Urban History, **28**, 2 (2001) © 2001 Cambridge University Press Printed in the United Kingdom

Water and power in Milan, *c.* 1200–1500

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'This city has a circular form, and such a marvellous roundness is the sign of its perfection. A trench of surprising beauty and breadth surrounds this city and contains, not a swamp or a putrid pool, but living water from fountains stocked with fish and crayfish.'[1] For friar Bonvesin de la Riva at the end of the thirteenth century, as for most of his successors, glorifying Milan consisted of singing the praises of its running water. Abundant, regular, gushing water was everywhere; it was 'marvellous to drink, clear, healthy, within reach of the hand'.[2] This praise is evidently for the geographical situation of Milan, which brought it harmony and wealth. But it is also for the Milanese themselves, who brought running water from the rivers to the Lombard capital. Milan, after all, was naturally 'Medio-Amnium', at an equal distance from the two rivers (the Ticino and the Adda) that flowed

* This article is the revised version of a presentation given at the 11th international congress of economic history, which was held at the Università Bocconi, Milan, Sep. 1994 and has been translated by John Holland and Julien Théry. It was prepublished under the title 'Usages et partage de l'eau à Milan et dans le Milanais (XIIIe–XVe siècles)', in E. Crouzet-Pavan and J.-C. Maire Vigueur (eds), *Le contrôle des eaux en Europe occidentale, XIIe–XVI siècles* (Milan, 1994), 123–38.
Abbreviations:
ANNALI: *Annali della Fabbrica del Duomo di Milano*, ed. C. Cantù, 7 vols (Milan, 1877–1880); ASCM: Archivio Storico Civico di Milano; ASMi: Archivio di Stato di Milano (Acque = *Atti di governo, Acque, parte antica*; DDS = *Diplomatico, Diplomi e Dispacci Sovrani*; Panigarola = *Officia Gubernatorum et Statutorum, Registri Panigarola*; Sforzesco = *Archivio ducale, Carteggio sforzesco interno*).

1 *'Civitas ista ipsa orbicularis est ad circulli modum, cuius mirabillis rotonditas perfectionis eius est signum. Eius fossatum admirande pulcritudinis et latitudinis, non paludem, non stagnum putridum, sed aquam fontium vivam, pissibus et cancris fertilem, continens, ipsam civitatem circuit undique'*, Bonvesin de la Riva, *De Magnalibus Mediolani. Le meraviglie di Milano*: G. Pontiggia (ed.), intro. A. Corti (Milan, 1974), 40 (2, IV–V). For this text, see Y. Renouard, *Les villes d'Italie de la fin du Xe siècle au début du XIVe siècle* (Paris, 1969), 434–48; G. Orlandi, 'Note sul ''De Magnalibus Mediolani'' ', *Studi Medievali*, XVII (1976), 863–906 and finally B. Sasse Tateo, *Tradition und Pragmatik in Bonvesins 'De Magnalibus Mediolani'. Studien zur Arbeitstechnik und zum Selbstverständnis eines Mailänder Schriftstellers aus dem späten 13. Jahrhundert*, 'Europäiche Hochschulschriften, III, 452' (Frankfurt am Main, Bern, New York and Paris, 1991).

2 *'Sunt in civitate non cisterne, non aquarum a longe conductus, imo aque vive naturalles humano usui potatu mirabiles, limpide, salubres, habilles, nullo ariditatis tempore deffective, in tanta copia, ut in unaquaque fere domo decente sit fons, qui dicitur puteus, aque vive'* , *ibid*., 32 (1, III).

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around it.[3] At the end of the Middle Ages, it was at the centre of the most immense system of navigable rivers in Europe, and it owed this condition to three centuries of effort during which the communal power, but also private initiatives, had dug the canals and connected the streams. Water became the vital element in the economy, and the development of Milan multiplied the concurrent, sometimes rival uses of it. How could stagnant water from trenches be reconciled with that of the navigable rivers? How could it be ensured that the water that irrigated the garden would also supply the needs of the paper mill? There were many economic contradictions that could be resolved only by an equitable and measured sharing of the water. At the same time, the growing strength of the seigniorial and territorial state sought to appropriate the management of the water to itself. If the prince succeeded in guaranteeing a supply of clean water, which flowed constantly for the good of the whole community, he would have found the best way not only of participating in the development of his city but also of ensuring that his own power was retained.[4]

From stagnant to running water: uses of water in the urban economy

Writing his history of Milan under Ludovico the Moor, Bernardino Corio argued that the first urban canals had been dug, in the twelfth century, in order to promote navigation.[5] At this end of the Quattrocento, the Milanese hydraulic network was devoted mainly to trade and to the circulation of commodities, and it had been forgotten that the initial function of the Lombard water lines was defensive. More important than connecting it to its countryside, water protected the town. The use of ditches as fortifications was not, however, peculiar to Milan, for it concerned the cities and villages of the Po plain, where 'water was everywhere, running, gushing, or stagnant'.[6] It thus encircled the high walls of the city in a '*fossatum communis*' that collected the waters of the Seveso in the north-east, and of the Nirone in the north-west. Certified in 1156, the ditch was filled by Federico Barbarossa, and dug again by the

[3] This etymology is more common during the Middle Ages: see, for example, *Libellus de situ civitatis Mediolani*, ed. A. Colombo and G. Colombo, *Rerum Italicarum Scriptores* (Bologna, 1900), 13.

[4] The theme of relations between political legitimacy and artistic enterprises has been much discussed in P. Boucheron, *Le pouvoir de bâtir. Urbanisme et politique édilitaire à Milan (XIVe–XVe siècles)* (Rome, 1998).

[5] B. Corio, *Storia di Milano*, ed. A. Moriri Guerra (Turin, 1978), vol. 1, 247. On this author, see particularly G. Soldi Rondinini, 'Spunti per un' interpretazione della "Storia di Milano" di Bernardino Corio', in idem, *Saggi di storia e storiografia visconteo-sforzesche* (Bologna, 1984), 205–20.

[6] F. Menant, '*Fossata cavare, portas erigere*. Le rôle des fossés dans les fortifications médiévales de la plaine padane', *Aevum*, 61 (1982), 205–16, esp. 206, and idem, *Campagnes lombardes du Moyen Age. L'économie et la société rurales dans la région de Bergame, de Crémone et de Brescia du Xe au XIIIe siècle* (Rome, 1993), esp. 171–203.

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Milanese in 1167. The latter, who had just had a bitter taste of the vulnerability of their system of fortifications, pursued their efforts and, as early as 1179, dug a new canal, the Ticinello, later called Naviglio Grande – which, starting in the south of the Ticino river, reached the gates of the city in 1209.[7] The chroniclers defined the function of this canal clearly: *'pro difensione Mediolanensium'* – in order to defend the Milanese, precisely against possible attacks from Pavia – and it mattered very little at that time that the Ticinello was not navigable. It was this same military logic that prompted the construction of the Redefosso at the beginning of the fourteenth century. Galeazzo Visconti then undertook the digging of an advanced ditch, *'circa suburbia civitatis'*.[8] This surrounded the city, uniting and protecting all the new industrial suburbs which, encouraged by developments associated with irrigated agriculture and the development of work at home by artisans, had spread far from the centre of Milan. Certainly the Redefossso, however much it was fortified with bastions and defensive embankments, posed very little resistance to the French troops in 1499.[9] At least it had marked, for a century and a half, the military and fiscal limits of a city that protected itself behind its canals.

If the history of Milan never demonstrated the real efficacy of the aquatic lines of defence, it is doubtless because, as early as the thirteenth century, this military employment of water was overtaken and probably hindered by another, commercial use, that people wished to make of it. At the time when the alpine passes were opened, when the city enlarged its sphere of influence, and when its merchants were pushing back the horizon of trade,[10] it became necessary to make the network of rivers around the Lombard capital fully navigable. There was no need, moreover, for considerable investment: by connecting the water-lines inherited from the twelfth century, the commune achieved a true hydraulic network, making Milan the economic heart of Lombardy. Water divided up the political spaces; it would henceforth integrate an economic space.

The year 1269 appears, in this respect, as a real watershed. At a time when Giacomo Arribotti, the most famous Milanese engineer of the time, worked to deepen and enlarge the Naviglio in order to make navigation

[7] G. Biscaro, 'Gli antichi navigli milanesi', *Archivio storico lombardo*, XXXV (1908), 285–326, esp. 305. For general orientation, see G.C. Zimolo, 'Canali e navigazione interna dalle origini al 1500', in idem, *Storia di Milano*, vol. VIII (Milan, 1960), 867–95; M. di Gianfrancesco, 'Per una storia della navigazione padana', *Quaderni storici*, X (1975), 199–226; and finally G. Fantoni, *L'acqua a Milano. Uso e gestione nel basso medioevo (1385–1535*) (Bologna, 1990).

[8] G. Fiamma, *Manipolus florum*, ed. L. A. Muratori, in *Rerum Italicarum Sciptores*, t. XI (Mediolani, 1729), col. 730b.

[9] A. Cassi Ramelli, 'Le fortificazioni milanesi (1450–1507)', *Castellum*, 12 (1970), 91–104; S. Leydi, 'La linea di fortificazione di Milano, 1323–1550', *Storia urbana*, 31 (1985), 3–29.

[10] G. Soldi Rondinini, 'Le vie transalpine del commercio milanese dal sec. XIII al XV', in idem, *Felix olim Lombardia. Studi di storia padana dedicati dagli allievi a Giuseppe Martini* (Milan, 1978), 343–484.

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easier there, the commune levied a special tax on all the Milanese 'occaxione laborerii Ticinelli e Navigii'.[11] In the same year, the records of the commune testify to the arrival at the Laghetto de San Eustorgio, the gates of the city, of barges filled with cattle, wood and hay, which had come down the Ticino from Lake Maggiore without dividing the load.[12] From the great lakes to the urban canals, in going through the capillary diversions of the Lombard plain's river system, there was a single integrated hydraulic network that thus foreshadowed what would be, under the Visconti, the Milanese political domination of the region. It is fitting to note that private initiative also played a part in this major transformation. Again in 1269, an association of great proprietors, led by the powerful Abbey of Chiarravale, organized and financed new hydraulic works. These aimed at supplying water to the southern urban trench of Milan, between the Porta Tosa and the Pusterla della Chiusa, where the water was stagnant. In order to do this, it was necessary to dig a collector (*xorator*) of 900m. which supplied the Vettabia, an irrigation canal that itself flowed into the trench, with running water. These works, managed by Arribotti, who, as we have seen, was working for the commune at the same time, cost 300 lire, and the users of the Vettabia bore the financial charge for it.[13]

The new uses of water in the thirteenth and fourteenth centuries actually required an abundant and regular flow. First, the extension of the irrigation of gardens and meadows into the suburban zone most probably contributed to this need. Thus the history of the uses of water matches that of the improvement of the land and the transformation of cultural practices.[14] The considerable development of the 'cassine', agricultural enterprises that were set up where the water was the most abundant, modified the suburban landscape of Milan, particularly to the south of the city around the Porta Ticinese.[15] The hydraulic network and its agricultural potential thus attracted merchant capital: the greatest families of the new Milanese oligarchy sought to have these 'cassine'

[11] P. Ghinzoni, 'Maestro Giacomo Arribotti e il Naviglio Grande reso navigabile', *Archivio storico lombardo*, XX (1893), 200–3.

[12] *Gli Atti del Comune di Milano nel sec. XIII*, ed. M.F. Baroni and R. Perelli Cippo (Alessandria, 1982), vol. II, doc. 638, 686.

[13] L. Chiappa Mauri, 'L'uso delle acque: la normativa duecentesca', in idem, *Paeaggi rurali di Lombardia* (Rome, 1990), 132–62.

[14] G. Chittolini, 'Alle origini delle ''grandi aziende'' della bassa lombarda: l'agricoltura dell'irriguo fra XV e XVI secolo', *Quaderni Storici*, 39 (1978), 828–44, now in *L'azienda agraria nell'Italia centro-settentrionale dall'antichità ad oggi. Atti del convegno di Verona (1977)* (Naples, 1979), 185–99. See also E. Roveda, 'Il beneficio delle acque. Problemi di storia dell'irrigazione in Lombardia tra XV e XVII secolo', *Società e storia*, 24 (1984), 269–84; E. Occhipinti, 'L'economia agraria in territorio milanese fra continuità e spinte innovative', in *Milano ed il suo territorio in età comunale. Atti del 11° congresso internazionale di studi sull'alto medioevo (1987)* (Spoleto, 1989), 245–63; F. Menant, 'Agriculture et environnement: le moment communal dans l'Italie padane', in L. Segre (ed.), *Agricoltura, ambiente e sviluppo economico nella storia europea* (Milan, 1993), 83–96.

[15] L. De Angelis Cappabianca, 'Le ''cassine'' tra il XII ed il XIV secolo: l'esempio di Milano', in *Paesaggi urbani dell'Italia padana nei secoli VIII–XIV* (Bologna, 1988), 375–415.

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conceded to them by the monastic orders, for they found in them both a stable source of revenue and an indispensable support for their strategy of social recognition. Perhaps it was also through the communal management of the water in the suburbs of Milan that the former aristocracy and the new merchant classes, two groups that would soon be amalgamated into a single class directing the service of the seigniorial state, were first brought together. The expansion of the mills in the Milanese suburban enclosure followed the same economic and social logic, making them concentrations of wealth and merchant capital. Again, the hydraulic geography influenced the settlement of what constituted the most significant technological investment of the Middle Ages. Water power was used not only to grind grain, but also to full cloth, saw timber, work metal and prepare paper.[16] It is thanks in part to a fiscal document which divided into sections the expenses of maintaining the public paths in the suburbs of the city, the *Compartizione delle fagie* of 1345, the process by which these mills added to the power and reputation of the city from the end of the thirteenth century can be studied.[17] The communal, and then the seigniorial, power steadfastly promoted the development of these mills, which guaranteed the security of the grain supply for the overpopulated city. From 1216, the mills benefited from the *'favor'* of the communal statutes since 1216 and the public power which protected it from improper use could divert the water of the *'roggie'*, the little diversion canals that accelerated the current up to the mill's vertical wheel.[18]

The water defended and protected, connected and circulated, worked and nourished: the communal age relied on urban water as its vital element, systematizing an increasingly dynamic hydraulic network that had been inherited, in part, from the twelfth century. Everywhere, stagnant water was brought to life. Closest to the city, the circular trench brought a striking testimony of the changes that were being made: doubled by the Redefosso, it lost its defensive role and became a navigable canal. The turrets that jutted out over it were broken up little by little, and conceded to individuals who transformed them into wharves and warehouses.[19] These *'sciostre'*, by opening their porticos and their streams on to the canals, and commanding a new system of roads structured around the *'ripe'* and the *'Terragi'*, a way of access to the edge of the water, profoundly changed the landscape of the outskirts of

[16] L. Chiappa Mauri, *I mulini ad acqua nel milanese (secoli X-XV)*, Biblioteca della 'Nuova Rivista Storica', 36 (1984), 67. For another example of the economical importance of mills, see A. Guenzi and C. Poni, 'Un "network" plurisecolare: acqua e industria a Bologna', *Studi storici* (1989), 359–77.

[17] *Statuti delle strade e delle acque del contado di Milano fatti nel 1346*, ed. G. Porro Lambertenghi in *Miscellanea di Storia Italiana*, vol. 7 (Turin, 1869), 311–437, esp. 374.

[18] *Liber Consuetudinum Mediolani anni MCCXVI*, ed. E. Besta and G.L. Barni (Milan, 1949), ch. 19, 1–2, 107.

[19] The first datable mention of *asciostra* in Milan is the ducal concession to Ambrogio de Bononia, Porta Ticinese (ASCM, *Litterarum ducalium*, Reg. 4, f. 68r, 19 Jan. 1411).

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Milan in the Quattrocento.[20] This transition, from still water to flowing water, represented an evolution that is exactly the reverse of what André Guillerme proposed for northern France.[21] The explanation probably lies in the fact that economic development implied not so much a succession of 'times of the water' as a multiplication of the 'uses of water'; uses that were socially determined and often concurrent, and led the government to face the challenge of arbitration and shared use.

Statutory norms and juridical conditions for a common management of water

The sharing and distribution of water could not be controlled in the absence of a law regulating its appropriation and use. The mutations that affected the Milanese hydraulic network were accompanied by juridical adjustments which, in the first stage, hampered any statutory unification. The reason for this is simple, and arises from Roman law: all rivers are public, and no one can appropriate the course that they take. The Milanese courts made a restrictive reading of this fundamental principle and, since the peace of Constance, argued that only streams of navigable water enjoyed this public status.[22] It was the custom in 1216 that everyone could draw the river water freely, provided that he or she did not damage the '*commodum*' of other users[23] and this tradition remained unchanged, since the statutes of 1502 reaffirmed the right of all to dig '*aqueductus opportuni de lapidus & cemento vel lignamine*'.[24] Thus, in a region where geological conditions made the digging of diversion or small canals easy and inexpensive, the statutory law could neither prevent nor control this freedom of use, and the jurists never missed revisiting this principle if the lords attempted to exceed this inalienable right. When, for example, in 1266, the Menclozi and Saporiti families passed an agreement for the construction of a *'roggia'* diverting the water from the Lambro into the region of Linate, it was a matter of a purely private contract where public had nothing to say.[25]

Since the trenches and canals were not navigable, the water in them was not, in a juridical sense, public. Because they had been dug at the expense of the inhabitants, however, they became the property of the commune. Under this heading, the financing of their maintenance had

[20] L. Patteta, *L'architettura del Quattrocento a Milano* (Milan, 1987), 351.
[21] A. Guillerme, *Les temps de l'eau. La cité, l'eau et les techniques* (Paris, 1990), 142.
[22] F. Sinatti d'Amico, *Per una città. Lineamenti di legislazione urbanistica e di politica territoriale nella storia di Milano* (Lodi, 1979), 47. For the distinction between *regalia maiora* and *regalia minora*, see D. Balestracci, 'La politica delle acque urbane nell'Italia comunale', *Mélanges de l'Ecole française de Rome. Moyen Age*, 104 (1992), 431–79, esp. 432.
[23] *Liber Consuetudinum*, 107.
[24] *Statuta Mediolanensis Urbis* (Milan, 1512), f. 86.
[25] R. Perelli Cippo, 'Sulla linea dei cisterciensi. Accordi per la costruzione di una roggia in un documento milanese del 1266', *Nuova Rivista Storica*, 70 (1986), 159–73.

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also to be undertaken by all of their users.[26] As early as the Trecento, the ducal registers are cluttered with decrees that remind the Milanese of this obligation to maintain the rivers and their character, and threatened contraventions with heavy fines.[27] The sharing by sections of the charges for strengthening the banks or clearing the canals was implemented more and more meticulously, and the princely power, as guarantee of the common good, played a decisive role in this attempt at regulation. Thus, in 1485, and then again in 1493, the Duke of Milan fixed a scale of water charges (1 sou for a measure of irrigated meadow, 4 lire for a mill-wheel, 4 lire as well for a small barge, etc.) which defined a fiscal hierarchy for different uses of the water.[28] However, because such uses were sometimes incompatible, this system of financing reached its limits very quickly. The prince therefore increasingly made direct interventions so as to find money for emergency works.

The great suburban proprietors sought also to protect their exclusive use of an irrigation network that had been dug at their expense. Since landownership included the property rights over the water that flowed through it, this water became an economic good like any other and was liable to appropriation. Nevertheless, the development and enlargement of an integrated hydraulic network in the thirteenth century inclined proprietors to take precautions against usurpers. Hospitals, monasteries, great families, all the users of the Olona, combined as early as 1236 to control the level and the span of the water.[29] The same 'statuta et ordinamenta' was passed by the users of the Vettabia in 1256[30] and, four years later, in 1260, it was the turn of the people from Nirone, the ground landlords, and also the claim holders of mills and manufacturers of fustian, to organize the common defence of their acquired rights.[31] In all cases, an officer was named to manage the uses of water (consul for the Olona, 'Antianus' for the Vettabia, 'comparo' assisted by six elders for the Nirone) according to a purview that prefigured what would later be the communal administration of the water.[32] Moreover, public power made itself increasingly evident: the statutes of the Vettabia were ratified by the assessor of the Podesta of Milan, those of the Nirone were drawn

[26] Fantoni, *L'acqua a Milano*, 39.

[27] For example, during the years 1413–15, ASMi, *Panigarola*, f. 68v–69v, 30 Aug. 1413; f. 90, 31 Jan. 1414; f. 97, 28 Apr. 1414; f. 100v, 16 May 1414; f. 109r, 14 Sep. 1414; f. 124, 1 Feb. 1415; f. 130v, 5 Apr. 1415; f. 183r–184v, 2 Oct. 1415.

[28] ASMi, *Panigarola*, Reg. 10, f. 218r–220r, 29 Jan. 1485 and Reg. 23, f. 67r–68r, 9 Nov. 1493.

[29] Chiappa Mauri, 'L'uso delle acque', 143.

[30] *Statuta utentium de acqua Vitabiae*, ed. A. Ratti, 'Del monaco ciscertense don Ermete Bonomi e delle sue opere', *Archivio Storico Lombardo*, XXII (1895), 303–82, esp. 373–5. For Sinatti d'Amico, *Per una città*, 186, this text is '*un prototipo di autodeterminazione di utenti*'.

[31] *Statuta Nironis*, ed. G. Porro Lambertenghi, in *Miscellanea di Storia Italiana*, vol. 7 (Turin, 1869), 433–7.

[32] For the function of *camparius*, see P. Toubert, 'Les statuts communaux et l'histoire des campagnes lombardes au XIVe siècle', *Mélanges de l'Ecole française de Rome*, 72 (1960), 397–508, esp. 427–9, now in idem, *Etudes sur l'Italie médiévale (IXe–XIVe siècles)* (London, 1976).

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up by a notary of the commune, and the whole was integrated in 1346 into the Public Water Statutes.[33] Not that the communal administration used force to meddle in these private accords; it was, on the contrary, as a result of the proprietors' requests that it became the guarantor of these statutes. The users of the water invested the communal power with the duty of protecting them against usurpers' efforts to divert the water. If the political struggles at the end of the thirteenth century did not allow the water official to fill this role, the despairing proprietors then required Matteo Visconti to invoke a 'comparo delle acque', that is the extension of the jurisdiction over all the water of the Milanese region.[34]

The creation of a specialized magistracy in charge of the management of the water must not be understood as an interference by seigniorial power, but, on the contrary, as the response to an expectation that had been formulated for a long time. The merchant who was interested in the navigability of the river network and therefore in the abundance of its waters had conflicting interests to the ground landlord who, on the contrary, sought to increase the intake of the water even if the canals downstream had insufficient supplies. The millowners of course were always afraid of seeing their activities stop altogether for a lack of water. Interested parties each turned towards the seigniorial state to arbitrate their disputes. The charge of 'giudice delle acque' was attested to as early as 1346 in the *Statuti delle strade e delle acque*, and was incorporated into the Communal Statutes of 1396. Nevertheless, from at least 1385 on, the waters, routes and bridges were managed by the same increasingly complex administration.[35] Named by the Duke, this officer guaranteed the constancy and abundance of water in Milan, a power which entitled him to intervene upstream, far into the countryside. This duty, characteristic of the territorial and princely state, was reserved by statute to foreign jurists. In practice, however, the Milanese obtained this office with increasing frequency, and even though the statutes continued to forbid it until the end of the fifteenth century when such nominations became the rule under the Sforza. At that point the Milanese hierarchy reappropriated this office, which was frequently sold or was sometimes transmitted to sons, and their power over such patronage was reflected in the fact that the Duke conceded his right to name the water officers in 1408 to his adviser, Galeotto Malatesta.[36]

It was thus largely by the will of the most important users that a centralized magistracy for managing water was created. This institution evidently was moving towards unifying the juridical statutes, the diversity of which could not resist the integration of the network for long. How could the public water of the navigable river be 'privatized'

[33] *Statuti delle strade e delle acque*, 415–16 (chs 76–9); 417–18 (chs 82–5); 420 (ch. 89).
[34] Chiappa Mauri, 'L'uso delle acque', 153.
[35] Fantoni, *L'acqua a Milano*, 122.
[36] ASCM, *Litterarum ducalium*, Reg. 3, f. 67v, 17 Aug. 1408.

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while crossing the great irrigated suburban estates, and then become common property when approaching the townspeople's trench? By mixing their water, the canals, ditches and diversions of any kind diluted their juridical specificity. The management of the water became the business of all, and thus one of the most powerful stimuli for political integration. It became the duty of the princely state to decree the common rules, and this necessity was particularly pressing in the case of public hygiene. For the circulation of urban water was always ambivalent: although it was the bearer of riches and the dispenser of abundance, it could transport dirt and disease as well. The anxiety of infection, and of stagnant and putrid water that retained what it should have eliminated, was a constant worry that evidently increased in times of plague. Confronted with this anxiety, the juridical distinctions (public water, common water, private water) no longer held. The first urban statutes, though far from being a specifically Milanese situation, regulated industrial locations at the edge of the water, identifying those that caused the most pollution and placing them furthest away from the centre of the city. Similarly, the use of seigniorial power led to a supervised system to deal with waste water, by means of small channels built at the expense of individuals or by tanks which were often placed between the houses.[37] The legitimacy of such interventions, which was uncontested in matters of hygiene, was, nevertheless, much less so in regard to the economic management of the uses of water. The creation of a single magistracy did not, in effect, mean that centralization had triumphed definitively. What the princely power sought fundamentally was less to impose a single and overarching law than to insinuate itself into the social discontinuities and economic conflicts that the quality and abundance of water created.

The mirror of the prince as 'buon governo'

'Modulare, moderare': modulate and moderate the intake of water and the diversions, ensure a harmonious and regular flow, guarantee an equitable sharing; such was the princely concern, constantly reaffirmed in practice. This ambition, which was as much ideological as economic, consisted of claiming a power that had more to do with arbitration than constraint. The constitution of a single law for managing the water for all the Milanese would only truly begin with French domination during the long struggle of the sixteenth century.[38] When Filippo Maria Visconti, in 1445, believed that he would be able to submit the intake of water in all the rivers and canals to the attainment of a ducal licence, he demonstrated his political weakness more than his ambition, and when faced with protests could not escape a humiliating volte-face.[39] Princely

[37] Fantoni, *L'acqua a Milano*, 107–10.
[38] G.B. Settala, *Relationi del Naviglio Grande e di quello di Martesana* (Milan, 1603).
[39] ASMI, *Acque*, cart. 1, 22 Jun. 1445, and 6 Apr. 1446.

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power, as this incident had definitively shown, could show its strength only by settling conflicts. Concerning the use of water, such conflicts were incessant since the interests of the different users often diverged. Certainly, custom had, for a long time, fixed the technical norms for the diversion canals (*'rogge'*) and for the valves of the intake of water (*'bocche'*).[40] Sometimes, even, the statutes had imposed hours of opening and closing for the 'bocche' turning the water toward the irrigated cultivations in order that the 'roggie' of the mills would always be supplied.[41] Such a system could only be effective, however, if the flow of the water was constant, which constituted precisely the terms of these statutes. In reality, the technical means of the time made the measuring of flow and power virtually impossible.[42] The sharing of water could only be approximate and, consequently, conflictual. How, for example, could this petition by citizens who, in 1482, denounced an improper diversion of the circular canal, be judged? The water of the Nirone that had plunged into the trench at the height of the Porta Comacina was diverted towards Porta Vercellina and the south of the city, thus leaving the inhabitants of the Porta Nuova with the polluted air of a dry canal that no longer discharged impurities. Now, they specified, 'old dispositions' had ordained that three-fifths of this water had to flow towards Porta Nuova.[43] The Duke's power was invariably solicited by such conflicts of usage and, in order to respond to them, he could extend his influence further by dispatching his officers and engineers to those places. The careers of most of the ducal engineers, who were often specialists in hydraulics, testify to these interferences on his part. Thus, Aristotele da Bologna, who had been in the service of Francesco Sforza since 1458, was first sent to Parma to supervise work on the 'Naviglio civico'.[44] By the politics of water, the Dukes of Milan affirmed and frequently extended their rights over the cities of the duchy, which were always prompt at recovering their autonomy.[45] There again, it was by becoming part of a local conflict that the princely power reached its

[40] For example, in 1402, three communal engineers, Tomaso de Comite, Antonio de Melzo and Marcholo de Pecortis reported with many details: *'Sola ipsius buchae est alta a fondo navigii tergis duabus et longa brachiis tribus alta a solia tertia una et a dicta tertia super versus cellum est murata taliter quod non potest exire aqua et per talle modum ipsa bucha est taliter ordinata et moderata quod non potest defluere ex ea de aqua fluminis navigii nisi in quantitate once quadraginta octo'* (ASMi, *Registri Panigarola*, Reg. 3, f. 199r–200r, 9 Jan. 1402).

[41] ASCM, *Litterarum ducalium*, Reg. 14, f. 54v–55v, 16 Jun. 1480.

[42] S. Escobar, 'Il controllo delle acque: problemi tecnici e interessi economici', in *Storia d'Italia Einaudi, Annali 3* (Turin, 1983), 85–156 and idem, 'Il tecnico idraulico tra saper e saper fare', in *Leonardo e le vie d'acque* (Florence, 1983), 11–25.

[43] ASMi, *Sforzesco*, cart. 1086, 25 May 1482.

[44] L. Beltrami, *Aristotele da Bologna al servizio del duca di Milano, 1458–1464* (Milan, 1888).

[45] G. Chittolini, 'Governo ducale e poteri locali', in *Gli Sforza a Milano e in Lombardia e i loro rapporti con gli Stati italiani ed europei (1450–1535)* (Milan, 1982), 27–41 and P. Racine, 'Les Visconti et les communautés urbaines', in *Les relations entre princes et villes aux XIVe–XVIe siècles: aspects politiques, économiques et sociaux (Rencontres de Gand, septembre 1992), Publications du centre européen d'études bourguignonnes (XIVe–XVIs)*, 33 (1993), 187–99.

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goals. Aristotele was thus sent into the region of Cremona in 1460 *'per intendere quanto dicono li huomini di Soncino in la materia de tale naviglio'*.[46] The city of Cremona, whose canals were, in part, fed by the diversions of the Olio, planned to dig a supplementary feeder canal which would take its source further to the north, upstream of the Soncino, on the right bank of the Olio. The people of Soncino were opposed to such a project and refused to see themselves thus bypassed by a diversion canal, which would expose them to the risk of floods. This attitude, which was inspired, no doubt, by the hope of speculating on the lands destined for the works of the Cremonese, was emphatically denounced in Aristotele's report, where the engineer set out systematically all the advantages that Cremona and its prince would gain from the project.[47] This document enumerated all the political, economic and social uses of water. For the city, running water would constitute, first of all, the best defence both against enemies[48] and against epidemics.[49] It would be a source of agricultural and industrial wealth,[50] and, finally, and this was a new requirement, it would beautify the urban landscape as much by itself as by the new constructions to which it would give rise.[51] The prince would be the first beneficiary of all these improvements, and it was with great economic realism that Aristotele foresaw all the supplementary resources that could be expected from them: a tax on mill wheels, taxes on hay and grains, ground rents, tolls on the procurement of supplies and trade; water was a fiscal matter as well. Thus Aristotele da Bologna calculated that the princely state would easily end up as a beneficiary of this new construction which he estimated required an investment of £24,000.

It was therefore thanks to conflicts and rivalries created by hydraulic development that princely power was able to impose its control on the whole of the Po plain. This is why public power never sought to impose regulations on the provision of drinking water, and never even constructed any public fountain, a rare occurrence in Italy. Bonsevin de la Riva affirmed that Milan possessed 6,000 wells, each house having a 'source of live water'.[52] If the figure remains unverifiable, the fact is realistic: thanks to the shallowness of the ground water, digging a well was possible financially for everyone; in consequence, the fountain was

[46] Bibliothèque Nationale de Paris, *Manuscrits italiens*, cod. 1595, f. 229r, 23 Jul. 1490, ed. Beltrami, *Aristotele da Bologna*, doc. IV, 30.
[47] *Ibid*., f. 234, n.d., doc. V, 31–4.
[48] *Ibid*.: *'Primo per esso navilio se fortifica la citade assai perche per esso navilio se mantene lacqua nele fosse della citta continuamente et anche la dicta aqua decorrera continuamente per li redefossi ala presente sono sutti et in modo che se poria andar appedi alle mura della citta, et per altro modo non se po da lacqua alle dicte fosse et redefosse'*.
[49] *Ibid*.: *'Item la citade se resanera e se defendera dalla contagione del morbo'*.
[50] *Ibid*.: *'Item se bonificara larte della lana per le fosse e per le tentorie che al presente non se po follar panni ne tenger per mancamento dacqua'*.
[51] *Ibid*.: *'Item se ornara la cita perchè tutti li hedificii sono nella citade e de fora se redificarano quali tutti sono andati in guasto zoe molini foli e resige a altri edificii'*.
[52] Bonvesin de la Riva, *De Magnalibus Mediolani*, 32.

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not a social or political necessity. There was no 'war of the wells' in Milan, for it was the conflict of uses that involved political regulation.

If, by its politics of sharing and arbitration, the state legitimized itself as distributor of order and equity, it should be understood that it was in its own interest to settle these conflicts. By its politics of water, the princely power often served as a brake on the ambitions of the oligarchy to which it owed its power. In this respect, the story of the Navilio de la Martesana is exemplary. By a decree of 1 July 1457, Francesco Sforza decided on the construction of a canal that, by deviating from the Adda, would link Milan to Lake Como.[53] This great initiative completing the Milanese river network was along with the Ospedale Maggiori only one of a large number of public works undertaken by the new duke to establish his political legitimacy.[54] La Martesana, which was financed entirely by taxes, would receive water from the prince. The layout of this new canal followed exactly the plan that a group of the great names of the Milanese nobility had suggested to Filippo Maria Visconti on 3 June 1443 in order to improve and irrigate their lands.[55] The works of Francesco Sforza followed the project of 1443 so faithfully that the work of making the canal navigable was not even undertaken: the Martesana did not reach the circular trench. It was necessary to wait until 1496 for the digging of the last section that linked the canal to the urban trench, and in order for the Martesana to lose its exclusive right to irrigate the great feudal property of the princely state.[56] If the duke reserved the exclusive use of the water of the Martesana for himself, thus making this canal a patrimonial possession, it was in order to concede it to the powerful or to offer it to the faithful. Thus an enquiry of 1472 enumerated throughout the canal 50 authorized 'rogge', of which 15 had been given, 17 sold and 18 conceded. In 1486, a similar list enumerated 30 that had been given and 18 that had been sold.[57]

The princely distribution of water thus participated in a politics of favouritism, and therefore did not always obey strictly economic imperatives. The cathedral *Fabbrica*, for example, which played an active role in enlarging the navigable network, always did so under ducal protection. The marble blocks of the quarry of Candoglia were moved from Lake Maggiore by the Tessin, and then from the Naviglio Grande up to the gates of the city, to the 'laghetto San Stefano', the basin from where the

[53] ASMi, *Acque*, cart. 889, 1 Jul. 1457.
[54] P. Boucheron, 'Les expressions monumentales du pouvoir princier à Milan au temps de Francesco Sforza (1450–1466)', in idem, *Les princes et le pouvoir au Moyen Age. Actes du XXIIIe congrès de la société des historiens médiévistes de l'enseignement supérieur* (Brest, 1992; Paris, 1993), 117–35.
[55] G.P. Bognetti, 'Per la storia dello stato visconteo', *Archivio storico lombardo*, LIV (1927), 237–357, esp. 309–22 and idem, 'Da chi fu ideato il naviglio della Martesana', *Città di Milano*, LXVII (1950), 114–15.
[56] Fantoni, *L'acqua a Milano*, 71.
[57] ASMi, *Acque*, cart. 886, 7 Apr. 1472 and 1486 (n.d.).

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construction materials were unloaded.[58] In 1396, the duke conceded to the factory the exclusive use of the Laghetto, the merchants being unable to have access to it without a licence granted to them by the deputies of the works.[59] The great building of the cathedral progressively imposed its control on the whole of the river network, of which it was the first user. When, in 1438, the architect Filippino degli Organi da Modena and the engineer Fioravanti da Bologna (the father of Aristotele) constructed the first double lock in Milan, the Conca di Viarenna, it was on account of the cathedral works.[60] This technological innovation resolved a major difficulty: the navigable double lock allowed a way both to overcome the differences in the level of the terrain, and to regulate the flow of water into the canals. In this respect, it was a major element in the politics of 'moderating' the intake of water, and this is why it would be up to the duke of Milan to systematize the use of it throught the canal of the Martesana. As to the *Fabbrica* of Milan, they used the lock of Viarenna in a purely fiscal manner, leasing for themselves the rights that the duke had conceded to them.[61] From that moment, water became the element of a group of clients, and the prince distributed it, as he distributed his favours, more and more extensively, while the real bases of his power were gradually becoming smaller and smaller.[62] The duke who claimed to defend the uses of water against all of its diversions and improper uses had helped produce, in reality, an even greater detour; water fed a number of systematic alienations that would precipitate the internal crisis of the Sforzian state.

In 1493, Ludovico the Moor decided to divert the water that supplied the fountain in the park of his castle towards the gardens of Santa Maria delle Grazzie.[63] This water drawn from the ancient circular ditch of Milan, running through the gardens and the hunting-grounds for the sole pleasure of the prince and his courtiers, was perhaps the last remnant of the ducal policy. Economic water, the water that defended, linked and nourished, the water that irrigated and made the mills turn, henceforth, passed far from the castle. Public power had a hold on it only inasmuch as it could manage its uses, arbitrate the division of it, and guarantee its constant and regular flow. From this point of view, the politics of water highlighted the social inequalities that were covered

[58] P. Braunstein, 'Les débuts d'un chantier: le Dôme de Milan sort de terre (1387)', in O. Chapelot and P. Benoit (eds), *Pierre et métal dans le bâtiment au Moyen Age* (Paris, 1985), 81–102 and idem, 'Il cantiere del Duomo di Milano alla fine del XIV secolo: lo spazio, gli uomini e l'opera', in J.-C. Maire Vigeur and A. Paravicini Bagliani (eds), *Ars et Ratio. Dalla torre di Babele al ponte di Rialto* (Palermo, 1990), 147–64.

[59] ANNALI, vol. 1, 158, 30 Jan. 1396.

[60] Fantoni, *L'acqua a Milano*, 36–9.

[61] ANNALI, vol. 2, 183.

[62] F. Leverotti, 'La crisi finanziaria del ducato di Milano alla fine del Quattrocento', in *Milano nell'età di Ludovico il Moro. Atti del convegno internazionale*, 2 vols (Milan, 1983), vol. 2, 585–632.

[63] ASMi, *DDS*, 8, doc. 70, 14 Feb. 1493.

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over by sovereignty. The prince wanted to make water into the mirror image of his good, equitable and impartial government; the historian sees in it the reflection of the social forces and economic interests that sustained the Sforzas' state. Water flowing through the area of Milan probably never had the pacifying and unifying role that princely ideology had lent it: more often, it strengthened social disparities, exacerbated economic conflicts and brought political differences to light. It was, without doubt, a principle of erosion, but one that was remote from the gentle formulation that Leonardo de Vinci, at the court of Ludovico the Moor, gave to it: 'The water erodes the mountains and fills the valleys; if it could, it would reduce the world to a perfect sphere'.[64]

[64] Leonardo da Vinci, *Codice Atlantico*, f. 185v.

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