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Water management in Milan and Lombardy in medieval times: an outline

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Abstract: The abundance of water has certainly been a very important resource for the development of the Po Valley and has necessitated, more than once, interventions of regulation and drainage that have contributed strongly to imprint a particular conformation on the land. Already in Roman times there were numerous projects of canalisation and intense and diligent commitment to the maintenance of the canals, used for navigation, for irrigation and for the working of the mills. The need to control the excessive amount of water present was the beginning of the exploitation of this great font of richness that was constantly maintained in subsequent eras. In the early Middle Ages, despite the conditions of political instability and great economic and social difficulty, the function of the canals continued to be of great importance, also because the paths of river communication often substituted land roads, then left abandoned. After the 11th century A.D. the resumption of agricultural activity was conducive to the intense task of land reclamation of the Lombardian countryside and of commitment by the cities to amplify their waterways with the construction of new canals and the improvement of those already existing. The example given by Milan, a city lacking a natural river, that equipped itself with a dense network of canal, used in various ambits of the city life (defence, hygiene, agriculture, transport, milling systems) and for connections with the surrounding territory, can be considered as emblematic. In the surrounding countryside, the activity of the Cistercian monks of Chiaravalle represents one of the situations more indicative of how land reclamation and waterways contributed fundamentally to the organisation of the territory over the span of the ages.

Key words: *agriculture, drainage, irrigation, Lombardy, Middle Age, Po Valley, reclamation, water*

THE WATER NETWORK IN THE CITY: LOOKING AT THE MILAN CASE

The organisation of historic Lombardy and its capital city in medieval times was well placed in ancient tradition. Milan is at the northern confines with the lower Padana plain, in an area characterised by the presence of numerous springs[1] and in which the soil and the impermeable subsoil allowed abundant surface down flow, which raised the problem of drainage of the water[2]. The problems caused by the presence of abundant, spontaneous sources of water had found solutions al-

ready in ancient times: in the IV century B.C. one has records of the settling of the Celtic Insubri, and in the I century B.C. we have records of land reclamation in the southern area of the city and the surrounding countryside, accomplished with the installation of an irrigation system that channelled off the stagnant waters southwards. Other types of drainage systems have been found under the foundations of Roman edifices of the III–IV centuries A.D[3]. The *centuriazione*, the assigning of land to colonies in Roman times, contributed greatly to the land reclamation and the agricultural development of the plain; in parallel with this the Romans had tried to exploit, also from the point of view of commerce and the defence system, the river nearer the city, so that the successive irrigation works have not devastated the hydraulic situation introduced by the Romans[4]. In the medieval age the Seveso and the Lambro are outlined as a fundamental axis of the eastern hydrographical system of Milan and the Olona and the Nirone for the western system (Fig. 2 and 3). The Seveso, originating in the springs near Como, flowed alongside, firstly along one bank then along another, of the ancient Comasina Roman road that linked Milan with Como, even if the archaeological finds of the bronze and Iron Age lead us to believe that the course of the river preceded the road. The medieval settlements that appeared in the vicinity to the canal were firstly linked to the presence of the mills[5]: these and the large number of locks[6] made the navigation difficult, but favoured the exploitation of the water of the Seveso for the irrigation of the properties, both clerical and laymen[7] by the excavation of the ditches sometimes in existence up till now[8]. Also the Lambro was a river from springs, crosses Brianza and arrives at Milan. Since ancient times the Lambro had represented for Milan, that was reached by the Vettabbia, the possibility to connect with the Po, of which it was a tributary, near Piacenza where the port used by the Milanese was situated and from where it was possible to meet up directly with the Adriatic sea (Fig. 1). Besides, in the era preceding the Roman era the Lambro was an important communication path together with the route that went from Bologna towards Lodi and Milan, the future via Emilia (Fig. 1). This role, fundamental even in the Middle Ages, went side by side with the river that was densely occupied with hydraulic plants both around Monza (Fig. 2)[9], but even more so along the middle part of the Lambro, in the area near Milan, in a territory east of the city, where the river flowed in open countryside. As opposed to other rivers the Lambro guaranteed a constant and sizeable supply of water, so much so that in the XIII–XV centuries it became the "the hub of a complex network of canals, irrigation ditches and trenches made and adapted with the aim of maximising the potential irrigation and energy supplies"[10]. These two forms of exploitation of the water from a canal or river tended to coexist: in fact, the relative ease of excavating the terrain allowed the opening of secondary canals, or irrigation ditches that could act as irrigation, or as energy for the mills or both. In fact often, and not only as far as the Lambro is concerned, as the copious regulations and decisions issued by the relevant authorities demonstrates,

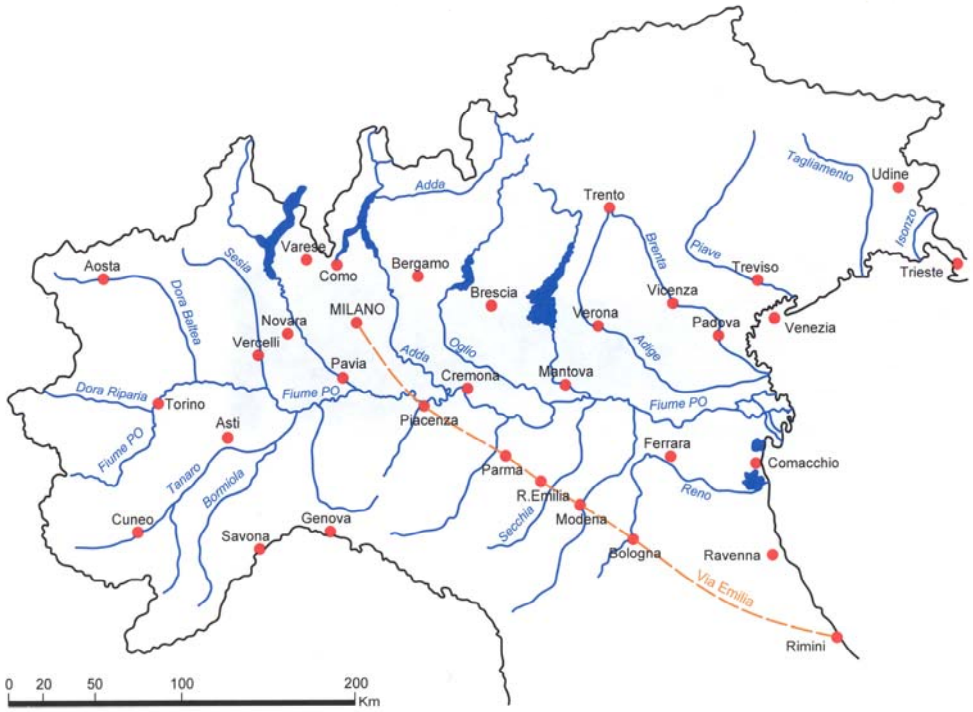

Fig. 1. The Po Valley

this was the origin of endless arguments and abuse of the use of the water. Frequently, activities disturbed other users, for example, like the installation of locks, mechanisms that could be and usually were very simple and easily removed, that could also be obstacles and impede the normal flow of the waterways[11]. The acquisition of the rights of the waterways of the Lambro, something that Milan gained over its rival Lodi after the peace treaty of Costanza at the end of the XII century, signified, given the powerful renewal of agricultural activity mainly due to the Cistercian monks, not only a guarantee of the right of an important river[12], but also the possibility to restart intensive exploitation of the territory, that in the balance of different and sometimes contrasting interests, imprinted the Lombardian countryside with distinct characteristics.

The Olona is a river that has its origins of springs in the area near Varese and at the height of Rho was deviated to Milan, where it took the name of Vepra or Vetra (Fig. 3). The Nirone, indigenous of the Groane (Fig. 2), north of Milan, entered the city by the Giovia gate, where the Sforzesco castle now stands (Fig. 3), and flowed into the Vettabbia. The *fossatum* (moat) that spanned the city in a circle, completely covered in the first decade of the XX century, was dug out to be used as defence in the XII century, with a larger perimeter as opposed to the Ro-

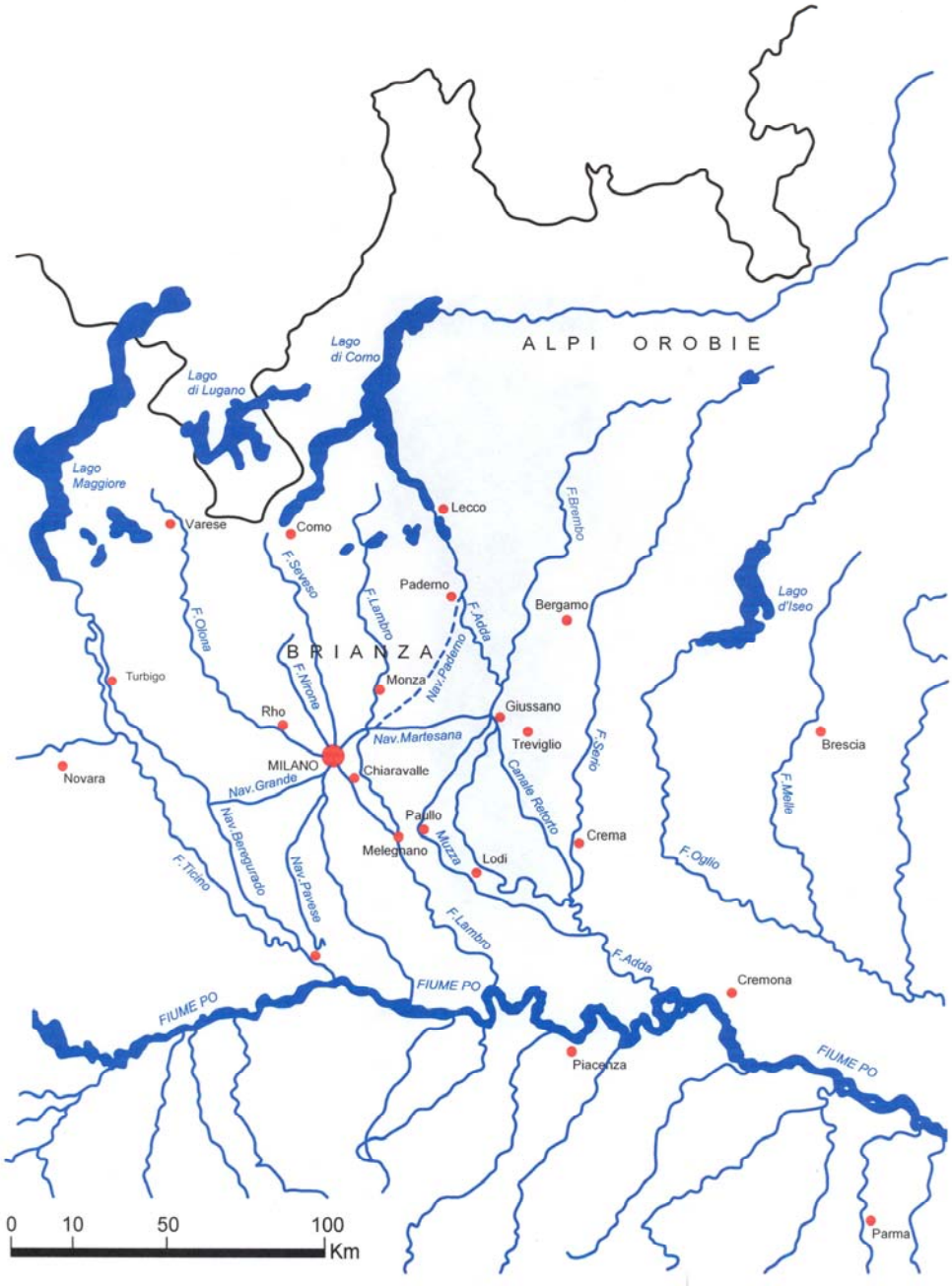

Fig. 2. Rivers and canals in Lombardy

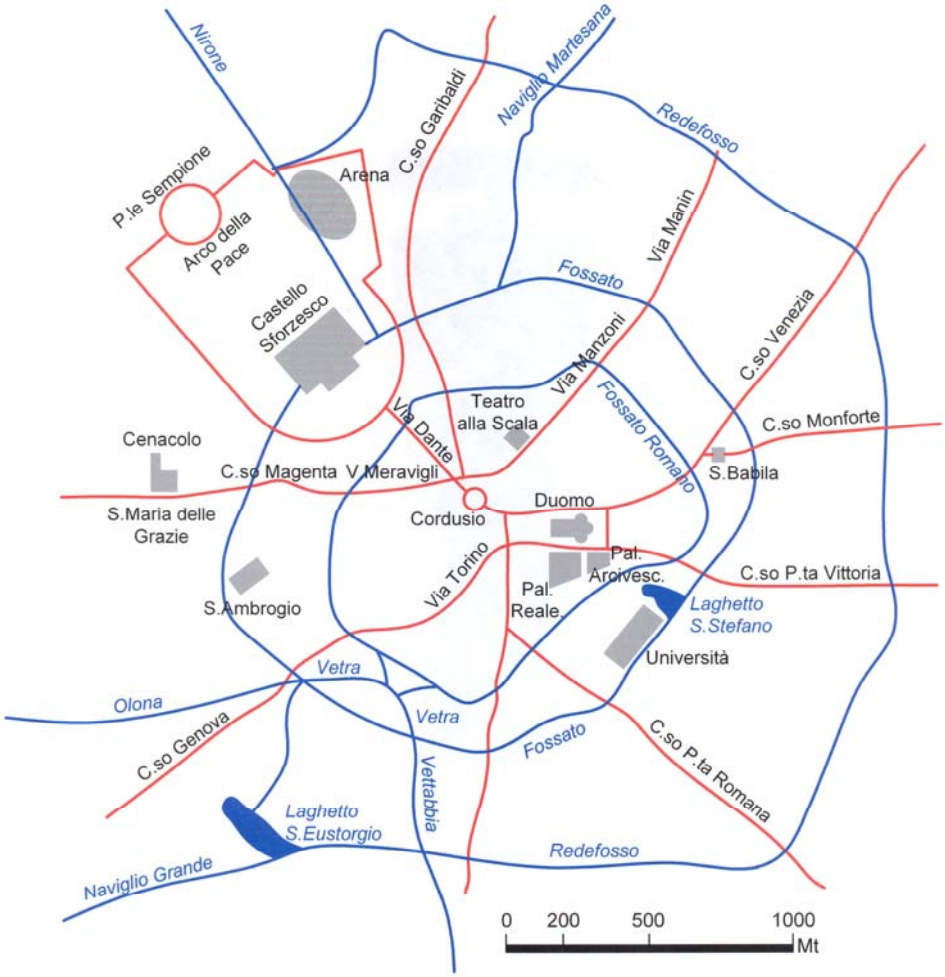

Fig. 3. Milan in the XV Century

man moat of the I century BC. However, it soon assumed the function of linking, in a way that made them usable for the various urban activities, the various existing rivers of the city and new canals. The new canals (Fig. 3), dug out to allow the supply of the marble for the cathedral to the construction site, and the Redefosso (Fig. 3), for which in an irrigation ditch north of the city, one proceeded, starting from the first half of the XIV century to the excavation of a canal that circled Milan on three sides at north, east and south. Also in this case the initial reason was for defence and was later followed by a customs barrier.

Also in the city, water from the canals was used to irrigate vegetable gardens, but certainly the presence of the canals and above all the presence of the *fossatum* was linked, as well as hygienic reasons, to the possibility of commerce, as was

demonstrated by the numerous stopping points and at the manufacturing activities that used the water as a source of energy[13]. Also the difensive system provided, especially in the 11th and 12th century, the excavation of the canals and the origin of the most important milanese canal, the *Naviglio Grande* (Fig. 2 and 3) is just linked to this reason.

THE NAVIGLIO GRANDE (THE GREAT CANAL)

The *Naviglio Grande,* dug out west of the city, derives from the Ticino and the first section was carried out in the XII century as a defence canal against the Pavesi allies of Barbarossa. The works necessary for the enlargement and the deepening of the riverbed in order to allow navigation, possibile solo a partire dal 1270, promoted the use of the Great Canal for irrigation and later on to operate the wheels of the mills[14], in a productive structure in which the agricultural economy integrated with the artisan-industrial development. A new draining was therefore necessary, to substitute the Vettabbia (Fig. 2) and the expenses were contributed by the actual users of the Vettabbia, for example, the great religious authorities of Chiaravalle (Fig. 2), S. Calimero and S. Celso, who in this way could also have a claim to waterway rights on the new canal[15].

THE VETTABBIA AND THE MEADOWS OF CHIARAVALLE

It is the case, for example, of the properties of Chiaravalle, a monastic community under strict Benedectine rule founded in the 12th century just near the Vettabbia, to obtain water for cooking, hygiene and the mills, which from X century were distributed along the course of the river from the gates of the city up to the position in which the Abbey was situated[16]. In the XII and XIII centuries the monks dedicated themselves to the establishment of a land patrimony of various origins and types, but around 1280 it was organised in such a way that irrigation occupied prime place, as Bonvesin da la Riva emphasises citing the Chiaravalle monastery as one of the main producers of hay of the countryside[17]. Besides, the cultivation of irrigation systems permitted not only to increase hay production, but also to improve the quality and strengthen the cultivation introducing a mixed system. The irrigated fields constituted, therefore, an important item in the monastic enterprise, so much so, that in the XV century their management was separated from the arable management. Therefore, it had lead to the necessary development of a water network originating in Vettabbia, of which the monks had the guarantee of use, its provenience from the Great Canal assured a continual supply, and it enlarged to satisfy all the necessities of all the sections of fields. The Vettabbia represented the main trunk of a dense water network, consisting of streams mainly deriving from

the Vettabbia itself, but in more than one case they had different origins, for example, the resurgences. No matter how large and efficient a water network is it would never be able to satisfy all the water necessities of a vast complex of fields if for the irrigation one didn't use, alone or integrated with those directly obtained from a ditch, also the refluent water coming from more fields, not always adjoining, that were left to flow slowly taking advantage of the slopes of the terrain[18].

THE MUZZA CANAL

Cultivation of irrigated fields in the Lombardian countryside had already increased thanks to the excavation of the extension to a canal which had been important ever since Roman times: the Muzza canal (Fig. 2). A new section was opened up to Paullo, reaching the Po after crossing the territory of Lodi, from the original bed, between the Cassano and the Lambro, wich was kept as draining. The excavation was authorized by a diploma of the emperor Federico II and was accomplished between 1220 and 1230, to the benefit of Lodi's population and of local properties of the Milanese people[19]. Opening this new water course allowed the opening of several other ditches, deeply influencing the territory: vineyards, walnut groves and woods decreased while falx, wheat and other cereals cultivation but especially meadows increased in numbers, paving the way for the great development of animal breeding from the XV century[20].

THE NAVIGLIO DELLA MARTESANA (THE MARTESANA CANAL)

Another canal originating at the Adda, but dating from the XV century, is the *Naviglio della Martesana* (Martesana Canal), taking its name from the region it crosses. Although it was evident that such canal would be very useful, its construction was not at all straichtforward. Already in 1443 Filippo Maria Visconti, with the instructions *Ordo rugie extrahendi ex flumine Abdua,* authorised a group of Milanese noblemen to open a canal in the Martesana area originating at the Adda, with the function of irrigation and the operation of ten milling wheels[21]. This project never carried out, was taked back from Francesco Sforza, who at 1st of July 1457 ordered the excavation, while the work commenced three years later. However, even though the Martesana in 1496 was prolonged to Milan to encourage connections between the capital of Lombardy and the surrounding countryside, the objectives of irrigation and operation of the hydraulic plants were always considered paramount, while navigation was feasible only for short distances due to the course of the source of the river that was not always verifiable and the hard and brittle rock in which the river bed was excavated[22].

THE CREMASCO TERRITORY AND THE RETORTO CANAL

The care and attention of the conservation, development and expansion of the cultivation of the irrigated lands was a standard feature on the Lombardian terrain, so much so, that even the nearby Republic of Venice observed the noteworthy aspects with great interest This was especially so in the second half of the XV century when the so called territories of beyond the Mincio (Fig. 1), i.e. bresciano, bergamasco and cremasco, which had recently passed from the domain of the Milanese to the Venetian domain, acted the pilot role in the territories of San Marco[23]. Nevertheless, it must be emphasised, and this is the specific case of the Retorto canal, that from the point of view of the agricultural exploitation, of the settlement typology, of the products and the economical importance, the difference in the change of public entity is not noted, even despite the inevitable controversies regarding the water duties, concessions, privileges and above all the charges and the fiscal revenue[24].

PROJECT FOR THE NAVIGLIO DI PADERNO D'ADDA (PADERNO OF ADDA CANAL)

On the 6th of September 1516, François I of Valois-Angoulême, King of France since January 1515 and Duke of Milan for less than a year, commissioned the senate of the Lombardian capital to establish a committee to choose the position in which to excavate the new Naviglio. For this venture it would be necessary to use a part of the ten thousand duchies derived from the duties on merchandise, pertaining to the ducal chamber, donated by the king to the Milanese people in response to two of their petitions[25]. Four years later Carlo Pagnani published the result of the work of this commission with the title *Decretum super flumine Abduae reddendo navigabili*[26] and the Naviglio, which it refers to, is Paderno of Adda (Fig. 2) that, even though completed more than two centuries later[27], was already subject of many studies, including those carried out by Leonardo da Vinci[28]. The gesture by François I was an astute political move made by a victorious king, determined to regain possession of his privileges and desiring, at the same time, to gain support in the city. The authorisation for the opening of a new canal, the main function of which was to compensate the poor navigation opportunities offered by the Martesana canal, would integrate the king of France into the customs of the Milan lords that had preceded him, who had recognised the management of the rivers as a significant political instrument, and a profitable way of collecting taxes and principal source of productive growth. With the same diligence, he applied himself over the years to the Naviglio Grande, its navigability and the consequent tax revenue, and also to the *fossatum* in the city (Fig. 3), whose cleaning and maintenance was also subject to taxes.

Even his predecessor Louis XII had reasserted the obligation to control the opening, the positioning and the dimension of the mouths from which the irrigation ditches branched off, as diverting the water from the main canals enabled the irrigation and the functionality of the hydraulic plants but could jeopardise the water flow necessary for the navigation and the stability of the embankments. He then used water to bestow favours on his supporters in the city, as is the case of Gian Giacomo Trivulzio, marquis of Vigevano, to whom he gave the licence to conduct the water from the Ticino in his territories[29]. The water had long ceased to be a *res publica*: the consolidation of procedures of noblemens'power entailed, in fact, a parallel trend towards privatisation of the state in a patrimonial manner[30], and within this procedure water represented an increasingly important item for tax revenue. Nor did the situation change when indipendence was definitely lost and the French domination on the duchy of Milan was followed by the long Spanish domination and in the XVIII century by the Austrain one, during which the project of the naviglio di Paderno of Adda was, at last, completed.

REFERENCES

1. SAIBENE C., 1977. La Padania. In: Capire l'Italia. I paesaggi umani. Milan: 52–54.
2. SINATTI D'AMICO F., [undated], L'immenso deposito di fatiche.
3. FANTONI G., 2005. I navigli milanesi e il loro sfruttamento energetico tra età romana e basso medioevo. In: L'energia dei navigli. Ed. E. Malara, G. D'Amia. Geneva–Milan: 67–68.
4. TOZZI P.L., 1974. Saggi di topografia storica. Florence: 7–12.
5. With the term *molendinum*, and notin this area, one intends as well as the grain mills, any mechanism worked by hidraulic force, Chiappa Mauri L., 1998 (a.r. 1984). I mulini ad acqua nel milanese, Milan: 35. ASM (State Archives Milan), Acque p.a., c. 1198, 1739 February 22, 1569 August 8, 1542, 1661 July 9, 1564 May 2; c. 1198 bis, 1514 May 14, 1565 December 5, 1565 May 30, 1518 May 22, 1523 March 13, 1517 July 13.
6. ASM, acque p.a., c. 1198, 1739 February 22, 1770 January 8, 1569 August 8, 1769 May 3, 1741 April 14.
7. ASM, acque p.a., c. 1198, 1569 August 8, 1569 September 17, 1570 February 25: Church of S. Giovanni Battista of Vertemate; 1769 May 3, 1770 January 8: female monastery of S. Vittore of Meda; 1569 April 20; c. 1198 bis, 1563 March 18: Monastery of S. Pietro Martire near Barlassina; 1514: Galeazzo Porri and consorts; 1564 May 2, 1565 May 30, 1543 April 10: Paulo e Mariano de Coquis.
8. The roggia Desio (Desio ditch), from the name of the closetst town, was one of the most important ditches: ASM, Acque p.a., c. 1198 bis [end 16th century] ut supra; c. 1198, 1569 August 8, 1198 bis, 1517 July 13, 1518 May 22, 1523 March 23, 1563 March 8, 1563 March 18, 1563 April 3, 1563 September 16, 1563 September 23, 1584 February 25, 1591 March 9, 1591 June 25.
9. CHIAPPA MAURI L., 1998: 32–44.
10. CHIAPPA MAURI L., 1998: 87.
11. FANTONI G., 1990. L'acqua a Milano. Bologna: 66–74.
12. FANTONI G., 1990. 19–25.
13. FANTONI G., 1995. 69–73.
14. CHIAPPA MAURI L., 1998. 67–85.
15. FANTONI G., 1990. 20–31.

16. CHIAPPA MAURI L., 2001. Una lunga storia. In: Libro de li prati del monasterio di Chiaravalle. Ed. L. Chiappa Mauri, G. Fantoni. Milan: 3–4.
17. Bonvesin da la Riva, 1991. De magnalibus Mediolani. Ed. P. Chiesa. Milan: 106–107.
18. CHIAPPA MAURI L., FANTONI G., 2001: 11–23.
19. BORGONOVO M., PALICI DI SUNI L., 1994. La questione della Muzza: nuovi contributi. In Archivio Storico Lodigiano: 73–135.
20. BIGNAMI P., 1939. Il grande canale Muzza, Milan: 341–359. Chittolini G., 1978. Alle origini delle 'grandi aziende' della bassa lombarda, in Quaderni Storici: 828–844. Roveda E., 1987. Allevamento e transumanza nella pianura lombarda: i Bergamaschi nel pavese tra '400 e '500, in Nuova Rivista Storica: 49–70. Arioli N., Cattaneo F., 2002. La nascita dell'industria lattiero-casearia nel Lodigiano. In P. Battilani, G. Bigatti, Il settore lattiero-caseario in Val Padana tra Otto e Novecento, Lodi: 274––276.
21. FANTONI G., 1998. Lo stato delle acque a Milano prima dell'attivazione del Naviglio. In: Cinquecento anni di Naviglio Martesana. Ed. C. Tangari. Milan: 11.
22. FANTONI G., 1990: 63-64.
23. CIRIACONO S., 1994. Acque e agricoltura. Venezia, l'Olanda e la nuova bonifica europea in età moderna, Milan: 49–52. Spinelli F., 1997. Gli Statuti del Comune e delle corporazioni della Brescia medievale, Brescia: 127–128. Forgiarini G. (ed) 1996. Lo Statuto di Bergamo del 1353, Spoleto: 48, 151, 182, 302–304, 308–312, 346, 350–351.
24. FANTONI G., 2000. Acque milanesi e acque cremasche. In: Le acque cremasche. Ed. C. Piastrella, L. Roncai. Conoscenza, uso, gestione. Crema: 22–29.
25. ASM (State Archives Milan), RP (Officia Gubernatorum et Statutorum, Registri de Panigarolis), 15, p. 66 1516 July 30, pp. 67-68 1516 July 8, in which, amongst other things, the concession already granted by the constable Duke of Borbone, governor of Milan, from the income derived from the duties on the milling and wine, distracting it from the ducal premises, 24 March 1516: ASCM (Civic State Archives, Milan) RLD (Registri delle Lettere Ducali), 18, p.132; the petition bear the dates of 7 January and 7 July 1516: Verga E., 1894. Delle concessioni fatte da Massimiliano Sforza alla città di Milano. In Archivio Storico Lombardo: 335–336.
26. PAGNANI C., 2003. Decretum super flumine Abduae reddendo navigabili. La storia del primo naviglio di Paderno d'Adda (1516–1520). Ed. G. Beltrame, P. Maragaroli. Milan.
27. SANDRI M.G., 1983. Il Naviglio di Paderno. In: Costruire in Lombardia. Aspetti e problemi di storia edilizia. Milan: 138–160.
28. MALARA E., 1983. Il porto di Milano tra immaginazione e realtà. In: Leonardo e le vie d'acqua. Ed. E. Malara. Florence: 37.
29. ASM, RP, 14, 15, 26 passim.
30. SINATTI D'AMICO F., 1979. Per una città. Todi: 247–248.

STRESZCZENIE

Zarys gospodarki wodnej w średniowiecznym Mediolanie i Lombardii

Słowa kluczowe: *kanały, melioracje, znaczenie gospodarcze, średniowiecze*

Obfitość wody była z pewnością ważnym czynnikiem rozwoju doliny rzeki Pad, ale też wielokrotnie z jej powodu niezbędne było podejmowanie działań interwencyjnych, tj. regulacji i drenowania, które przyczyniły się do specyficznego ukształtowania terenu. Już w czasach rzymskich istniało wiele projektów kanalizacji i już wtedy uświadamiano sobie pilną potrzebę utrzymania kanałów używanych

do nawigacji, nawadniania czy napędzania młynów. Potrzeba kontroli nadmiernej ilości wody stała się początkiem eksploatacji tego ogromnego źródła bogactwa, z którego korzystano także w następnych wiekach. We wczesnym średniowieczu, mimo niestabilnej sytuacji politycznej i poważnych problemów społecznych i ekonomicznych, znaczenie kanałów było nadal duże, m.in. z powodu zastępowania, bardzo zaniedbanego w owych czasach, transportu lądowego komunikacją wodną. Wznowienie działalności rolniczej po XI w. n.e. przyczyniło się do intensywnego rozwoju melioracji na wsi lombardzkiej i nałożyło na miasta obowiązek rozbudowy sieci dróg wodnych poprzez budowę nowych kanałów i ulepszanie już istniejących. Przykład Mediolanu, miasta pozbawionego naturalnej rzeki, które zbudowało gęstą sieć kanałów używanych na różne potrzeby mieszkańców (obrona, higiena, rolnictwo, transport, młynarstwo) i do komunikowania się z sąsiednimi terytoriami, można uznać za typowy. Działalność mnichów z zakonu cystersów w Chiaravalle na okolicznych terenach wiejskich jest ilustracją tego, jak istotnie melioracje i drogi wodne wpłynęły na organizację terenu na przestrzeni wieków.

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