safavid Isfahan.

All over the world human settlements depend on water, but in an arid land like Iran water resources are a vital factor in the formation and survival of a city. For this reason the river Zāyanda-Rūd, the most important river in central Iran, has attracted inhabitants for thousands of years and, according to scholars, nourished settlements even before the arrival of Arian tribes.<sup>1</sup> The Seljuq ruler Ṭughril Beg conquered Isfahan in 442/1051 and chose it as his capital city.<sup>2</sup> Even after the Seljuq period, Isfahan remained a point of interest for dynasts. In the mid-tenth/sixteenth century, Shāh Ṭahmāsp I, the second Safavid ruler (r. 930–984/1524–1576), turned his attention to Isfahan and tried to revitalize its vital vein, the Zāyanda-Rūd, by digging a tunnel between Kārūn river (in the Zagros mountains) and this river.<sup>3</sup> In 1006/1597, more than five centuries after Ṭughril, Shāh 'Abbās I Safavid (r. 996–1038/1588–1629) chose Isfahan as his capital. In order to make Isfahan a true capital city, Shāh 'Abbās succeeded in executing his ambitious construction plan in three decades.<sup>4</sup> Indeed, an important part of his plan was related to the water system. It was necessary to organize the city in matters of water supply and water management, whether for urban or agricultural use, in a way that would be compatible with the increase in population, the extraordinary growth of the city, and Shah 'Abbās I's vision and authority.

Already many centuries before the Safavids, water canals (*mādīs*) had been flowing through the city of Isfahan and transferring water from the Zāyanda-Rūd to the lands in the region of Isfahan. In rebuilding Isfahan as the new capital during the reign of Shāh 'Abbās I, water canals were essential: new parts of the city were built along these canals; new water canals were dug in order to transport water from the Zāyanda-Rūd to the royal complex and royal gardens; and various buildings were erected along the canals in different parts of the city. In some buildings such as madrasas and caravanserais, water passed through the building

1 Kulsnikuf 2010, 188.

2 Lockhart 1960, 20.

3 Ibid.

4 Brignoli 2006, 7.

itself; in others, such as mosques, water passed nearby or under the building; others, such as watermills or paper mills, were built nearby canals to take advantage of water-power.

Numerous gardens built in Isfahan during the Safavid period transformed it into a garden city.<sup>5</sup> In the Safavid period, water was required not only to water these gardens, but also for ornamental purposes. Safavid chronicles and travelogues contain descriptions of gardens in Isfahan that offer a glimpse into the grandeur of their elaborate waterworks, including water channels, variously formed fountains, basins, and waterfalls.

Beside all its beauty, that such a large amount of water was used in Safavid Isfahan begs the question of how this water was supplied and managed for these urban purposes. Did these idyllic waterworks in urban spaces and gardens always have water or just at special times?

In 1938, Ann K. S. Lambton introduced a document on the distribution of water from the Zāyanda-Rūd, popularly known as the Shaikh Bahā'ī Scroll.<sup>6</sup> Since then, many studies based on this document have considered the regulation of the Zāyanda-Rūd's water;<sup>7</sup> however, these studies do not examine the water management system inside the city of Safavid Isfahan. In this article, we will investigate this issue by drawing upon Safavid-era travelogues and chronicles, and the water distribution document for the Zāyanda-Rūd.<sup>8</sup>

### *Water distribution from the Zāyanda-Rūd*

Although extant examples of Safavid constructions in Isfahan are of high value, the surviving remnants are trivial in comparison with the original layout of the city. What remains from other examples of Safavid urbanity in Tabriz, Qazvin, and Herat is hardly enough to complete our vision of Safavid Isfahan.<sup>9</sup> Likewise, not much can be extracted from the histories of the Safavid period regarding its water systems. The same holds true in regard to pertinent documents from that time as well: surely, many documents would have been prepared for such a great project; of them only a few are known.<sup>10</sup> Due to the scarcity or lack of evidence related to Isfahan's water system, resorting to information and records about water distribution from the Zāyanda-Rūd is inevitable.

A system of water distribution from the Zāyanda-Rūd had existed long before the Safavid period.<sup>11</sup> Ibn Rusta, geographer of the late third/ninth and tenth centuries, has attributed the Zāyanda-Rūd's water distribution system to Ardashīr Bābakān, the first Sasanian king:

[...] they distribute according to the division made by Kīsrā Ardashīr ibn Bābak; and he had determined a specific share with a specific time, letting the stream flow in certain proportions to each village; so that everyone would take his share justly.<sup>12</sup>

5 Alemi 2007, 133.

6 For the first time the complete version of the document was printed in the newspaper of *Rāh-i Nijāt-i Isfahān* in 1928.

7 Varahrām 1990; Maḥmūdīyān 1969; Ḥusainī Abarī 1998; Ḥusainī Abarī 2000; Mihriyār 2000.

8 This and related questions are examined focussing on the Fadan *mādī* in Maḥmūdīyān 2017.

9 Brignoli 2006, 8.

10 McChesney 1988, 103.

11 Ḥusainī Abarī 2000, 80–85.

12 Ibn Rusta 1968, 183. Unless otherwise noted all translations from Persian are the authors'.



Written documents concerning such distributions probably existed as well; but of all possible documents throughout the centuries, the oldest available distribution record is the one attributed to Shaikh Bahā'ī (953–1031/1546–1622).<sup>13</sup>

A mistake in artificially dating this document (which bears the date 923/1517 and a decree of Shāh Tahmāsp, who did not ascend the throne until 930/1524) and the Qajar expressions used in it<sup>14</sup> show that this document was written during the Qajar period, and that it was probably attributed to Shaikh Bahā'ī in order to reinforce the authority of its content.<sup>15</sup> A couple possibilities have been presented in this regard: first, this document may have been extracted from an older document and modified for the specific needs of the Qajar time;<sup>16</sup> second, the content of the document may have been the spoken command of the Shaikh which was orally transferred and written down only during the Qajar period.<sup>17</sup> As it mentions older traditions and their continuation,<sup>18</sup> and given the fact that in every region the fundamental principles of a water system changed quite slowly before the modern time,<sup>19</sup> this document can help us to understand the general aspects of water distribution from the Zāyanda-Rūd during the Safavid Period.

Two similar Qajar copies of this document are available: one in the National Library and Archives Organization of Iran (NLAI); the other in the Majlis Library, Tehran.<sup>20</sup> Ḥusainī Abarī (2000) has studied the text of the document and published it in its entirety, which was the version used for this article.

The document consists of 27 pages: one page for the Shāh's decree and an explanation of how calculations in the document have been made; two pages for the general executive rules; and 24 pages for details of the water rights of different districts and villages in the vicinity of the river. These 24 pages describe: 1) the 33 shares allocated to the lands along the river from Kalla Bridge to the vicinity of Gāv-Khūnī Marsh (Gāvkhānī Lake); 2) the distribution of these 33 shares among the *mādīs* of the districts; 3) the distribution of the districts' shares and their transfer from *mādīs* to the streams; and 4) the distribution of the stream-water among village farms according to their annual agricultural production rate.<sup>21</sup> During the cold season this allocated water could be used freely, but in the warm season, for a period beginning 75 days after the Persian year (roughly 2 June)<sup>22</sup> and lasting for 165 days, water was to be obtained exactly in accordance with the measure mentioned in the document.<sup>23</sup> As we shall see, this order was not implemented exclusively for farmlands; the water rights inside the city of Isfahan were also included.

13 Ḥusainī Abarī 1999, 103; Varahrām 1990, 133.

14 Lambton 1938, 663; Ḥusainī Abarī 2000, 85–88.

15 Ḥusainī Abarī 1999, 103–104.

16 Ḥusainī Abarī 2000, 87.

17 Varahrām 1990, 133, footnote.

18 Ḥusainī Abarī 2000, 66.

19 It has even been hypothesized that the water distribution system from the Zayānda-Rūd that was in use during the Safavid and Qajar periods had directly evolved from the system used during the Sasanian period. See Ḥusainī Abarī 1998, 101.

20 Ḥusainī Abarī 1999, 118, footnote.

21 Ibid., 104.

22 Lambton 1983, 664–665, has mentioned the beginning of this period as 4 June.

23 Ḥusainī Abarī 1999, 104.

*The network of water canals (mādīs) and city water rights*

There is no exact account of the number of *mādīs* that passed through Safavid Isfahan. This is due on the one hand to the fact that the city's boundaries during the Safavid period have not yet been exactly identified, and on the other, modifications from the Qajar period were also included in the aforementioned water distribution document. Therefore, it is possible that some *mādīs* could have been destroyed between the Safavid and Qajar periods and are not named in the document. However, from the water distribution document and Jalāl Munajjim, an early eleventh/seventeenth century chronicler who mentions water canals in the newly built Safavid district, 'Abbās Ābād,<sup>24</sup> we know that in the Safavid period at least three *mādīs* – Fadan, Farshādī, and Nīyāşarm – passed through the city of Isfahan (Fig. 1).<sup>25</sup> At this time, some water canals were also dug for the irrigation of the royal gardens, one of which was Jūy-Shāh (king's water canal). Among the *mādīs* that passed through, the city had water rights just from two, Fadan and Farshādī (which received its share of the water right for the city from the Fadan *mādī*). The other *mādī*, Nīyāşarm, passed by the city and flowed into the farmlands nearby.<sup>26</sup> From the two *mādīs* Fadan and Farshādī, separate streams, rushes, and gutters spread into the city creating a widespread water network. This network covered a large area of the city: as Taḥvīldār reports in the Qajar period, three-fourths of the city used water from the Zāyanda-Rūd.<sup>27</sup> The descriptions of European visitors during the Safavid period also indicate that much water flowed in most of the city's pathways; for example, the French traveler Jean Baptiste Tavernier writes:

On rencontre aussi en même temps dans les rues de petites fosses au pied des murailles, où les persans n'ont point de honte de s'accroupir sur les talons pour pisser dedans en presence de tout le monde. Comme il y a en bien des endroits quelque petite eau courante, ils en prennent dans la main et se lavent en même temps la partie que la pudeur nous défend de nommer.<sup>28</sup>

The system of water distribution that drew from the river and its *mādīs* in the warm seasons also included the city water network. The water in these networks did not flow continuously, but as the German traveler Engelbert Kaempfer mentions only at specific times and on designated days, or else once a week, with extreme prudence.<sup>29</sup>

According to the so-called Shaikh Bahā'ī Scroll, during times of water shortage and when it was needed for farming,<sup>30</sup> water flowed among the *mādī* networks systematically and at specific times. In his description of Julfā district in Isfahan, the French traveler Jean Chardin (1643–1713) also mentions such a water regulation during the summer: "L'eau court l'hiver dans toutes les rues de ce bourg nuit et jour, mais pendant l'été l'eau y pass seulement

24 Munajjim Yazdī 1987, 413.

25 The water distribution document mentions another *mādī*, called Chalpās-i Nīyāşarm, which was destroyed or, to quote the document, was "washed away" (Ḥusainī Abarī 2000, 85, 88), while the document was being written.

26 Shaikh Bahā'ī Scroll, in Ḥusainī Abarī 2000, 124–142.

27 Taḥvīldār 1963, 16.

28 Tavernier 1681, 355.

29 Kaempfer 1977, 195.

30 This comprised two regular fifteen-day periods, from 14 to 31 Khurdād in the Persian calendar (approximately 3 June to 20 June) and from 14 to 30 Ābān (approximately 4 November to 20 November 20). During this time, water was allocated to the two villages of Rūdashṭīn and Barā'ān. From 21 June 21 to 9 October water was shared among the towns. Lambton 1938, 664–666.

quelques jours de la semaine.”<sup>31</sup> The same water regulation was probably observed in the other parts of the city, but the important question is whether the royal gardens in *Dawlat-Khāna* (the royal complex) and the Chāhār-Bāgh promenade, which was watered by the king’s water canal, Jūy-Shāh,<sup>32</sup> also followed this general rule. Do the descriptions of the elaborate water works in the Chāhār-Bāgh promenade, royal gardens, and Naqsh-i Jahān square all record the specific times when water policies allowed it?

According to the water distribution document, 24 water shares were allocated to the *mādī-i shāh-i kabīr* (“the canal of the great king”, to be interpreted as the Jūy-Shāh). However, this share was probably exempt from the river’s usual shares because it is mentioned that, “one share of it does not belong to the river’s shares and is allocated after the general share distributions have taken place”. Moreover, by calculating all the water shares of the *mādīs* of the relevant district (Mārbīn), it seems that the share of Jūy-Shāh has not been counted in the total of water shares, and as mentioned in the document, its share has been probably separate from other water shares of the river. In that case, what does the allocation of 24 water shares to this stream mean? Apart from the aforementioned water share, according to the document, “a *ḥalāl* [religiously permissible] water thread from the *qanāt* reconstructed by the late Mu‘tamid al-Dawla was also added to the Jūy-Shāh water.” Mu‘tamid al-Dawla is a Qajar title.<sup>33</sup> Therefore, this part of the document’s text might have been the result of a misrepresentation in Qajar time, yet the word “reconstruct” does imply that the aforementioned thread of the *qanāt*, or underground channel, had existed previously.

Therefore, we can conclude that the Jūy-Shāh, of which “one share of its water does not belong to the river’s shares” and the *qanāt* thread that was added to it, unlike the other *mādīs*, always carried water. However, Tavernier’s (1605–1689) description of the unpleasant situation of the stream of Naqsh-i Jahān square indicates the opposite: “Le canal où beaucoup de pierres viennent à manquer, n’est pas toujours aussi bien rempli d’eau, & celle qui y croupit en esté rend une puanteur fort incommode.”<sup>34</sup>

Tavernier was in Isfahan during the reign of Shāh ‘Abbās II (1052–1077/1645–1666) and Shāh Sulaimān (1077–1105/1666–1694). His reports about the broken borders of the stream inside Naqsh-i Jahān square are probably related to the time of relative turmoil in Isfahan during the reign of Shāh Sulaimān. The water canal in Naqsh-i Jahān square was a continuation of the Jūy-Shāh canal. In Tavernier’s writing it is implied that during the reign of Shāh Sulaimān, the Jūy-Shāh did not have a continual flow of water in summers, similar to all the other *mādīs*; however, this might not have been the case during the reigns of Shāh ‘Abbās I, Shāh Ṣafī, and Shāh ‘Abbās II. Nevertheless, further research on Jūy-Shāh is necessary to provide a more thorough assessment.

Other water canal networks in Isfahan did not convey water at specific times; yet it was very important that any water shortage in the city did not last for too long. To this end, during the second fifteen-day period when the river’s water was allocated to the district of

31 Chardin 1811b, 8:103.

32 Shaikh Bahā’ī Scroll, in Ḥusainī Abarī 2000, 126.

33 Ḥusainī Abarī 2000, 87.

34 Tavernier 1681, 359.

Rūdasthīn,<sup>35</sup> it is recorded in the water distribution document that “because the Fidā [Fadan]<sup>36</sup> *mādī* flows into the town, three quarters of a *sang*<sup>37</sup> (stone) of water is let into it”.<sup>38</sup>

Water issues in the city were so important that the ruler himself would sometimes intervene. For instance, according to Jalāl Munajjim when the city was short of water in 1020/1611, Shāh ‘Abbās I remitted on his benefits from his own rice harvesting lands in Linjān and Alinjān, to the southwest of Isfahan, and ordered that the water be redirected from those places to the city:

A petition has been sent from Isfahan stating that the lack of water has led to the destruction of the gardens in the city and its surroundings, also aggravating the situation for the elderly and needy people; there is fear of their dispersion. His Majesty wrote a decree stating that since the towns of Linjān and Alinjān are rice-harvesting and that they belong to his Noble Highness, he had passed on his beneficial right; they can take its water to the city and consume it.<sup>39</sup>

Jalāl Munajjim continues that, nevertheless, “three hours after this decree was read in Isfahan’s Friday Mosque, rain poured for three days in a way that people’s pathways were blocked and there was no need to bring water [to] the city”.<sup>40</sup>

Three factors were important in the city’s water system that the water bailiffs (*mīrābs*) and their assistants had to be aware of: the water network, the water quantity, and the timing of the water. According to the French travelers Tavernier and Chardin, who both lived in Isfahan, each for a decade about the same time, water was provided to the quarters once a week. Every house and garden had a special right to water, which was supplied from the larger streams flowing nearby.<sup>41</sup> On the appointed day, everyone opened the canal of his garden to let the water in: “l’eau ne manque point d’être envoyée au jou nommé.”<sup>42</sup>

Cheating in the use of water could lead to serious punishment, as Chardin mentions:

Comme on arrose tout un canton à-la-fois, il n’y auroit rien de plus aisé que de faire entrer plus d’eau dans son jardin, et de la détourner du jardin d’un autre; mais c’est ce qui fait aussi que cette sorte de fraude est fort défendue, et que le crime de l’avoir commise est sévèrement puni.<sup>43</sup>

Managing water rights fell under the authority of the water bailiffs. If the water bailiff allowed water to be distributed to a piece of land, its owner had the right to dig a stream to transfer the water. The bailiff could easily increase that stream’s water supply, decrease it, or block it altogether.<sup>44</sup>

35 All upper *mādīs* were “blocked” for ten days “and then for five days they open[ed] the *mādīs* and let a little water through,” so that water could flow only to this district; Lambton 1983, 668.

36 In the Shaikh Bahā’ī document, “*fidā*” is used throughout instead of “*fadan*.”

37 “In Isfahan 1 *sang* of water is calculated as the amount of water that irrigates 1 *jarīb* (1,495 sq. yds.) of land in 1 hour.” Lambton 1991, 408. According to Ḥusainī Abarī, one *sang* (stone) for measuring the amount of water is defined as “the opening of the water pipe or anything similar with the width of a 25 x 25 cm brick that was commonly used in the division of water from the Zayānda-Rūd before the use of *lat*. The installation method was to set it in a way that the outgoing water would be able to move a millstone, around 14 to 16 liters of water per second.” Ḥusainī Abarī 2000, 308.

38 Lambton 1983, 668.

39 Munajjim Yazdī 1987, 429.

40 Ibid.

41 Tavernier 1681, 359.

42 Chardin 1811a, 99.

43 Ibid. See also: Tavernier 1681, 359.

44 Kaempfer 1977, 110.

*The status of the water bailiffs and their thorough supervision of water distribution*

The importance of the water system in the organization of Iranian cities was such that water bailiff was long known as one of the highest ranking state jobs; for example, Iṣṭakhrī (244–328/858–940) noted that, “this river [Murghāb] has a water bailiff whose reverence is more than that of the governor”.<sup>45</sup> Kaempfer (1651–1716) recorded 21 state job holders who had the right to sit by the king in the Safavid court, with the city’s water bailiff occupying the 12th position.<sup>46</sup> Regardless of whether Kaempfer might have mistaken the order of the occupations, it is perfectly clear that water bailiff was a high-ranking occupation in the Safavid court. Tavernier introduced this job as one of the best state jobs regarding status and payment, and compared it with the Superintendent of Waters and Forests in France.<sup>47</sup> Chardin describes the role of a water bailiff as follows:

Pour mieux entendre cette distribution d’eau, il faut savoir que chaque province a un officier établi sur les eaux de la province, qu’on appelle *mirab*, c’est-à-dire, Prince de l’eau, qui règle cette distribution par-tout, avec grande exactitude, ayant toujours ses gens aux courants des ruisseaux pour les faire aller de canton en canton, et de champ en champ, selon ses ordres.<sup>48</sup>

As Chardin writes, at the time of water distribution, the water bailiff regulates and distributes water with the help of his “men”. The hierarchy of these assistants was as follows: head of the *mādī* (*mādī sālār*), head guard (*sar kishīk*), guard or herald (*kishīk* or *qāsīd*), and head of the stream (*sar jūy*).<sup>49</sup> Some of these jobs were annual, some fulltime, and others were limited to the certain time of water distribution.<sup>50</sup> Beside these people, the alderman (*kadkhudā*) would also come to the place so that the level of “its brine [*shūrāba*]<sup>51</sup> [could be] marked by the water bailiff and given to the alderman, the *mādī* head and the herald.”<sup>52</sup>

The person appointed water bailiff had to be a trustworthy, reliable, and accountable individual. Vahīd Qazvīnī, a chronicler of the eleventh and twelfth/seventeenth century, attests this by mentioning that the water bailiff of the capital Isfahan, Alī Beg, was also once the commander-in-chief of Khurasan province.<sup>53</sup> The water bailiff’s office was so important that his mistakes would hardly be forgiven – to the extent that a blunder made by ‘Alī Beg in Khurasan’s commandership led to his removal from the position of Isfahan’s water bailiff.<sup>54</sup> The water bailiff might even have risked his life in making a mistake. As Chardin attests:

L’an 1676, c’étoit contre le mirab, ou prince des eaux. Un canton à sept lieues d’Ispahan, lui avoit donné neuf mille livres pour avoir de l’eau dix jours de suite, mais il ne leur en avoit fourni qu’un jour durant. Les paysans vinrent demander justice, portant des branches d’arbres à la main. C’étoit pour fair voir qu’en effet tout mouroit faute d’eau. Le mirab fut mis à l’amende. Un autre roi l’auroit fait mourir.<sup>55</sup>

45 Iṣṭakhrī, 1968, 207.

46 Kaempfer 1977, 110.

47 Tavernier 1681, 530.

48 Chardin 1811a, 99–100.

49 Ḥusainī Abarī 1999, 105–106; Lambton 1983, 672–673.

50 Ibid., 109.

51 “Water which trickles through the head of a *mādī* which is blocked.” Lambton 1983, 672.

52 Shaikh Bahā’ī Scroll, in Ḥusainī Abarī 2000, Appendix.

53 Vahīd Qazvīnī 2004, 610.

54 Ibid., 641.

55 Chardin 1811a, 281–282.

The year 1676 was during the time of Shāh Sulaimān's reign. It was a time of such recession and desolation that, according to Chardin, in a short twelve-year span between the reigns of Shāh 'Abbās II and Shāh Sulaimān, it was as if the country's wealth had shrunk to half.<sup>56</sup> The waning of the Safavids progressed along with, or was followed by, the propagation of corruption in the water system management. According to Chardin, this was probably the reason why the life of the water bailiff was spared; if the bailiff had committed the same fault during the reign of the previous ruler, he would have been killed.

Outre ce droit de vingt sols par girib, il y a les présens ordinaires et extraorinaires qu'il faut faire au *mirab*. Per exemple, lorsqu'on manque d'eau, il faut s'en aller plaindre à lui, et il répond d'ordinaire qu'il n'y a point d'eau dans le pays; mais dès qu'on lui fait un présent chose qu'on ne manque pes de faire, pour ne pas perdre les fruits et la moisson, on est sûr d'avoir de l'eau suffisamment.<sup>57</sup>

Writings by other travelers during the reign of Shāh Sulaimān testify to expanded oppression but also corruption among water bailiffs. For instance, Kaempfer mentions that since the product of a section of land depends on the amount of water it is given, the water bailiffs and their assistants usually took huge bribes from the peasants; in other words, the peasants would try to outdo each other in giving bribes.<sup>58</sup>

However, being a water bailiff was a very profitable office. As Tavernier states: "celui d'Ispahan, par exemple, tire de sa charge quatre mille tomans par an, qui sont soixante mille écus, sans ce que ses subdélégués amassent pour eux."<sup>59</sup> Apart from being extremely profitable for the water bailiff himself, this corruption brought much profit for the king as well; according to Tavernier, applicants for the position had to lavish the king with invaluable gifts.<sup>60</sup>

### *Selling Water*

According to Islamic jurisprudence, water that can be gained naturally, such as sea water and water from natural rivers and springs, cannot be owned; but water that has been gained through hardship or that has been made to flow, such as through a *qanāt* or a water canal which someone has dug, can be owned.<sup>61</sup> In Isfahan, water from river branches that flowed through *mādīs* and rushes became private property and, for this reason, their owners were to pay tax.<sup>62</sup> Most of the *mādī* water belonged to the king, and the money collected in selling them was one of his main sources of revenue. However, *mādīs* could also be privately owned, as is attested in some surviving Safavid deeds of pious endowment (*waqfiyya*). These deeds endow gardens and buildings, including their right to receive water from a *mādī*, their water channels, and their water shares. Moreover, in some cases, the revenue from selling water was endowed for the upkeep of a madrasa.<sup>63</sup>

56 Ibid. 1811b, 3: 292.

57 Chardin 1811a, 101.

58 Kaempfer 1977, 110.

59 Chardin 1811a, 100.

60 Tavernier 1681, 369.

61 Khumaini 1989, 4: 383.

62 Chardin 1811, 100–101.

63 Kaempfer 1977, 149.



As mentioned, Fadan *mādī* supplied the city's water. This share of water was spread throughout the city by two *mādīs*, Fadan itself and Farshadī, and their subdivisions. The Qajar author Muḥammad-Mahdī Iṣfahānī described Fadan *mādī* as follows:

The fourth stream is known as Fadayn [= Fadan]. Since some Safavid sultans had sacrificed a branch of it by their own selves and had dedicated most of it to the city, it became famous as the *Fidā* (sacrificing) stream.<sup>64</sup>

From Iṣfahānī's statement we can interpret that, first, the water of Fadan was dedicated to the city by the Safavids, and before them not much water from this *mādī* was consumed by the city. Second, Fadan *mādī*'s shares had been dedicated to the city. In this case, this share of water could not have been sold; however, some travelogues, including Tavernier's, mention selling the *mādī*'s water:

Pour ne rien dire sur ce sujet que de l'ordre qui s'observe à Ispahan & à Zulfa, il faut remarquer que chaque jardin est taxé plus ou moins selon sa grandeur pour avoir l'eau une fois la semaine, & qu'on donne de même l'eau tour à tour en certains quartiers qui en ont besoin, chaque maison ou jardin ayant son canal particulier par où l'on derive l'eau des grands canaux.<sup>65</sup>

On the other hand, the water from Fadan was not used for ornamental waterworks in open spaces. According to travelogues of Safavid-era visitors, such waterworks were limited to the Chahār-bāgh promenade and Naqsh-i Jahān square, which received their water shares from the king's water canal, Jūy-Shāh.<sup>66</sup> Therefore, if Muḥammad-Mahdī Iṣfahānī's statement about the consecration of a branch of the Fadan *mādī* is correct, he may have meant consecrating the *mādī*'s water for religious buildings such as schools and mosques. In either case, it still remains unclear which branch of the Fadan *mādī* was consecrated to the city and for what reason. However, European travelers mention selling water as one of the major income resources of the Safavid court. For example, Chardin listed the income from water sales as the fifth most profitable source:

En cinquième lieu, il faut mettre le revenu de l'eau, qui est fort considérable; car comme tout vient à force d'eau, presque dans toute la Perse, il n'y a pas un filet d'eau de perdu et qu'on ne vende. J'ai ouï assurer que les eaux d'autour d'Ispahan produisent quatre mille tomans par an, qui font soixante mille écus.<sup>67</sup>

According to him, in addition to the size of all the owners' properties, "The gardens pay so much a year for water so many times per month".<sup>68</sup> Concerning the water taxes Chardin writes:

Les terres et les jardins de cette ville royale et environs paient vingt sols l'année, au roi, par *gīrib* (*djéryb*), qui est leur mesure de terre ordinaire, laquelle est moindre qu'un arpent; ce n'est que pour avoir de l'eau de rivière ou de source; car pour les autres on ne paie rien.<sup>69</sup>

They measured the amount of water that entered each garden and the amount of time that it was used there. The water was measured using *lats*. These *lats*, or dividers, are stones that were placed along the course of the *mādīs* or streams in order to regulate the amount of water

64 Al-Iṣfahānī 1989, 100.

65 Tavernier 1681, 369–370.

66 Shaikh Bahā'ī Scroll, in Husainī Abarī 2000, 126.

67 Chardin 1811a, 398–399.

68 "Les jardins paient tant par an, pour avoir de l'eau tant de fois par mois." Chardin 1811a, 99.

69 Ibid., 100–101.

that could flow downstream.<sup>70</sup> The period of water consumption was measured with a *pangān* (cup)<sup>71</sup> which worked as a waterclock. As Chardin described:

Pour ce qui est de la distribution de l'eau des rivières et des sources, on la fait par semaine ou par mois, selon le besoin, en cette manière: on met sur le canal qui conduit l'eau dans le champ, une tasse de cuivre, ronde, fort mince, percée d'un petit trou au centre, par où l'eau entre peu à peu; et lorsque la tasse va au fond, la mesure est pleine, et on recommence, jusqu'à ce que la quantité d'eau convenue soit entrée dans le champ. La tasse est d'ordinaire entre deux à trois heures à s'enfoncer.<sup>72</sup>

Chardin also introduced another method in measuring the water amount that entered the farms which he termed "water measurement by ducks":

[...] et puis avec la bêche ils unissent la terre, et la mettent en carrés, comme des parterres de jardin, y faisant des rebords hauts d'un pied, plus ou moins, selon qu'il lui faut donner de l'eau. Le mesure d'eau qu'il faut donner aux carrés, c'est qu'il y en ait assez pour qu'un canard y puisse nager, et c'est de cette manière que l'on en donner aux jardins toutes les semaines.<sup>73</sup>

### Conclusion

After Isfahan became the capital city in the Safavid period, the water system management gained even more importance, as it was impossible to establish a powerful government without having control over the water system. The Safavids also highly favored using water for representative purposes in the city. This, along with urban development and population increase, led to a great surge in the city's water consumption. Providing water for the city and local farming, well-developed during the Safavid period, were only possible through authoritative management of the water system. Without doubt, studying elements of Safavid Isfahan's urbanization without considering its water management system would be incomplete.

Investigating the Zāyanda-Rūd's water distribution system reveals one aspect of the water management system in Safavid Isfahan. Although this system functioned for hundreds of years, the oldest available record is a Qajar document known as the Shaikh Bahā'ī Scroll. By studying this document and travelogues and chronicles from the Safavid period, we can understand the nature of the water system and its management in this city.

Water from the Zāyanda-Rūd was distributed through a network of main streams, called *mādīs*, then through rushes in the city, and from there towards suburban farms. Of Isfahan's *mādīs*, Fadan and Farshādi supplied water for the city, which with their branches covered a large area of the urban area. The network of water canals in the city followed the general water management system of the Zāyanda-Rūd; this means that during the warm season when agriculture required water, water flowed into these networks only at specific times. In order to control water shortages in the city, special shares of water were dedicated to the city at these times.

The importance of the water system to the city's structure meant that the ruler monitored it personally and water bailiffs were some of the highest-ranking positions of the court. Water

70 Husainī Abarī 2000, 309.

71 Ibid., 305.

72 Chardin 1811a, 98–99.

73 Ibid., 101–102.



bailiffs were usually chosen from among trusted and persuasive people who had proven their competence and management skills in previous positions. The soundness of water management and the stability and safety of the water system in Isfahan was so significant that one can trace the strengths and weaknesses and ups and downs of each phase of the Safavid government by studying the water system and its management.

During the Safavid period, water from the *mādīs* was sold and this money comprised one of the main sources of revenue for the government. The price and cost of water for each tract of land in Isfahan city was set according to its size and the number of times water was used there in a month; payment was collected annually.

According to the so-called Shaikh Bahā'ī Scroll, the Fadan and Farshādī *mādīs* supplied Isfahan's water.<sup>74</sup> The physical water system in the city – consisting of *mādīs*, their rush branches and smaller rushes, which moved towards the surrounding countryside – along with its non-material system – consisting of water bailiffs and related professions, distribution and management rules and their executive assurances, water related civil laws, the economic system based on water, consecration, etc. – represent aspects of Safavid Isfahan that help us re-evaluate this city with more precision.

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### *Illustration credit*

Fig. 1: Drawing S. Mahmoudian.

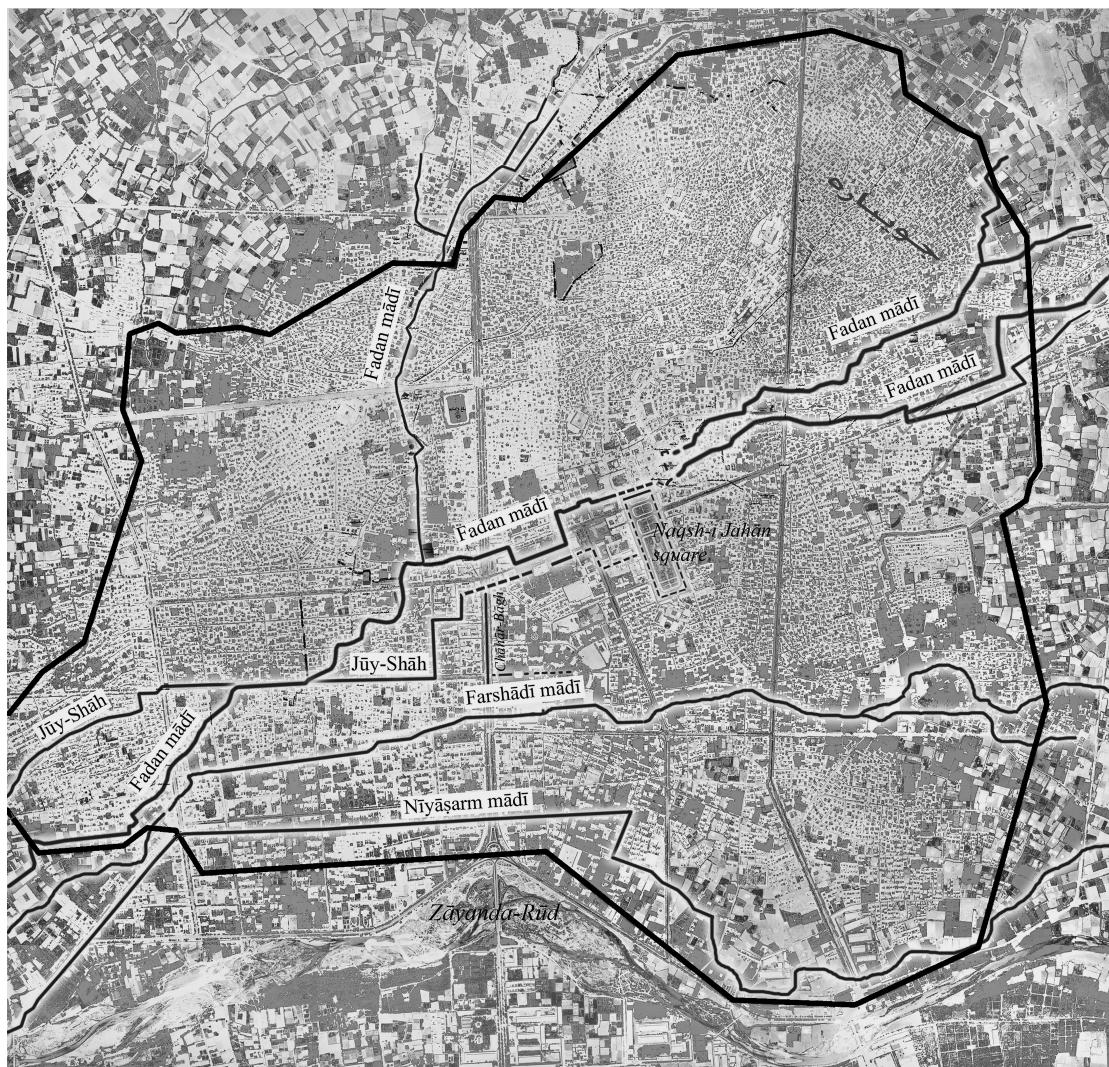


Fig. 1: Water channels (*mādi*) in Safavid Isfahan, marked on the aerial photo from 1951.