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WATER RESOURCE MANAGEMENT (WRM) IN THE VENETO REGION:
A HISTORICAL PERSPECTIVE

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Water Resource Management (WRM) in the Veneto Region: A Historical Perspective

Paolo Rosato¹ and Giuseppe Stellin²

Introduction

In Italy, and in particular in the Veneto region, Reclamation Consortia have always played an important role in land and water resource management. The way in which they are organized and, above all, their ability to bring together public and private interests have allowed the Consortia to respond to the changing needs of a society which throughout the centuries has changed radically, in particular with regards to how natural resources such as water and land are used.

The aim of this work is to illustrate the historical evolution of man's intervention in water resource management in the Veneto region in order to highlight, from both the technical and financial points of view, the ability of the institution of the consortia to join public and private interests and to adapt itself to the changing economical and social needs in this region.

From the Beginnings to the Sixteenth Century

Prior to Roman rule in the Veneto region, numerous channels and rivers flowed through much of the plain in a changeable relationship between land and water in which water often prevailed for long periods of time. In fact, due to the shallow riverbeds, the absence of banks, the sinuous flow and the light slope, the water easily overflowed onto the land and it would take a long time before the flooded lands could reappear (see fig. 1).

These conditions, in addition to the unhealthiness of the marshes, made it difficult for man to settle in the lower plains and cultivate the land. Therefore, quite early on in history water resource management presented itself as a problem in the Veneto region.

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Roman settlers were the first to attempt to manage water in the region. Starting from the First Century, A.D., by assigning land to the war veterans, they organized the territory according to both legal (land registry or cadastre) and productive issues making large portions of the plain suitable for agricultural activity.

Figure 1 – Venetian mainland before river deviation out of the lagoon



In many areas of the Veneto, signs of the Roman settlements can still be seen, in particular, in the layout of the streets and the square shape of the plots of land called “centuriation” (fig. 2) (Pesavento, 1998). In the ten centuries that followed, because of the fall of the Roman Empire and the constant barbarian invasions, no significant effort was made to protect or maintain the water management interventions that had been carried out in the territory by the Romans so that many were lost and the territory progressively became woods again. This can be explained by the fact that the Longobards, the most important barbarians to invade and settle in the Veneto, were careful to not settle in the middle and lower plains, but rather settled mostly in the foothill plains which were more suitable for hunting, forestry and sheep farming (Varanini, 1990). Human settlements were therefore limited to just a few elevated “islands” and there was certainly less agricultural surface

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than the uncultivated soil and forest which dominated the plains of the Veneto during the Middle Ages.

Figure 2 –Plot shape in a roman “centuriation” area



Efforts to make significant parts of the territory suitable for cultivation were taken up again only towards the second half of the 11th century thanks to the religious orders, first of all by Benedictine monks, in various places around the Veneto³. By deforesting large areas around the main cities, which were once again beginning to flourish following the profound crisis that took

³ Some monasteries actually began to be built in the area in the middle of the tenth century when the rulers of the age assigned the religious orders feudal rights to impose duties and to hunt and fish on certain lands.

place between the end of the Ancient Age and the Late Middle Ages, the plains began to be settled again.

Environmental conditions regarding water in the area, however, proved to be significant obstacles to these renewed attempts at settlement. It was difficult for an individual landowner to deal with these problems alone and this led to the creation, starting from 1100, of sorts of consortia of landowners to defend the territory from flooding.

Reclamation in the Republic of Venice

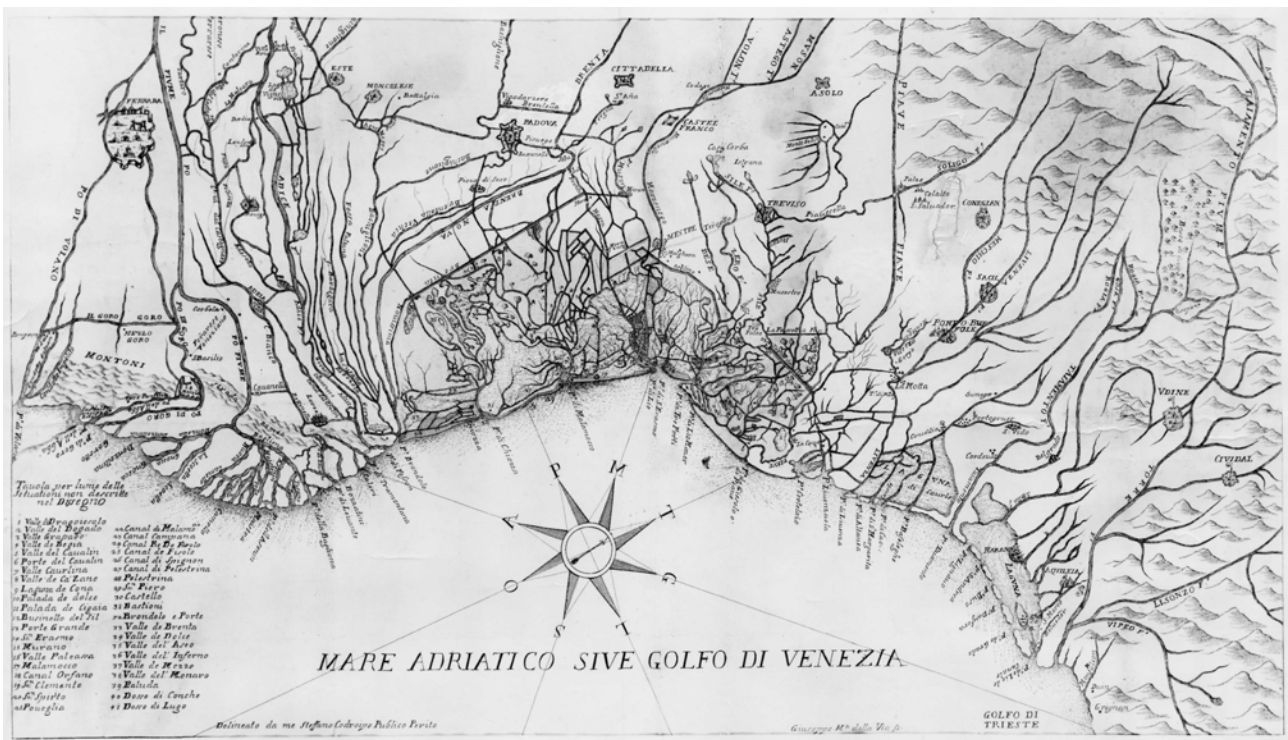
A systematic and widespread organization of water management in the Veneto, from both the private and public points of view, did not really take place, however, until the sixteenth century with the expansion of the Republic of Venice to the mainland. In fact, when the Republic of Venice set up the Water Authority and the Uncultivated Soil Authority (*Magistrato alle Acque* and the *Magistrato ai Beni Inculti*), it took on the public management of the waters in its territory, including reclamation. This new interest the Republic had in its territories on the mainland came from a double necessity: a) to defend Venice by deviating the main rivers to avoid the silting up of the lagoon and a decrease in water salinity; b) to ensure the food self-sufficiency, using the new crops coming from the Americas as well (corn).

These two objectives convinced rulers of the Republic of Venice, towards the middle of the sixteenth century, to face the expenses needed to drain the water in the lowlands and to create and manage a network of channels to lead the water towards the sea (see fig. 3). It is important to point out that, at the time, uncultivated land occupied about a third of the Republic's land in the Veneto.

The Republic considered reclamation to be of "public benefit", and not only useful for private landowners, essentially because of the repeated shortages of grain in Venetian markets. In fact, as long as it was possible to compensate for the insufficient internal production by importing grain on profitable conditions, the Republic of Venice did not worry much about the imbalance between supply and demand. However, when an increase in the population occurred at the same time as an increased difficulty in importing caused by the high cost of transportation, the Republic had to intervene⁴.

⁴ These increased costs, which led to increases in the price of food, were essentially due to the need to transform a part of transportation ships into warships because of the wars going on at the time. It has been calculated that at the end of the sixteenth century the price of grain tripled in twenty years (Lane, 1991).

Figure 3 – Venetian mainland after river deviation



Furthermore: a) it was uncertain whether imports would even arrive from grain producing areas because of the changing political situation, Ottoman control, and; b) the Republic was spending large amount of gold. The most evident sign of the Republic’s interest in the mainland was the spread during the following centuries of the so-called ‘villas’ civilization, which was sustained by the enormous investments in the mainland, made by the Venetian aristocracy. Many noble country homes, which were often of significant architectural value⁵, were built and became economic and organizational centers for vast reclaimed areas.

Until the “public utility” of reclamation was recognized, projects were carried out and managed by private individuals or by consortia and the Republic did nothing more than grant or deny permission to do the projects⁶. It is worth underlining, however, that the initial goals of the

⁵ This economic phenomenon was so widespread that it involved the entire social and cultural system. The masterpieces of Andrea Palladio and other architects testify to this.

⁶ In fact, as far as the lagoon was concerned, reclamation continued to be strictly prohibited to the point that if certain works could be dangerous for the equilibrium of the lagoon, their destruction was ordered.

consortia of landowners was not to reclaim the land, but rather to keep the waters under control by creating embankments and keeping the river beds deep⁷.

All of the projects took place under strict public control. In fact, in the case of public works, the Uncultivated Soil Authority had to organize, supervise and carry out the project from both the technical point of view (appointing technicians, evaluating projects, etc.) and from the organizational point of view (finding the financial support; choosing the areas to be expropriated and penalizing offenders). In the case of private works, which were much more frequent, the Authority only supervised the carrying out of the projects which were proposed and approved giving preference to the projects of greater public interest. Some privileges were given to the landowners who carried out private works in the public interest or on public lands, such as being tax exempt for long periods of time or taking advantage of future benefits from the works.

It soon became clear, however, that it was extremely difficult or even impossible for individuals to carry out projects both because of the enormous cost of the works and the difficulties involved in bringing all of the landowners in a given area into agreement. Therefore, the conclusion was reached that reclamation could only be carried out if all of the landowners participated and that only in this way could public and private interests be brought together. The consortia of landowners were thus institutionalized under the direct control of the Water Authority, in the case of managing and defending the waters, and the Uncultivated Soil Authority, in the case of reclamation and irrigation. Consequently, the safeguarding and reclamation works came to influence not only the water regime, but land and property organization and local economies as well, bringing even closer together the relationship between public and private.

The consortia could be set up voluntarily by landowners themselves or be imposed on them by the Republic. In the first case (Voluntary Consortia), the rulers of the Republic merely confirmed the creation of the Consortium, approved the project and the works proposed and made sure that they were carried out properly. On the other hand, the Consortia which were set up by order of the Republic (Obligatory Consortia) were created by the appropriate public authority right from the start or later on if there were problems between the landowners involved.

Regardless of how they had been created, the consortia in the Veneto were regulated from the beginning by precise norms inserted in the charter. In fact, all of the following were regulated: a) the convocation of assemblies; b) the election of three presidents; c) contribution to the expenses

⁷ A project was carried out by a public authority only when the public benefit was particularly evident or when the costs of a project were high enough that it could not be privately financed.

in proportion to the amount and quality of land owned; d) the appointment of judges to resolve any problems.

It is nonetheless worth pointing out that the goal of water safety was more important than the goal of food self-sufficiency and, as far as actual time is concerned, actions were taken to meet the former goal before the latter. In fact, the Water Authority was created first and all of the pre-existing Consortia were immediately put under its jurisdiction. Only after 1556, with the creation of the Uncultivated Soil Authority, did reclamation works to improve production really start taking place. In fact, this Authority was given the function of promoting the reclamation of uncultivated land and arranging for these works to be carried out (Campos, 1937).

The Uncultivated Soil Authority, which continued to function for more than two centuries, had the following specific duties: a) to propose to the Senate the works which it believed were necessary and that could be carried out even against the will of the landowners⁸; b) to make sure the works were carried out properly by supervising them and providing for the necessary resources (both technical and financial); c) to control the administration of the Consortia; d) to supervise diversion and irrigation works by allowing the waters to be used, controlling how agriculture (e.g. rice fields) and industry used the land and waters and imposing taxes.

One of the problems that the Republic always considered was how the works were to be financed and how the cost was to be divided between the landowners involved. Before the Uncultivated Soil Authority was created, this division, called *campatico* (reclamation tax) was based on how much land was owned, i.e. the number of fields. However, following the creation of the Authority, the benefit received, measured by quality of land, and was also considered in addition to the number of fields. For example, lands which were completely unproductive before the reclamation had to pay a higher *campatico* than those which, even without the reclamation, could guarantee even minimal production. The amount of the *campatico* was related to the value of the

⁸ When the experts believed that a particular project would be advantageous for the State, the private initiative was encouraged by inviting the landowners to form a Consortium to carry out the works. If the individuals did not adhere to the proposal, the landowners could be forced to set up the Consortium and the works could be carried out directly by the Republic. It is worth pointing out the way in which the members of the Authority managed to reclaim private lands: a) experts estimated the cost of completing the work; b) this sum was communicated to the landowners giving them the option of depositing it; c) if they did, the work was carried out by the Authority and the land remained private property; d) if they did not, the work was still carried out by the Authority but due to the costs, the Republic took half of the private lands for itself. The lands which were the property of the Republic were divided into lots and sold at auction on the Rialto bridge.

cultivation before the reclamation, i.e. the initial conditions and, consequently, the benefit to be obtained⁹.

All of the members of the Consortia had to pay a *campatico*, even those who had not wanted the reclamation or taken part in the actual works, even though they benefited from them. Debtor insolvency was taken care of by expropriating the reclaimed lands and then auctioning them.

However, as the number of Consortia members not fulfilling their responsibilities increased, at a certain point the Republic found itself owner of significant amounts of land but having to pay significant amounts of money for reclamation as well. Therefore, in order to encourage the owners to pay, it was decided that those who did not pay would have all of their property and goods expropriated in addition to having to pay not only the debt but a significant fine as well.

Once the reclamation was carried out, in order to avoid the return to the natural conditions, the works had to be maintained. Therefore, the landowners were also responsible, at least financially, for regular maintenance interventions. The annual payment for ordinary maintenance was called the *campadeghetto* and its amount was proportional to the number of fields owned.

To finance the project, the Consortia could ask for both public and private mortgage loans, providing the real estate of the Consortium as a guarantee. However, only the Voluntary Consortia were autonomous from the administrative and financial points of view and so only they could ask for private loans. In fact, Obligatory Consortia were under the public management of the Uncultivated Soil Authority, which collected money and took care of paying for expenses. This distinction was so clear-cut that even the accounting documents (*libri campatici*) and technical documents (*libri catastici*) were different.

Reclamation from the fall of the Republic of Venice until the law n. 215/1933

The Reclamation Consortia were an important and unique invention of the Republic of Venice. In fact, at the same time, other Italian states also carried out reclamation works, but in different ways and certainly without fully understanding the importance of linking public and private interests. Therefore, when the Republic of Venice fell in 1797, a period of great uncertainty regarding the nature and power of the Reclamation Consortia began. Under the Italic Reign, in

⁹ A criteria which was often used was that unproductive lands paid the entire *campatico*; less productive lands paid half; productive lands paid a fourth.

1804, the Uncultivated Soil Authority and the Consortia disappeared and were substituted by the “Societies for water drainage, reclamation and land improvement”, which were no longer responsible for carrying out reclamation works, but rather only for maintaining pre-existing ones. Therefore, there was a significant reduction in the reclamation of new lands.

Then, with the Lombard-Venetian kingdom (1815), there was a return to the Venetian laws and the Consortia were restored, even if with reduced responsibilities and powers. This reduction, compared to Venetian laws, became even more noticeable with the creation of the Italian Kingdom (1865). In fact, when the distinction was made between defensive and profit reasons for carrying out works, the regulation of the works respectively fell under administrative and civil laws and this led to the creation of two separate entities: the Drainage Consortia and the Reclamation Consortia.

Only later on, with the Baccarini Law of 1882, did the functions of the two Consortia reunite in one type of Consortium which could be either voluntary or compulsory, a prerogative that had been lost with the fall of Venice Republic. Nonetheless, the Consortia were only allowed to carry out minor works, intended to improve agricultural production, whereas more important works, i.e. those to produce significant improvements in hygiene, were reserved for the State. In this way, the State could demonstrate its interest in reclaiming bogs and marshes, mostly in the fight against malaria. The consequent possibility to cultivate reclaimed soil was simply considered a secondary advantage.

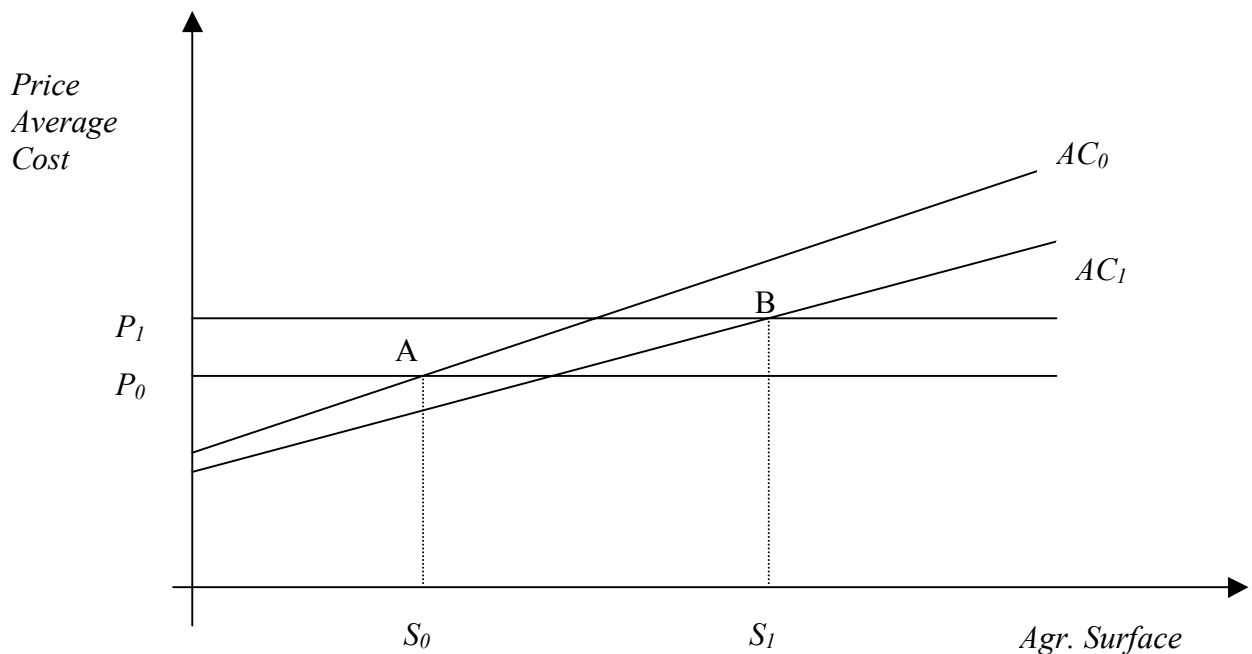
Reclamation in the Consolidation Act of 15 February 1933, N° 215

This situation changed radically during the period between the two World Wars (1920-1940). There were three particular circumstances in Italy at that time: a) Italy had just come out of a war which had devastated part of it (in particular the Veneto Region) in addition to ruining public finances; b) the country had undergone massive migration, mostly towards the Americas, due to an unbalanced relationship between land and labour; c) there was a political regime whose objective was to become self-sufficient, regarding food production as well as other issues.

Therefore, in Italy in general and in the Veneto in particular, there was significant support for an increase in agricultural production by reclaiming lands which were still flooded and by diffusing irrigation. In some ways the great reclamation works were carried out following the model for agricultural development which V. Ruttan (1982) called “frontier development”. The reasons for the reclamation confirm also the traditional Ricardian model (fig. 3), in which the expansion of cultivated lands is limited by their productivity, i.e. new land will be cultivated as long as the price is greater than or equal to the average production cost on less fertile lands and reclaimed last (e.g.:

point A, with a cultivated surface equal to S_0). A new situation arose when four circumstances occurred at the same time: 1) the internal prices of grain increased (e.g. from P_0 to P_1) due to limits imposed on imports; 2) there was a consistent demand maintained by a policy of demographic increase; 3) there was a decrease in the average costs of production (e.g. from AC_0 to AC_1) due to new mechanical reclamation techniques; 4) the State was giving significant subsidies to invest in reclamation. In this context, it was even worth cultivating lands which were less productive and/or which required a lot of work to be cultivated (e.g. from S_0 a S_1).

Figure 3 – Expansion of cultivated lands.



It is nevertheless important to remember that, at the beginning of those years, reclamation definitively lost the military importance it had had during the Republic of Venice, and took on a new role which was hydraulic safety for urban areas as well. In fact, cities and towns began spreading faster and faster into rural areas so that the Reclamation Consortia dealt with a territory including cultivated lands, urban settlements and non-agricultural production as well.

In order to favor reclamation and to respond to the pressing needs stated above, the Reclamation Consortia were recognized as local authorities delegated by the State to deal with reclamation and given substantial powers which can be summarized as the abilities to: a) plan the works to be

carried out in the territory under their jurisdiction according to the General Reclamation Plan; b) plan and carry out public reclamation works; c) maintain and manage the works carried out.

The way in which reclamation was carried out became very similar to how it had been carried out during the two centuries under the rule of the Republic of Venice, integrating public and private interests. In fact, given the economic advantage (greater value) that real estate located on the reclaimed land would have, the government had real estate owners contribute not only to the expenses of carrying out the work (when the State had not taken on all of the expenses), but to the expenses of maintaining the work as well. Since they would benefit from the works, the owners of the real estate were considered to be those who would be most interested in efficiently maintaining and managing the works. Therefore, even though the public works were state owned, their management was entrusted to the Reclamation Consortia.

In order to be able to ensure the financial means to carry out a project (for the part it was responsible for) and to maintain the hydraulic works, the Reclamation Consortia received the power to impose contributions on the owners of the real estate involved, given the benefit they would gain. In order to ensure the norm be respected by all, this contribution was considered, by the law, a tax. The Consortia were given the right to recover the money they spent for their various activities. The reclamation tax, therefore, was not equal to the benefits produced by the reclamation but rather to the costs needed to carry it out.

The reclamation tax was calculated based on a “classification plan” of the real estate and a related “division plan” of the costs. Since the goal of reclamation was to obtain “...significant hygienic, demographic, economic and social advantages...”, the benefit was two-fold. In fact, the pre-existing real estate would gain a general economic advantage from the hygienic improvement of the environment (such as a reduction in malaria) and from the improvement in the quality of life of the people living there (better road networks, availability of drinking water), as well as a specific economic advantage from an increase in the value of the real estate resulting from the reclamation.

The quantification of the benefit was difficult to determine and, from the beginning, differed from Consortium to Consortium. Some Consortia were involved exclusively in the field of irrigation, others only in land reclamation, and others yet carried out both functions. These differences increased over time. In fact, because of the quick economic development, after the Second World War, agriculture, industries, services and housing were mixed up in many areas of the Veneto.

Therefore, since the vision of reclamation could no longer be strictly agricultural, but rather involved many different fields, reclamation taxes were imposed on real estate, which was not solely

agricultural. The issue was actually debated for years on a judicial level. Today, however, it is widely agreed that the owners of all the real estate involved, agricultural and not, must pay the tax since they benefit from the increase in value which is only a result of the reclamation work¹⁰. However, it is worth pointing out that at the present state of reclamation in the Veneto, it would be more appropriate to speak of conservation of value and profitability of the real estate, rather than increased value, since it is thanks to the maintenance and the proper management of the reclamation works that they can keep functioning.

Reclamation in the Veneto Region today

At the beginnings of the 70's, the State passed the responsibility of reclamation over to the Regions and the Veneto, heir to the centuries-long tradition of the Republic of Venice, over time improved the organization of the Consortia and increased their duties.

First of all¹¹, it reorganized the physical boundaries of the existing Consortia (reducing the number drastically to 20) mostly on the basis of hydraulic basins, and, at the same time, increased their responsibilities by introducing rural environmental protection among the goals. The traditional role of the Consortium of reclaiming and maintaining agricultural lands is now set in the wider social framework of environmental protection, considered the framework of human activities¹². In order to carry out this function, the Consortia participate in urban and territorial planning and in drawing up plans to clean the waters. Therefore, the Consortia are more and more involved in the urban and rural areas planning at regional and provincial scale.

It is interesting to closely examine the responsibilities given to the Reclamation Consortia by the Regional Territory Coordination Plan¹³.

They are to:

¹⁰ From a judicial point of view, the matter was clarified and defined in a sentence by the Supreme Court, n. 8960/1996.

¹¹ L.R. n. 3, 13 January, 1976

¹² The wider scope of the Consortia's goals were put into effect with the redefinition of the Consortia's tool for planning their activities: The General Reclamation Plan. Based on the abovementioned law, this Plan became the General Reclamation and Rural Territory Protection Plan.

¹³ Based on the contents of the Regional Territory Coordination Plan (P.T.R.C.), approved by the Regional Council on 13 December 1991.

- a) safeguard, maintain and modernize the patrimony of public reclamation and irrigation works;
- b) remove the obstacles to the regular flow of the waters and guarantee the hydraulic safety of the territory from flooding and by establishing the defences needed to avoid, or at least limit, the damages from adverse climatic conditions;
- c) protect the natural resources, regulate old water licenses even for different and competing uses, ensure suitable water for irrigation and avoiding water pollution.

This redefinition of the roles of the Reclamation Consortia has led to new functions and activities, which have been accompanied by increased expenses and costs. In addition to the traditional activities of managing and checking the reclamation, drainage and irrigation networks, the Consortia now have to check the sewer and drain water, protect the quality of the waters to be used for irrigation and maintain and restore the agricultural landscape and environment.

The profound changes in the roles and responsibilities of the Reclamation Consortia have occurred at the same speed as the profound changes in the territory, at least from the point of view of water management. In fact, with the loss of importance of agriculture (from both the employment and income points of view) and the industrial economic development that has spread throughout most of the Venetian Plain, a complex network of residential and industrial areas has developed which has often created significant problems for the drainage system of vast areas. The significant investments carried out on the territory in the Veneto have, on the one hand, greatly increased the capital that the reclamation must defend and, on the other hand, greatly decreased the time of concentration of meteorological waters (i.e. the time it takes rainfall waters in a certain point to reach the drains) and consequently showed significant limitations in the old drainage network designed on the needs of agricultural lands.

The intense urban development in many different areas has thus forced regional reclamation to make significant changes and lead the Consortia to lose their original, mostly agricultural, connotation. In particular, the development in the Veneto of sewage systems, which are interconnected with the reclamation networks, has given the Consortia new functions and greater responsibilities¹⁴. The Veneto Region has tried to respond to these new needs (L.R. n. 25/96) by reorganizing and redefining reclamation in order to pursue taxation equity endangered by the urban

¹⁴ These can also be seen from the recent norms regarding the defence of the soil (l.n. n. 183/89) and of water resources (l.n. n. 36/94).

expansion into the countryside¹⁵. In fact, owners of non-agricultural real estate in rural areas hesitate to recognize the role of reclamation as an indispensable factor in protecting the value and the profitability of their real estate (e.g. homes, industrial plants, commercial areas), asserting that reclamation regarded mostly agriculture, and thus they refused to pay the necessary tributes. This led to a significant number of court cases, most of which were won in favour of the Consortia. Therefore, in some ways, the law 25/96 can be considered a sort of measure for dealing with the transition from the traditional responsibilities of the Reclamation Consortia to the new ones. This led to full recognition of the role of the Reclamation Consortia as defenders of the entire system of the territory and made it necessary to face the delicate question of the division of costs. This issue was very important since the increase of the functions of the Consortia had to be accompanied by a relative revenue from taxes.

The division of the reclamation costs

Given the number of court cases related to reclamation and taxes, the law 25/96 paid particular attention to the definition of the procedures that the Consortia must follow to divide the costs of reclamation. The reason for doing this was, among others, the need to make all of the procedures adopted by the various Reclamation Consortia in the Region the same and to substantially reduce the litigation. These problems often arose from confusing division plans which did not clearly distinguish reclamation costs from irrigation costs and which did not make it possible to clearly attribute the costs to those who actually benefited from the interventions. The new procedure, therefore, aimed to make the division more transparent and, above all, to make the attribution of the costs and the evaluation of the actual benefit received much more precise. This took place in two basic steps: a) attributing costs to each water basin of the Consortium; b) attributing a specific benefit index to each real estate in the same basin to divide the costs.

a) As far as the first aspect is concerned, the norms provide a detailed system for quantifying all of the costs (both direct and indirect charges) for each basin. In other words, the costs (S_j) to be divided up between the owner of the Consortia for a given field, are given by

¹⁵ In particular, the new law provides for: a) the census of the water discharges in the channels of the Consortia and the identification of a specific contribution proportional to the benefits obtained; b) the separation of the contributions related to the water discharges from the expenses charged to the owners of real estate located in the area where the discharges originate; c) the precise cartographic identification of the reclamation district; d) the measurement of the benefit to the surfaces of the buildings are located on; e) the definition, on the part of the regional administration, of criteria and methods for dividing the expenses of the Consortia among all of those who benefit from their activities.

$$S_j = Sd_j + Si_j$$

where Sd_j are the costs the Consortium takes on directly for specific basin j , and Si_j the quota of the overall costs of the Consortium that can be attributed to basin j .

The general expenses (Si_j) can be determined using the following equation:

$$Si_j = \alpha_j Si$$

with

$$\alpha_j = f(x_j)$$

To attribute the indirect costs to each field, the following indexes (x_j) were used: surface area, channel development, maintenance carried out, number of real estates, etc.).

b) As far as the second step is concerned (that is to attribute a specific benefit index to each real estate of the basin) the norm states that the amount to be paid must be compared to the actual benefit received and that this benefit be measured according to some technical (usually regarding the water and surface area) and economic (value) indexes.

The technical characteristics of the water are summarized in a final index (I), which is obtained by multiplying three elementary indexes: I_s , I_c and I_e . The first index (I_s) is related the altimetry and makes it possible to estimate the risk of submersion of different areas. The second index (I_c) is related to permeability, which is minimal for urban areas and must be very high for the gravels of the high plains. The third index (I_e) represents the degree of hydraulic safety that the Consortium guarantees. The surface area, on the other hand, is determined by making reference to surface of the agricultural areas and the building plans.

Therefore, if k is used to define the portions of the basin occupied by real estate, which are the similar from the hydraulic point of view, it is possible to identify the amount of costs that the owners of these real estates must pay. These costs can be calculated using the following equation:

$$S_{jk} = S_j \frac{Su_k I_{jk}}{\sum_k Su_k I_{jk}}$$

where I_{jk} is the final water index of the homogeneous portion k of basin j and Su_k the surface of the same portion k of basin j .

At this point, all that is left to do is divide the costs (S_{jk}) between the owners of the real estates located in area k of field j . The law established that this be proportional to the value of the building

for tax purposes (V_i). This value is obtained by multiplying the taxable income (R_i) by a given coefficient (β_i)¹⁶.

If the reclamation tax of real estate (i) is C_i , then the following equation is obtained:

$$C_i = S_{jk} \frac{V_i}{\sum_i V_i}$$

with

$$V_i = \beta_i R_i$$

In this way it is possible to relate the reclamation tax to how much the Consortium has actually spent and to how much a given owner of the Consortium has actually benefited from the reclamation activities.

Some problems remain nonetheless unresolved, such as how to finance works to protect and improve the environmental quality in the territory. The criteria in the regional norm regarding how to divide the expenses are very uncertain and limited regarding these types of works. In theory, to fully carry out the functions assigned to the Reclamation Consortium, it should be able to autonomously plan and carry out environmental improvements works and, as a consequence, make up for the costs of these works through the taxes. Unfortunately, however, the technical indexes presently used do not seem to properly consider these aspects as they only deal with the benefit resulting from water reclamation.

Conclusions

Different, but always pressing, issues have motivated political authorities throughout the centuries to promote reclamation and water resource management of the territory in the Veneto Region. The Republic of Venice did so to defend itself for civil and military reasons; later on, in particular during the two World Wars, it was done for food self-sufficiency, and today it is carried out to protect the territory and the environment. These reasons all come directly from specific needs, which are the following:

- a) to guarantee hydraulic safety;

¹⁶ The value of the real estate which is used to determine the reclamation tax is estimated using the value used to determine the municipal tax on real estate. This value is obtained by multiplying the taxable income by a coefficient

- b) to settle the territory;
- c) to manage the agricultural land system;
- d) to manage the territory which can today be defined as “rural-urban”.

The evolution of the goals of land reclamation and the simultaneous territorial changes have, on the one hand, created great changes in the financial needs of the Consortia and, on the other hand, made it necessary to create more and more complex and articulated criteria for attributing reclamation taxes. In fact, while the first divisions were based solely on surface area (policy for water defence adopted by the Water Authority of the Republic of Venice), later divisions were also based on the benefit, which could potentially be derived from the increasing of land productivity after the reclamation. Then, with the law 215/1933, a division criterion was adopted which was based on a system of technical and economic indexes able to describe the benefit derived from reclamation, which was measured by the profitability of the real estate. Finally, as the situation of the territory changed together with the responsibilities of the Consortia, it became necessary to improve the division criteria by redefining the procedures for attributing costs and evaluating benefit, which is now based the value of the real estate.

Nonetheless, while there have been radical changes in the characteristics of the territory and in the aims of reclamation, the legal and organizational structure of the Reclamation Consortia have not changed substantially from the way they were set up by the Republic of Venice. The Reclamation Consortia have proven to be capable of joining public and private interests and flexible and able to adapt to the changing conditions of the context they operate in.

which varies according to the type of real estate: 75 for agricultural land, 100 for houses, 50 for factories and 34 for store and offices.

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