

Early water systems in Mughal India

This paper explores the patterns of water use which developed during the early years of the Mughal Empire in India. Research on Mughal water systems invariably draws attention to the refinement of garden pools, fountains, wells, and baths¹. These water features provided sensory delight; they expressed important cultural and political ideas; and they served various practical needs. Although the importance of garden water features has often been acclaimed, there have been no detailed investigations of their structure or development.

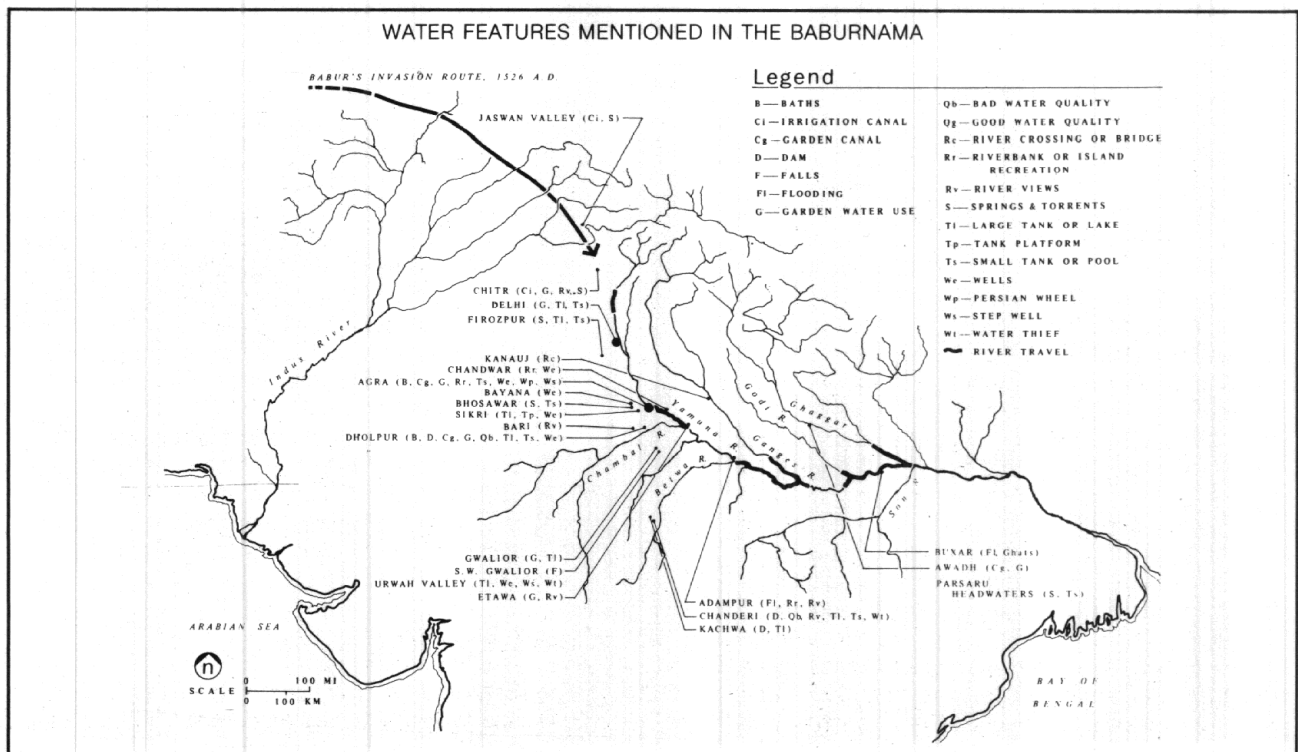
Even less is known about how garden water features were related to broader patterns of urban or agricultural water use. Several scholars have written about canal networks, well technologies, and irrigation during the 16th century². For the most part, however, research on garden water features has proceeded independently of research on large-scale water development. As a result, it is not known whether innovations in garden hydraulics led to or followed from innovations in large-scale water systems. Nor is it known how local water systems responded to regional flood and drought events. Because the pre-Mughal water systems of northern India have received even less attention than those which followed, it is difficult to know what is distinc-

tively «Mughal» about the water features of Babur and his successors.

This paper attempts to organize the issues mentioned above into a coherent framework for research. A regional emphasis is given to gardens along the Yamuna (Jumna) River at Agra. The following research problems are discussed:

1. Patterns of water development: What is an appropriate typology for describing «Mughal» water features? How were these features geographically distributed? How did Babur's perceptions of hydrology and water use compare with actual patterns?
2. Origins and influences: How did Babur's experience prior to occupying India direct the path of water development at Agra? What influences were derived from pre-Mughal or contemporary practices in India? How did the special qualities of the Agra landscape help shape the design of Mughal water systems?
3. Relationships between different scales of water development: How were local water features related to larger spatial patterns of water use? How were the esthetic, symbolic, and functional qualities of water related to one another at different scales of development?

The first set of questions is largely descriptive. It calls for a reconstruction of the physical patterns of water



development and the spatial distribution of various technologies. Answering the second and third sets of questions partly depends upon how well the patterns of water development can be described. This paper very briefly considers the lines of investigation that could eventually account for the origins and diffusion of various design innovations. The final set of questions probes the relationships among local water features and their broader landscape context(s). The proposed scales of investigation range from the individual garden to urban and regional patterns of water use.

Recent scholarship on Islamic gardens has tended to employ rather specific lines of esthetic interpretation — focussing on paradise symbolism³, kingship⁴, and social function⁵. Interestingly, contemporary garden descriptions do not fully conform with any single perspective; nor does Qur'anic paradise imagery. The argument of this paper is that inquiry into the three sets of geographical questions posed above will assist in interpreting the meanings of water in the Mughal landscape.

NATURAL WATER FEATURES

Upon invading India for the final time in 1526 A.D., Babur recorded detailed impressions of both natural and man-made water features that he observed. He noted, for example, three groups of rivers: the Indus and its tributaries; the Yamuna and Ganges Rivers; and lastly, the rivers of the «Hindustan Hills», upon which Babur noted that no snow falls⁶. Figure one maps out the location of water uses and devices that are mentioned in the Baburnama. The map suggests that what Babur most often meant by «Hindustan» was the Yamuna River corridor and its lower tributaries, such as the Chambal and Betwa Rivers. The Yamuna served as an artery for military transportation and recreational travel. Babur and his nobles held numerous parties on boats, islands, and riverbanks. The military and recreational functions overlapped when the army would halt at spots selected for scenic views overlooking a river.

We read in the Baburnama that agriculture was largely rainfed, but that wells were often used for irrigation⁷. The airs were described as damp but salubrious⁸. The rains were refreshing; but the country was generally hot, dry, windy, and dusty⁹. The rains eroded gullies and entrenched streams making travel difficult. Babur complained that the country was flat with no swift streams, but he commented favorably on springs, freshets, and waterfalls that he saw¹⁰. Indeed, he made quite strong qualitative judgements about most of the landscape features he encountered. «Hindustan» was alternately praised and criticized. Advantages and disadvantages were catalogued with wonder and occasionally disgust. These varied perceptions cannot be examined in detail in this paper. The

point here is to note that Babur's observations on the natural water features and hydrology of Hindustan were complex and sometimes paradoxical. He presented images of the wet and the dry which were simultaneously practical and poetic, positive and negative.

Babur's description of the natural landscape was reinforced by Shaikh Zayn al-Din Wafa'i Khwafi [Zain Khan]. Much of Zain Khan's text parallels that of Babur closely, but there are several interesting elaborations. For example, Babur accounted for the absence of irrigation canals by saying, «For not doing it there may be several reasons, one being that water is not at all a necessity in cultivating crops and orchards.»¹¹. Zain Khan's remarks may reflect the other unspoken ideas underlying this early perception of water use in Hindustan:

The reason for not doing this [i.e., building irrigation works] is that the Almighty sacred God has stripped the people of Hindustan of the sense of necessity of running waters, and they do not welcome the same except for cultivating crops or quenching their thirst. This is so much so that when sometimes someone, possessed of power and authority, during the course of his travels, happens to set up a tent with enclosures on the bank of a river, they keep the surrounding sides covered or veiled, and the front is also not left open towards the side of the river. This shows that they have a sort of aversion for looking towards water...¹²

The Shaikh's comments are loaded with ambiguities and intriguing connotations. He seems to say that the people of Hindustan did not build «running waters» because they had sufficient water, because they were unaware of the need for irrigation, because they were principally concerned with the functional qualities of water, and because they had an aversion or indifference to water — all at the same time. Each of these assertions is contradicted or qualified by other passages in contemporary texts. Immediately following his victory at Panipat, for example, Babur visited tombs and gardens of the Delhi sultans and other sites along the Yamuna River that presumably displayed functional if not also delightful uses of water¹³. There is ample evidence in the Sultanate histories of a sensitivity to the vagaries of rainfall, as well as to the value of a good riverfront location¹⁴.

As a final note on natural water features, there is an obvious neglect of Hindu sites along rivers and lakes in Babur's memoirs. Ghats are briefly noted at Buxar (Baksara); but otherwise Babur displays no interest in the qualities of Hindu structures located along natural water bodies¹⁵.

CANALS, WELLS AND TANKS

The absence of «running waters» (generally translated as «canals») is mentioned repeatedly. This is curious in light of the early and in some cases massive canal

construction which occurred during the Sultanate period¹⁶. The Jumna canal, which was constructed during the reign of Firoz Shah, reportedly extended over 120 miles. Gardens, palaces, and sarais in the Delhi area were presumably served by smaller canals. These would be relatively slow-moving, however, and would have few of the qualities of a channel diverted from a mountain stream — qualities that may also be implied by the words «running waters.»

Moreover, it is important to recognize that at Āgra the deeply dissected terrain restricted canal development both upstream and downstream of the city, giving support to Babur's remarks and reinforcing the idea that his descriptions of Hindustan are centered on the Āgra region.

There is an ongoing scholarly debate over the use of the Persian wheel and other well technologies in India. This literature was recently reviewed by Siddiqui and also by Askari¹⁷. Well types ranged in complexity from the temporary unlined wells that served military campaigns and local settlements, to the multi-storied step wells of the nobles. Babur described in detail the three-storied step well that supplied his first garden at Āgra¹⁸. Water lifting devices included leather buckets, Persian wheels, and water jars at shallow wells. Babur strongly criticized the sanitation of Hin-

dūstani well involving buckets drawn by bullock power at Āgra, Bayāna, and Chandwār, but Zain Khān implies that such problems went unnoticed for some time after the Mughals arrived¹⁹.

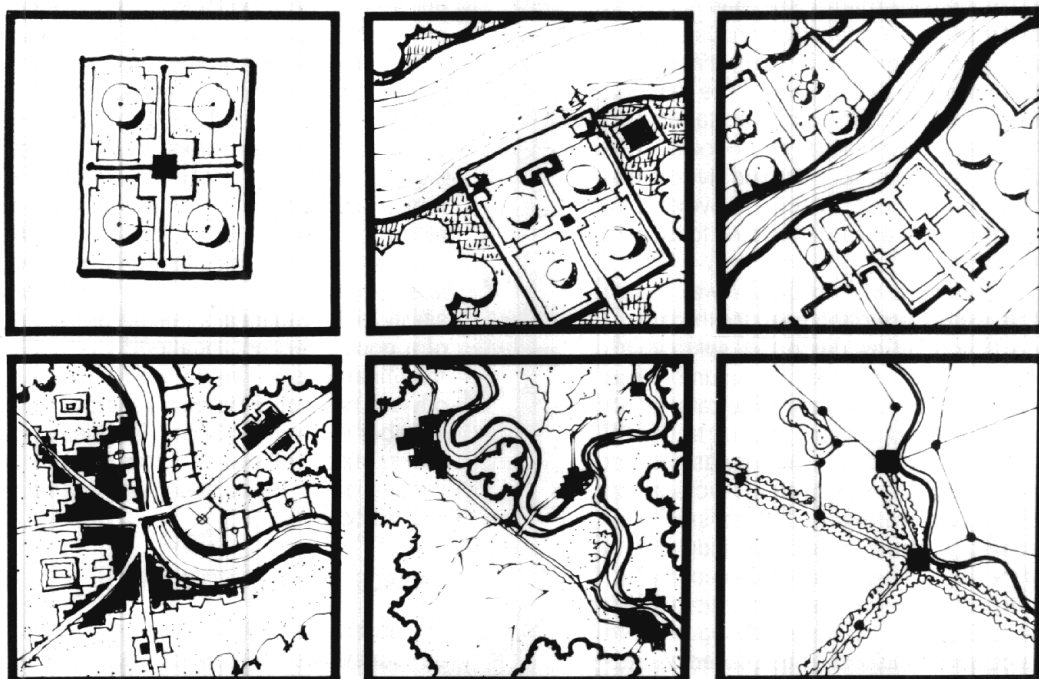
Tanks have perhaps the longest history of any water features in northern India. Among the first sites visited by Babur after the battle of Panipat were the Hauz Shamsi and Hauz-i-Khas, the latter dating to Khalji rulership in Delhi²⁰. Babur also mentions existing reservoirs and tanks at Dholpur, Sikri, Chanderi, and Gwalior²¹. As figure one indicates, references to water impoundments in the Baburnama fall into two classes: large reservoirs serving water supply and sometimes recreational needs; and small tanks built for esthetic and religious purposes.

Babur's own tanks were exclusively of the latter variety. His water gardens at Dholpur, for example, drew upon water impounded at a dam built by Sikandar Lodi²². His lake pavilions at Sikri were built in a large tank of unknown origins. Upon discovering a small stream or spring, he would often create a small octagonal pool for ablutions and esthetic enjoyment²³.

GARDEN WATER FEATURES

It is clear from the foregoing section, that the earliest

GEOGRAPHICAL SCALES OF WATER RESOURCES INVESTIGATION



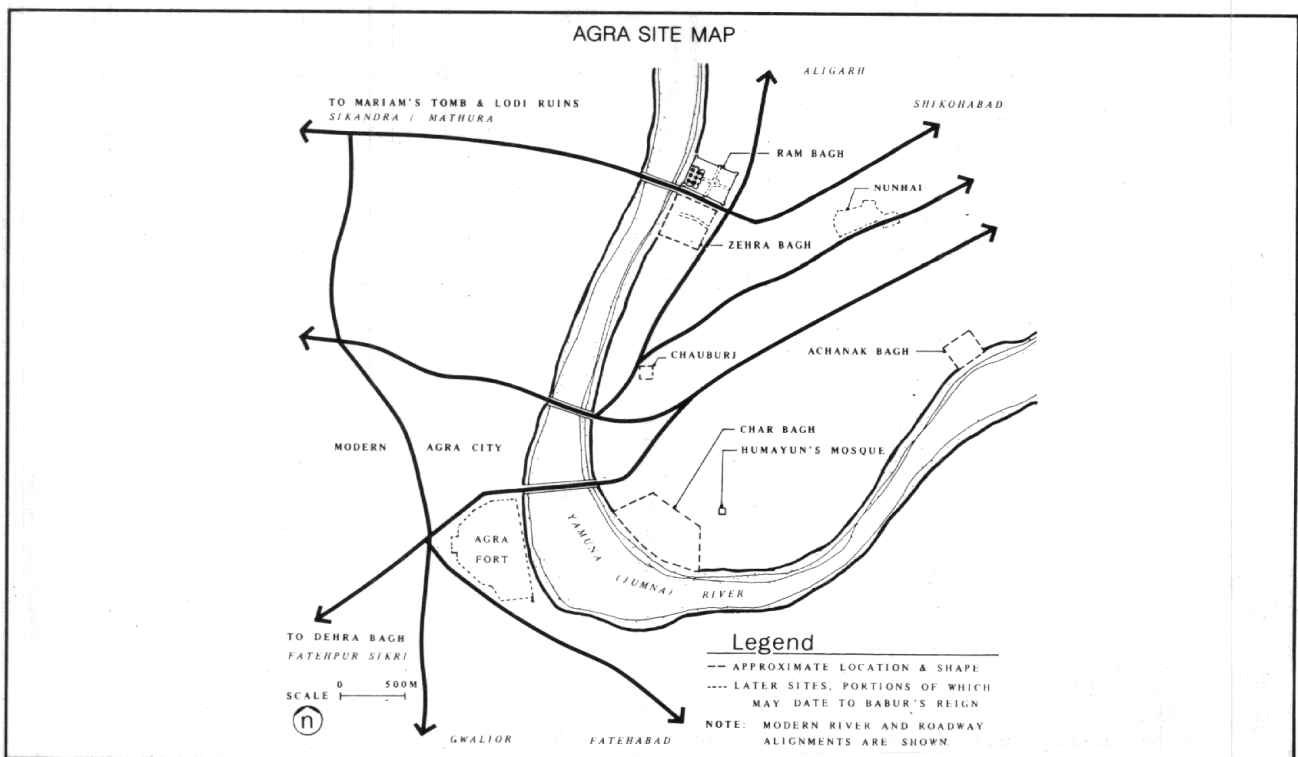
Mughal water features were not large-scale «civil works» but were instead the more exquisite wells, pools, and channels of the garden. Babur wrote several extended passages on the use of water in his gardens. The first of these describes the hot and cold baths built at Āgra. Construction of these and of the associated tanks and wells is rendered in considerable detail during the first year of Babur's rule, a fact that exemplifies the esthetic and functional importance of water for Mughal rulers²⁴. A second major class of water features was the octagonal ponds and seats built along small streams and springheads [op. cit. note 23]. Finally, several passages deal with the construction of more extensive garden pools and channels, for example those at Dholpur²⁵. Curiously, there are no references anywhere to chadars or fountains. The words «running waters» may imply such features, but at this early date they may also have meant any water moving through a channel which offered a combination of irrigation and visual delight.

It should be noted that sources on pre-Mughal water systems provide little information on garden water features²⁶. This suggests that Babur's complaint may not have been so much about the absence of any «running waters» in the landscape as an esthetic judgement about those he did observe.

ORIGINS AND INFLUENCES

The scope of this paper permits only a rough outline of the influences on Mughal water systems. Several hypotheses were mentioned above. These may be organized into seven categories which distinguish among the geographical origins of early Mughal design features:

1. Babur's previous design experience in Fergāna, Kabul, Samarkand, and Lahore.
2. Babur's travels prior to invading Hindūstān, e.g., in Herat, Lahore, and Samarkand — i.e., at places he visited but did not build.
3. Stories and descriptions of Hindūstān which Babur would have heard prior to occupying it.
4. Places visited during the invasion and shortly afterwards, i.e., Sultanate influences.
5. More distinctly Hindu influences, e.g., from the palace complex at Gwalior²⁷, and from the work of stonemasons and other craftsmen²⁸.
6. On-site influences at Āgra, i.e., the effects of landscape development prior to 1526 A.D. In part, Babur was reacting *against* existing landscape conditions, but there would also have been attempts to adapt Mughal design ideas to the circumstances of the local landscape.



"VIEW OF THE CITY OF AGRA FROM THE RIVER JUMNA" ENGRAVING DATED 1857



7. Babur's innovations at Agra.

Conventionally, only the first and last of these hypotheses have been taken seriously. Babur is presented as an innovator at Agra or as a vehicle for the diffusion of central Asian garden traditions into India. Hypotheses 1 through 3 call for more precise distinctions among Babur's early garden experiences and influences outside India. Hypotheses 4 through 6 require that similar distinctions be made among Babur's experiences within India. This is admittedly a difficult task since many of the early sites have disappeared or changed radically.

Nevertheless, historical texts provide some help, and also some motivation, for taking these six hypotheses seriously. Babur records many cases of conscious site-seeing, some of which are accompanied by detailed descriptions.

The final hypothesis receives considerable attention in the literature on Mughal environmental design. Babur's role as an innovator in India, however, must be determined from an analysis of the potential influences on his work there. The geographical scale of investigation is particularly important for understanding what was derivative and what was innovative in Babur's designs. That Babur and his contemporaries introduced new technologies and design forms into the Agra area is unquestionable; that the Agra projects had no important precedents in northern India is doubtful. Moreover, the Persian and central Asian roots of early Mughal design are not yet well enough known to sort out the «original» and «traditional». Attributes of Babur's designs. These issues are crucial for studies of later Mughal water systems and gardens, for they define the foundations of Mughal environmental design and the roles of various people who prepared those foundations.

GEOGRAPHICAL RELATIONSHIPS AMONG WATER FEATURES

In the previous section it was noted that the scale of investigation may influence what is regarded as innovative or distinctive about a particular water system. The geographical patterning of water systems also helps to establish the relationships that existed among functional, esthetic, and symbolic qualities of water. In the case of Agra, six geographical scales of analysis are pertinent for understanding the roles of water in the landscape: a) internal garden water systems; b) the landscape context of individual gardens; c) garden complexes along the Yamuna River corridor; d) the urban water system at Agra; e) urban centers along the Yamuna and its tributaries; and f) regional water systems.

Agra has only several gardens with extant water systems that have been attributed to Babur. These include the baths and pools at the Ram Bagh (also called Arām Bagh and Bagh-i-Gul Afshan by various

sources) and the remnants of the Zehra Bagh (also called Dehra Bagh and Zahara Bagh). Because the identification and history of these gardens await detailed study, inferences about the use of water in gardens must remain conjectural. Two other Baburi gardens were identified in Carleyle's archeological report of 1871-72, but they were in a ruined state at that date and have not been subsequently researched; these are the Char-bagh and the Achanak Bagh. Nath has recently argued that the Chauburj (located near the tomb of Itimad-ud-Daula) was part of a larger garden complex containing Babur's Bagh-i-Zar Afshan [op. cit. note 27]. There are reputed Lodi ruins in Sikandra; and numerous villas and pavilions which lined the riverfront, of which almost nothing is known. The latter included the riverfront residences of Zain Khan, Yunas-i-'ali, Khalifa, and presumably other nobles during Babur's reign²⁹.

a. The smallest scale of analysis focusses on these garden water systems — that is, on the garden as a self-contained object. The problem is to show how garden water systems operated, how they were experienced, and how their layout was related to the overall structure of the garden.

b. The next larger scale of geographical analysis is that of the garden landscape — i.e., views to and from individual gardens. It is clear from Zain Khan's comment quoted above that views of the riverfront from tented enclosures had great esthetic appeal. This goes against the common notion that the inward orientation and paradise symbolism of Islamic gardens resulted in weak relationships with the outside landscape. In Agra many of the gardens were open to the Yamuna River.

c. The Yamuna River played a prominent role in spatially organizing the complex of gardens which in later years would come to line the river. We learn from de Laet and other early 17th century travellers that, «The city is much longer than it is broad; for all the inhabitants have desired to be near the river, and hence have built their houses along its banks»³⁰. If the historical patterning of riverfront development at Agra could be reconstructed, it would provide a fascinating view of Mughal urbanism as it unfolded over a period of nearly two hundred years. Riverfront development became popular quite early during Babur's reign. During his first year in Agra, Babur stated that the residences and palaces along the river had acquired the name «Kabul» among the local residents³¹. Unfortunately, pre-Mughal riverfront structures have not been identified.

d. At the urban scale, there is a fundamental problem with locating where the Lodi fort and city lay before Akbar's rule. Those who follow Carleyle speak of a city which lay on the east bank of the Yamuna near the village of Nunhai³². Others have surmised that the foundations of Akbar's Red Fort have Lodi origins. The apparent reliance of Agra on shallow wells means that

large-scale canal features are not to be available to help reconstruct the early urban water system. It may be, however, that further review of Sultanate histories and descriptions of Āgra would answer some of these questions.

e. It is crucial to think of Āgra as spatially situated along a regional Yamuna River corridor. The Yamuna provided a spatial linkage upstream with Delhi and downstream with Benares, Allahābad, Etawah, and Ghāzipūr. These linkages placed Āgra in a strategic position for territorial control in northern India. Āgra history is intimately connected with river travel. The founding of Āgra by Sikandare Lodī occurred on a river trip from Delhi³³. Babur toured the region by boat, as did Humayūn, Akbar, and Jahāngir³⁴. The river served a complex mix of functions including commerce, festivals, military transportation, and water supply for gardens and residences.

f. At the largest scale of analysis are the «hydraulic» connections among areas which are not connected by rivers. Babur noted, for example, the strategic significance of the water supply at Fatehpur Sikri in his battle with Rāna Sanga³⁵. His memoirs give only a sketchy view of the regional pattern of water supplies — but again, it is a pattern that could be expanded through an analysis of pre-Mughal texts. In later years there would be trade in drinking water and ice. Also important at this scale of geographical analysis would be the provisioning of sarais and forts with water — either in tanks, wells, cisterns, or jars. Such way-stations constituted a crucial resource for long-distance military campaigns and general travel³⁶.

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¹ Jairazbhoy, R.A. *Early Garden-Palaces of the Great Mughals*, in «Oriental Art» 1958, 68-75; Rivzi, S.A. and Flynn, V.J. *Fathpur-Sikri*, Chap. 7. Bombay, Taraporevala, 1975; Nath, Ram: *History of Mughal Architecture*, Vol. I, New Delhi, Abhinav Publications, 1982; Nath, Ram. *Some Aspects of Mughal Architecture*, New Delhi, Abhinav Publications, 1976; Moynihan, Elizabeth, B. *Paradise as a Garden in Persia and Mughal India*, New York, George Brazillier, 1979; and Crowe, Sylvia, et al. *The Gardens of Mughal India*, London, Thames and Hudson, 1972.

² Habib, Irfan. *The Agrarian System of Mughal India (1556-1707)*, London, Asia Publishing House, 1963, pp. 24-36; Habib, Irfan. *An Atlas of Mughal India*, Delhi, Oxford University Press, 1982, plate 8B; Siddiqui, Iqtidar Hussain. *Water-works and Irrigation System in India During Pre-Mughal Times*, «Islamic Culture», 1984, 1-21; and Moreland, W.H. *The Agrarian System of Moslem India*, Cambridge, Cambridge University Press, 1929.

³ Schimmel, Anne-Marie. *The Celestial Garden in Islam*, in «The Islamic Garden», pp. 11-40. Ed. Elizabeth B. MacDougall and Richard Ettinghausen, Washington, D.C., Dumbarton Oaks, 1976.

⁴ Begley, Wayne. *The Myth of the Taj Mahal and a New Theory of Its Symbolic Meaning*, «The Art Bulletin», 1979, 7-37.

⁵ Pinder-Wilson, Ralph. *The Persian Garden: Bagh and Chahar Bagh*, in «The Islamic Garden», pp. 69-86. Ed. Elizabeth B. MacDougall and Richard Ettinghausen, Washington, D.C., Dumbarton Oaks, 1976.

⁶ Babur, Zahir ad-Din Muhammad. *Baburnama*, Trans. by A.S. Beveridge, 1921. Rpt. New Delhi, Oriental Books Reprint Corp., 1970, p. 485.

⁷ Ibid., p. 488.

⁸ Ibid., p. 518.

⁹ Ibid., pp. 518, 532.

¹⁰ For example, at Bhosawar, Firozpur, and Chanderni; ibid. pp. 580, 581, and 597.

¹¹ Ibid., p. 487.

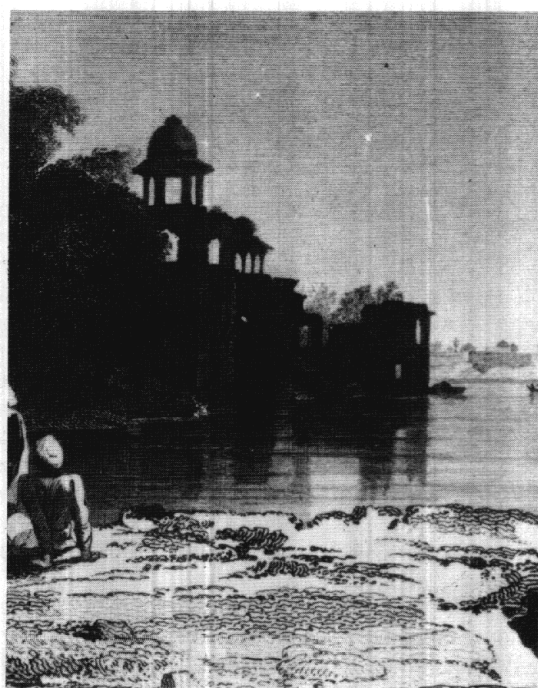
¹² Khwafi, Zain al-Din Wafa'i. *Zain Khan's Tabagat-i Baburi*, Trans. by S. Hasan Askari with B.P. Ambastha, Delhi, Idarahi-Adabiyat-i Delli, 1982, pp. 111-3.

¹³ *Baburnama* pp. 475-6.

¹⁴ Note the water shortage in the Āgra-Gwalior area during Sikandar Lodi's reign: 'Abdu-lla. *Tarikh-i Daudi*. In *The History of India as Told by Its Own Historians*, Vol. IV., p. 466. Ed. H.M. Elliot and John Dowson, Allahabad, Kitab Mahal Pvt. Ltd., 1964 [1st pub. 1867-77]; and the response to pervasive water shortage by Firoz Shah: 'Afif, Shams-i Siraj. *Tarikh-i Firoz Shahi*, in Elliot and Dowson, vol. III, p. 300; and *Tarikh-i Firoz Shahi*, of Barani, in Elliot and Dowson, vol. III, p. 146. The pre-Mughal interest in building along the Yamuna River is also evident in these two texts, Barani, p. 136 (*Kilu-ghar i*); and Shams-i Siraj, p. 302 (Firozabad).

¹⁵ *Baburnama*, pp. 591, 655. For a note on ghats: Pieper, J. *Water in Hindu Urban Architecture*. «Art and Arch. Research Papers», 15 (1979), 39-44. One is reminded here of the recurring stories about Muslim displeasure with Hindu behavior at rivers and tanks during religious festivals and eclipses. Although not mentioned by Babur, these stories are recounted in the histories of Firoz Shah before him and those of Akbar and Jahāngir later on.

"JAHARA BAUG" ENGRAVING BY CAPT. R. ELLIOTT



¹⁶ I.H. Siddiqui's recent study of pre-Mughal canals, tanks, and wells strikingly illustrates the gap between Babur's recorded perceptions and actual patterns of water development. Op. cit. note 2.

¹⁷ Ibid., pp. 8-12; and Askari, S. Hasan, trans. *Tabagat-i Baburi*, Delhi, Idarahi-i Adabiyat-i Delli, 1982, app. A. Interestingly, shallow wells have continued to be a principal source of irrigation water at Agra in modern times: India. Government of the United Provinces. *District Gazetteers of the United Provinces of Agra and Oudh, Agra District*, Vol. VIII, Allahabad, Government Press, United Provinces, 1905, pp. 35-7.

¹⁸ *Baburnama*, p. 532.

¹⁹ Ibid., p. 487.

²⁰ Ibid., p. 475.

²¹ Ibid., pp. 585, 588, 592, 612.

²² Ibid., pp. 606-7.

²³ Ibid., pp. 580, 581, 683.

²⁴ Ibid., pp. 531-4. Zain Khan parallels the *Baburnama* in his descriptions of the step-well and charbagh garden called Hasht Bihisht in Agra: *Tabagat-i Baburi*, pp. 156-63.

²⁵ The Dholpur garden water systems are described in the *Baburnama*, pp. 585, 606-7, 615, 634, and 639.

²⁶ For exceptions, see Siddiqui, *Waterworks*, (passim), who cites early references to fountains, channels, and garden tanks in Gujarat, Delhi, and Jaunpur. It is important to note, however, that Babur did not travel into Gujarat and that he stayed only briefly in Delhi and Jaunpur.

²⁷ Nath, Ram. *History of Mughal Architecture*, Vol. I, New Delhi, Abhinav Publications, 1982.

²⁸ *Baburnama*, p. 519.

²⁹ Ibid., p. 532; and *Tabagat-i Baburi*, p. 160-1.

³⁰ De Laet, Joannes. *The Empire of the Great Mogol*, trans. by J.S. Hoyland with S.N. Bannerjee, Bombay, Taraporevala Sons & Co., 1928, p. 37.

³¹ *Baburnama*, p. 532.

³² Carlley, A.C.L. Agra in. «Archaeological Survey of India, Report for the Year 1871-72», vol. IV, Varanasi, Indological Book House, 1966, pp. 93ff.

³³ Niamatu-lla. *Tarikh-i Khan-Jahan Lodi*, in «The History of India as Told by its Own Historians», Vol. V. Ed. H.M. Elliot and John Dowson, Allahabad, Kitab Mahal Pvt. Ltd., 1964 [1st pub. 1867-77], p. 101.

³⁴ River trips by Humayun, Akbar, and Jahangir are reported in the following passages:

°Allami, Abu'l-Fazl. *Akbarnama*, trans. by H. Beveridge, Calcutta, Asiatic Society, 1897-1939, vol. I, p. 329; vol. II, pp. 117-8, 187; vol. III, pp. 122, 135-8, 360, 617. Also Jahangir, Nur ad-Din Muhammad. *Tuzuk-i Jahangiri*, trans. by A. Rogers, ed. H. Beveridge, 1909-14 rpt. New Delhi, Munshiram Manoharlal, 1968, vol. I, pp. 137, 241, 248; vol. II, pp. 196, 199, 200, 285.

³⁵ *Baburnama*, p. 548.

³⁶ One is reminded here of the water shortages suffered by Sikandar Lodi's troops near Agra (note 14 above), Firoz Shah's army in the Rann of Kutch, and Humayun in western Rajasthan. While Humayun wandered in the desert, Sher Shah ordered a network of sarais to be constructed and provisioned with water: Sarwani, 'Abbas Khan. *Tarikh-i Sher Shah*. In «The History of India as Told by Its Own Historians», Vol. IV. Ed. H.M. Elliot and John Dowson, Allahabad, Kitab Mahal Pvt. Ltd., 1964 [1st pub. 1867-77], pp. 417-8.

"A RUIN ON THE BANKS OF THE JUMNA" BY CAPT. R. ELLIOTT

