

## Ancient Smartness of Tomorrow

Cecilia Scoppetta

(PhD Cecilia Scoppetta, Sapienza University, Rome)

### 1 ABSTRACT

While illustrating results and further implementations of an EU funded project regarding the old underground aqueduct of the Italian city of Siena, the paper proposes a rediscovery of ancient smartness as a by-product of social relation concerning the sustainable use of common goods.

### 2 BEYOND A MERELY TECHNOLOGICAL INTERPRETATION

The concept of “smart city” is usually associated with the network metaphor (see: Castells, 1996; see also: Scoppetta, 2009) that mirrors the technological evolution occurred within the frame of both post-Fordist restructuring and (neo-liberal) globalisation (see, among many others: Brenner, 1999; 2000; 2004; Brenner & Theodore, 2002; Peck & Tickell, 2002a; 2002b; Tickell & Peck, 2003; Harvey, 2005; Brenner *et al.*, 2010; Peck *et al.*, 2009; see, in particular: Castree, 2008a; 2008b), so that it is often translated into the idea of urban settings where ITC enable an acceleration of actions and inter-actions among individuals as never happened before: email, mobile and land-line phones, the Internet, satellite TVs and many other functions integrated in web-based communication devices, such as smart-phones and tablet computers. Such iper-technological systems are asked to work smarter not just in the way they make it possible for cities to be intelligent in generating capital and creating wealth, but in co-evolving with these developments and creating environments that produce knowledge in innovation systems. Best (1990), and to a lesser degree Porter (1990), have explained how such flexible production networks could take the form of flexible territorial production systems, as in the well-known cases of Silicon Valley (see, e.g.: Best, 1990; Storper, 1993) and, even if in a different way, the so-called “Third Italy” (see: Becattini, 1989a; 1989b; 1987; 1990; 1991; 2000), both illustrating the context-dependent nature of knowledge (see, also: Amin & Cohendet, 2004) and the need to reject as flawed and simplistic the distinction between “tacit” and “codified” knowledge.

In the age of late capitalism, when a strong pressure exists for cities to become smarter and smarter: being strongly supported by both EU policies (CEC, 2010) and a number of technology companies (see, e.g.: IBM, 2010), devices and media, such iper-technological narrative – whose roots are to be searched into the notion of “informational cities” advanced by Castells (1996) or Graham and Marvin (1996; 2001) as well as, with a different “nuance”, Mitchell (1995; 1999; 2001; 2003) – risks to be too entrepreneurial in outlook. Also given the unavoidable market-oriented images and imaginaries they produce, the pervasive storyline of iper-technological learning networks ends to look like the Foucault’s concept of «*dispositif* of power», meaning straightforwardly “apparatus” but also the arrangement or set-up of a web of practices and their attendant discourses (see: Foucault, 1994; see also: Deleuze, 1989). In fact, if we use Foucault’s lens to interpret the network metaphor, we find that it undoubtedly fits well in representing an understanding of power as disciplinary power which works throughout society rather than from a centralised source through discursive practice (and discourse-guided practices), being strictly related to knowledge.

But, if detached from a vision clearly oriented towards sustainability, the iper-technological “best-dream” scenario ends to reveal the «unspoken assumption» surrounding the too often «self-declaratory» (Hollands, 2008) nature of smart cities. Sustainability, instead, implies a respectful use of natural resources as well as appropriate knowledge to manage them: in this sense, both Castells and Graham and Marvin draw attention to the information technologies of the so-called critical infrastructures (water and drainage, energy and the like). Furthermore, sustainability also implies that ICTs can serve as communications that are smart for the way they allow cities to empower and educate their citizens, so that they can become members of society capable of engaging in a debate about their own environment and about the use of common resources «without compromising the ability of future generations to meet their needs» (WCED, 1987).

### 3 SMARTNESS AS A BY-PRODUCT

#### 3.1 Smart common goods

Thus, a relationship exists between smartness and common resources. This intrudes the broader issue of the commons, a term that has currently become very popular. In fact, even in relation of the ongoing

structural crisis, in recent times the issue has emerged as a crucial matter, by highlighting the need for a rethinking of the current development model.

Commons are a particular type of goods incorporating a wide range of issues that pose serious questions about the limits of commodification and the primacy of the market. When talking about goods, economists use to focus on ownership, being their reference a society mainly founded on the right of property. As a consequence, they usually distinguish between private and public goods – respectively referring to the governmental and the market sphere – by considering both the possibility of exclusion and the divisibility (or rivalry) in order to design their respective domain. But this view ends up to be challenged by certain kinds of goods that cannot be captured within such categories. On the one hand, in fact, we have the “club goods” (or “shared goods”), which are characterised by both exclusion and indivisibility, as they consist of a sort of “weakening” of the traditional private goods. On the other hand we find the common goods, whose features are no exclusion and rivalry, being them a weakening of the traditional public goods. Furthermore, we cannot consider the commons in a traditional sense, where owner’s rights fit with user’s right: in fact, free pastures of medieval time were progressively enclosed and transformed in private goods. Contemporary common goods, instead, concern more elusive “objects”, such as the quality of air, water and its quality, information and so on, for which the criterion of ownership is no more relevant, while the identification of the owner becomes important relatively to the users’ rights on these resources.

The case of water – which according to Leonardo da Vinci is the “*vetturale della natura*” (that could be translated as “the driver of nature”) – offers interesting insights on the issue, being it the common good par excellence. But, in international laws there is not an universally accepted definition of the “right to water”. An attempt in this direction consists of the Convention on the Law of Non-Navigational Uses of International Water Courses, whose central points are the equitable and reasonable use of water by any riparian state, the harmlessness of hydrological interventions, a cooperative management and the obligation to ensure the protection of basins. However, the fact that the concept of “fair use” remains to be clearly defined as well as the non-binding nature of the principles seem to reveal how the dramatic water shortage – due both to environmental degradation and the exponential increase of consumption – may become a relevant factor in conflicts (Wolf, 1998).

However, the very idea of water as a public good – i.e.: freely available for all – it is not an universally recognised notion. In fact, many believe that only giving a economic value to water, by making it a commodity like any other consumer good, could offer a real contribution to solving the problems of water scarcity: the creation of a water market could allow to trigger balancing mechanisms between supply and demand that, in turn, could make both searching and selling water really cost-effective as well as it could correctly address consumers’ choices in order to rationalise their consumption behaviour. The main argument used to support this thesis deals with the issue of waste: the lack of both adequate infrastructures and maintenance of the existing ones leads to inefficiency due to an ineffective public management, being the latter not economically viable. According to this approach, the existence of a water market would not be the point of arrival but only an intermediate step towards the final stage of efficiency, i.e.: the privatisation of water services. A number of initiatives in this regard have also been supported by international organisations (including World Bank) that have begun to affect their economic aid to developing countries by forcing them to adopt liberalisation and privatisation policies, by asking the retreat of governments in favor of private companies (thus opening the way to multinationals). According to the proponents of privatisation, this would be an element of social justice, allowing a more equitable distribution, eliminating market distortions that end up hitting the weakest actors.

Considering water as a common good, instead, involves a process of acknowledgement of its historical and identity value, which cannot be measured in mere economic terms. The emphasis is placed on management, but also on those “hybrid” and “territorialised” systems which are able to “taking care” of resources that are collectively recognised as «territorial heritage» (Magnaghi, 2006) creating a durable and not just economic wealth. Key principles concern non-exclusivity and resources’ regeneration, which appear as irreconcilable with a proprietary market logic, as they refer to “ancient” cultural elements – such as the collective sharing of primary resources – but they are also able to be reinvented, being knowledge their typical by-product, i.e.: the (intentional or unintentional) «result of processes oriented towards other purposes» (Donolo, 1997).



### 3.2 Underdeveloped smartness?

Shifting from knowledge infrastructures to knowledge as cultural practice as well as to the relationships between the latter and natural resources means rethinking discourses on technology, by attributing a broader sense to the term. Anthropological research on the (still!) so-called “developing countries” highlight the role of traditional knowledge in achieving sustainability goals based on an appropriate use of natural resources, by establishing the harmony of architecture with the environment, the symbiosis of the techniques of organisation of space with traditions, social habits, spiritual values and the fusion between practical aspects and beauty.

Pietro Laureano (1995) has shown how archaic societies, developed within economies characterised by lack of means, have linked their survival to a careful management and use of natural resources. Against the current model of existence, production and consumption – which has replaced the traditional order in the advanced countries, leading to the exhausting of local resources and feeding the hypertrophic growth of developed areas – Laureano, in fact, proposes the model of self-sufficient and small «hydrogenetic community», based on the transmission of a collective wisdom (i.e.: rules of coexistence that are essential to survive) concerning the ability to act in harmony with the environment, enhancing its potential without depleting it.

This is, in essence, the model of the oasis, whose spatial and social structure is determined by the supply and distribution system of the scarce water resources. A drainage tunnel, the *foggara*, passes under the village thanks to underground storage tunnels and provides water for both homes and collective laundries. Ancient caves and grottos for collecting water constitute a further element of the system, which is also useful for cooling the indoor air during the warm weather. When outside the village, the water of the *foggara* is divided into open ducts called *segua*. The latter run through the cultivated area of the oasis, by structuring the plot of the different properties through clay brick walls enclosing the soil particles, thereby accentuating the continuity between living tissue and cultivated areas. A “Master of Water” calculates the amount of water that is due to each family. He is the custodian of a complex and ancient knowledge, which is handed down from generation to generation, making him able to carry out the measurements by using specific tools. Through the divisions due to inheritances, marriages or purchases, the shares of water continue to fragment or reunify, so that an intricate system of canals, bridges and connections represents on the ground the evolving of the property system over time: a real “hydro-genealogical plot” recording the succession of generations, family ties and properties within a graph of relationship which is physically built by the network of canals. The fact that we can find again this branched graph in tissues, clothes, hairstyles and tattoos clearly demonstrates how such archaic infrastructural system deeply permeates these population’s culture.

According to Pietro Laureano, the model of the oasis can be found in many other situations whose complexity and dimension allow us to define them as “oasis city”. This is the case of the city of Shibam (Yemen), which is entirely made of clay, as well as the Italian city of Matera, whose “*Sassi*” (“stones”, i.e.: Matera’s historical houses) are an example of archaic ways of living and manage common resources in the karst areas of Lucania, Apulia and Sicily. This is also the case of Petra (Jordan), a real “oasis of stones”, now reduced to only archaeological remains, but described in the oldest texts as provided with canals, pools, fountains and gardens. Historical infrastructures of Italian municipalities of both the Middle Age and the Renaissance – such as the underground aqueduct of the city of Siena – also constitutes an example of such shared social-natural “constructs” that suggest a sustainable linkage between ancient and contemporary “smartness”.

## 4 THE SIENA’S ANCIENT AQUEDUCT AS A KNOWLEDGE INFRASTRUCTURE

### 4.1 “Concave” and “convex” old cities

According to Victoria Calzolari (2003), old Italian urban centers can be classified on the basis of their particular structure, which in turn is determined by their different relationships with the water system. She distinguishes «concave» and «convex» cities: the first typology (e.g.: Brescia, Florence, Turin) receives from the surrounding mountains and hills abundant waters, which in turn feed springs and fountains, allow the creation of large parks and gardens and, finally, radiate through geometric patterns across the irrigated lowlands. “Convex” cities, instead, are located on hills and spurs from which dominate the plain and use water coming from distant sources. For this reason, water is (was) used sparingly for gardens and orchards,

where undemanding plants are preferred. This is the case of cities such as Volterra, Montepulciano, or Todi: these are cities with an harder environmental context, where it was necessary developing a particular knowledge in order to capture, store, distribute, use and re-use water. Such a “water culture” – which today seems to be completely forgotten – not only resulted in the distinctive morphology of these centers, but also in the architectural and social forms. Thus, the aesthetic qualities of ancient cities as well as the peculiar forms of communal social life that have historically characterised them, are due to this harmonious relationship established over time with the environment.

The city of Siena constitutes a perfect example of “convex city”: it is located on top of dry ridges, away from the major rivers or mountain ranges, so that it has been forced to develop over the centuries in close relationship with the problem of water supply that has determined its social organisation according to a model based on civic engagement and active and responsible participation in public life.

The old Roman city, built around a probable Etruscan settlement, being isolated on the hill, did not have natural springs inside the urban walls, but only wells connected with cisterns for collecting rainwater. Only in very rare cases, because of the minor depth of the water table, wells drew directly from the latter. Outside the city walls, along the streets of the valley and on the slopes, there were instead a number of wells and springs capturing water veins of secondary water tables.

#### **4.2 The Siena’s bottini as a structure of urban social life**

Although it is believed that at least some parts date back to Etruscan age as well as it is established that the first works date back to 394, it was during the Middle Age that the realisation of the underground aqueduct (the “*bottini*”) started, in order to meet the needs of a city that was already largely consolidated. The construction of the two *bottini maestri* (i.e.: the two main stretches of the aqueduct) of Fonte Gaia and Fontebranda, with their related monumental fountains, was almost exclusively aimed to productive activities and services. As evidenced by a series of archival documents dating back to 1176, a rapid population growth, which began in the 12<sup>th</sup> century, had in fact increased the need of an efficient water supply and, in 1267-68, there had been advanced a project, then set aside, aimed at the diversion of the river Merse to the city.

The complex and articulated hydraulic system of the *bottini*, whose current extension dates back to 1466, was built in different phases between the Middle Ages and the Renaissance, with the commitment of Siena’s engineers such as Mariano di Jacopo (better known as Taccola) and Francesco di Giorgio, who left in their treatises a testimony of a real local technological skill. In these manuscripts are recorded with precision not only the techniques and tools which were used to build the network of the *bottini*, but also more or less imaginative projects of hydraulic engineering: not only studies for canals and river dams or apparatus for lifting and driving water, but also devices to enable man to float effortlessly.

The *bottini* are a still existing and operating network of underground tunnels, which covers a total of 25 km. and can be intended as the “spine” of the old city center. A distinctive feature of such network consists of being connected with a system of artifacts, ranging from the monumental fountains of the different *Contrade* (i.e.: the ancient neighbourhoods of the city center) to the little fountains in public spaces, the wells into the palaces’ courtyards and, finally, the canals that irrigate the gardens of the valleys outside the city walls. Around these artifacts the social life was organised: public wells, monumental fountains, the “*fontini*” (“little fountains”), located at the intersections of streets or in representative places in the urban space (such as markets, churches, cemeteries, gateways to the city through the urban walls) are the evident manifestations of the existing inter-relationship among urban structure, social organization and the network of water supply and distribution. In addition, the effective functioning of the water system required careful and daily maintenance which formed the core of a collective wisdom to be handed down from generation to generation – as in the case of the oasis – whose custodian (originally a simple but skilled worker) assumed a prominent role within the community.

Thus, one could say that the *bottini* really constitute the “spine” of the city not only in a morphological sense, being them the internal structure determining the urban form, but also in social terms, as clearly shown by the strict relationship historically existing between the underground aqueduct and the *Contrade*. It is worth remembering that such seventeen ancient neighbourhoods having names of animals or, more generally, a



medieval sound<sup>1</sup> are strictly linked to the famous horse race called “*Palio*”, where each jockey represents a *Contrada*, and the latter, in turn, is responsible for his funding, and also for celebrations before and after the competition. In the same way, each *Contrada* funded its own stretch of aqueduct as well as the construction of both its own monumental fountain and the other little public fountains in public spaces, including the one where children were baptised.

Through the realisation of the *bottini* – which are, at the same time, an engineering and architectural work, because of the *Contrade*’s monumental fountains – the city of Siena, characterised by the natural scarcity of water, succeeded in its aim of uniformly providing water supply through a distribution system that was able to reach both public fountains and private wells of individual residences. Beyond a tangible improvement in the quality of life, the *bottini*’s network allowed the city of Siena (which was devoid of natural waters) to compete against Florence (which is crossed by the river Arno) for the primacy in producing wool, i.e.: an activity, which requires an abundant use of water.

### 4.3 The *bottini* as a sophisticated engineering and architectural artefact

Underground tunnels are largely practicable and have an average size of 1.70 m in height and a width of 90 cm. The name “*bottini*” is due to the distinctive configuration of the barrel vault (in Italian: “*volta a botte*”), but there are also gable and square sections. The gutter on the ground (called “*gorello*”), where water can flow, is placed in a central position, but it can also be found laterally or in a niche. When they are not excavated directly into the rock (or, sometimes, into pebbles), the lining of the *bottini* is generally made of bricks. Along the way there are, at irregular intervals, some wells called “*smiragli*” or “*occhi*” (“eyes”), which were used in the construction phase for removing the excavated material, ventilating the tunnels and determining both direction and slope of the excavation through the use of plumb lines and a special tool called *archipendolo*.

While the *bottino maestro* of Fontebranda (i.e.: one of the two main stretch of the aqueduct) was excavated starting from only one side (with the consequent disadvantage of a more slowness of the work, due to the cramped space of the galleries, where only one man at a time could work), in the case of the *bottino* of Fonte Gaia – the second *bottino maestro*, whose monumental fountain is that of the famous piazza del Campo – a different method of excavation was preferred: for each of the different wells, multiple teams of diggers proceeded simultaneously in opposite directions and finally re-joined the galleries at an intermediate point. However, the need to realise the *bottino* in a short time led to a tunnel placed at a too shallow level. For this reason, the *bottino maestro* of Fonte Gaia collects a few veins and remains always poor of water despite it measures twice as that of Fontebranda. The latter, instead, is located at a greater depth and captures a large number of veins that, even today, constitute a substantial bringing of water. The project aimed at increasing the flow of the water directed toward Fonte Gaia, getting onto the *bottino* of Fonte Nuova, was entrusted to Francesco di Giorgio, who played the role of “worker” in 1469 and in 1492.

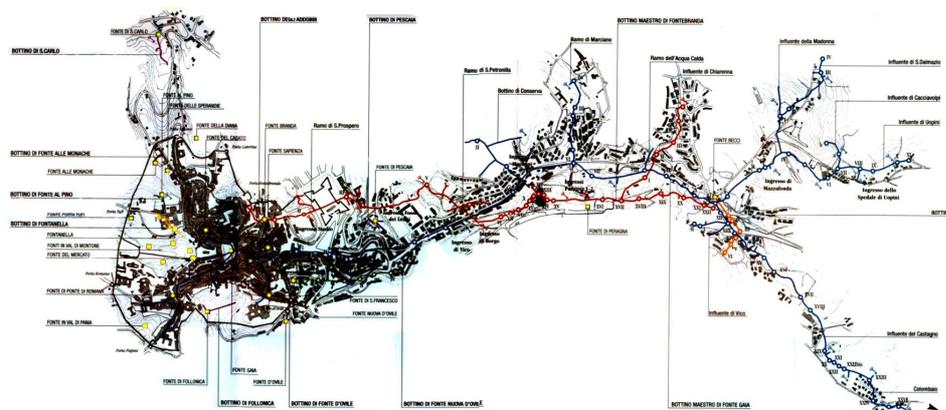


Fig. 1: The city of Siena and the network of the *bottini*.

<sup>1</sup> Such as: *Oca* (“Goose”), *Aquila* (“Eagle”), *Bruco* (“Grub”), *Chiocciola* (“Snail”), *Civetta* (“Owl”), *Drago* (“Dragon”), *Giraffa* (“Giraffe”), *Istrice* (“Porcupine”), *Leocorno* (“Unicorn”), *Lupa* (the feminine of “wolf”), *Nibbio* (“Kite”), *Onda* (“Wave”), *Pantera* (“Panther”), *Selva* (“Forest”), *Tartuca* (“Turtle”), *Torre* (“Tower”), *Valdimontone* (“Ram valley”).

#### 4.4 Functional structure and social role of the monumental fountains

The maximum development of this supply structure was during the 16<sup>th</sup> and 17<sup>th</sup> century, with both the documented presence of numerous private wells connected to the *bottini* and a growing and often unmet demand for new connections. This supply system, however, continued to live for many centuries together with a parallel one that collects and recycles rainwater. Therefore, we can talk about a mixed system, in which drinkable water is provided by fountains, by private wells connected to the *bottino* and by public wells, while water for domestic or craft activities is given by cisterns and agricultural works re-use the water coming from the overflow of the *Contrade*'s monumental fountains.

The latter are configured as public facilities and constitute one of the typical architectural structures characterising the landscape of Siena. In fact, from being simple water points, located along the slopes and in the valleys surrounding Siena, over the centuries such fountains have had an evolution in their architectural forms and uses, with also periods of complete abandonment. However, beyond the architectural differences, the model of the fountains – both their functioning and their single parts – is based on similar criteria.

In fact, it is possible to distinguish only two types of fountain: in the most complex typology the water flowing from the *bottino* was drawn on with containers for drinking and then flowed into a basin (where fish were bred) to be utilised for secondary uses. The cycle continued with the overflow of the basin, which fed a smaller tank, designed to water the animals. Then, water continued to flow into a tunnel inside the brickwork toward the *guazzatoio*, a tank where humans and animals could freshen up, and it ended its cycle coming up in a laundry, located at a level lower than the *bottino*, in order to prevent stagnation. Finally, from the overflow of the sink, it drained into the “white” sewer, which was placed in the downstream part of the complex, in order to feed mills and factories of wool workers and tanners or to irrigate the fields.

The typical location of this type of complex structure was at the arrival of minor routes in the city, close to the secondary access corresponding of the valleys belonging to each *Contrada*, of which it constituted the common good: beyond its function as public utility, through its monumental architectural forms the fountain, in fact, was somehow also entrusted with the role of representation of the *Contrada*'s identity. The monumental fountain of Pescaia – located outside the city wall, close to the Porta di Malizia (one of the gates of the urban walls) – is an example of this typology.

The structures of such fountain are arranged at right angles to the course of the today disappeared ditch of Pescaia and are enclosed in a narrow valley, which is bounded by the ridge of Camollia and by the plateau of Lizza. The original location of the fountain, presumably already existing during the Etruscan period, was near a Roman military road which, coming from Siena, headed towards Fiesole and Volterra. This route will then become a stretch of the Via Francigena, one of the medieval busiest routes connecting Rome with the northern and western Europe. Thus, the fountain of Pescaia was an important stopping place for this journey, which was frequented by merchants and pilgrims going to Rome. Fountains with a simpler structure were instead not far from the main ridges. Being them often hidden in a slower level of the street or along the slopes, they were reachable by means of steep roads or stairways.

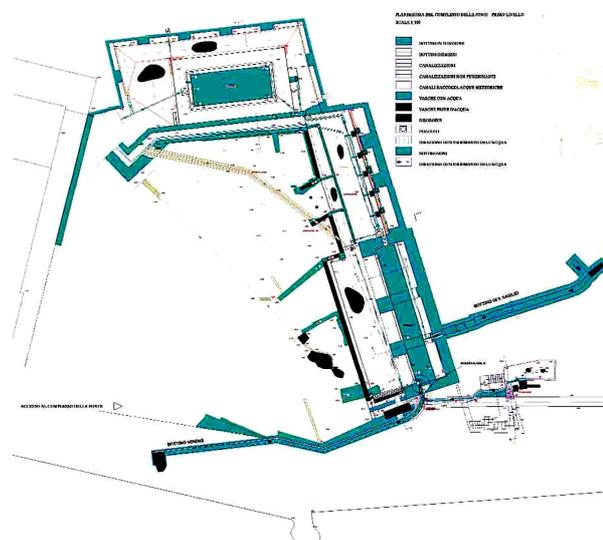


Fig. 2: Scheme of functioning of the monumental fountain of Pescaia..

## 5 CONNECTING ANCIENT WITH CONTEMPORARY SMARTNESS

### 5.1 The EU project “Siena city of water”

In the 20<sup>th</sup> century, the Siena’s medieval aqueduct was replaced, for both civil and productive uses, with the modern aqueduct Vivo, relegating for minor uses the water of *bottini* and wells. Beyond the monumental fountains, the current functioning of the *bottini* serves about 200 registered users (although it is estimated that, in the reality, users are at least twice). However, such extraordinary system of underground architectures, which is a masterpiece of the engineering of the 14<sup>th</sup> and 15<sup>th</sup> century, is a little-known historical and architectural heritage, consisting of artifacts and documents concerning the culture of water. This poetic world – real city beneath the city, crowded with shadows, noises and invisible matches emerging on the surface with dozens of fountains, wells and tanks – was the subject of a study, funded by the Europeans Commission as part of the Raphael Programme, aimed at understanding and valorizing such water supply system located both inside and outside the urban walls<sup>2</sup>. However, the theme of the relationship between historical and architectural heritage and water supply system – as well as the possibility to link their valorisation to a more general rediscovery of the culture of water – had already been tackled during the elaboration of the masterplan of the city. Research activities, which ended in January 2000, were oriented by the need to know, from a quantitative and qualitative point of view, the rich repertoire of “materials” that make up this complex system, highlighting the specific relations with both the configuration of the different sites and the specific rules of formation and development of the historic urban structure.

Therefore, through a detailed survey (scale 1:2000) and the subsequent computerised translation, a census of the different elements of the system was carried out, in order to allow the creation of a comprehensive mapping concerning not only the *bottini*, which were classified according to their different types, but also the springs, the fountains and many other minor elements (wells, cisterns, tanks, etc.), by considering them as modes of supply that are alternative to the network. In this way, 58 external fountains (including both existing and missing ones), 16 (historical and modern) monumental fountains, 4 *fontini*, 26 little fountains, 7 (existing and missing) public wells, 135 wells or wells provided with cisterns, 36 cisterns were complexively surveyed inside and outside the urban walls.

At the same time, an archival and bibliographic research was launched in order to link the results to the various thematic maps according to an hypertextual logic, which is particularly effective in terms of representation but also in translating the inter-disciplinary approach of the project, based on the contributions of a variety of specialised scholars, active in different research fields: archivists, historians, geologists, planners, architects, communicators, graphic designers, computer scientists, archaeologists, anthropologists, photographers and videographers. Beyond being the basis for specific insights, the archival research, carried out in parallel with the census, helped in individuating the structure of the whole system, also thanks to the information concerning the elements which are currently missing or modified, the uses established over the centuries, the type of ownership, etc ... In order to organise the vast collected documentation, thanks to the EU partnership, different cataloging standards have been used<sup>3</sup>. The individuation of such a multiplicity of approaches for organising the documentation derived from the heterogeneity of the collected material: unpublished manuscripts and documents, bibliographies, iconographies, old and recent photographs, historical maps and updated cartographies, videos or architectural and geological surveys. Further reasons are to be searched in the articulated research purposes: not only the creation of a specific archive of the Museum of Water (to be realized), but also a reconstruction of the urban history in relation to the theme of water, the divulging of the results by linking European institutions and organisations through virtual networks and, finally, the definition of guidelines for potential interventions on the different artifacts.

<sup>2</sup> The project “Siena City of Water” was co-sponsored by the municipality and coordinated by the designers of the Laboratorio Aqua, with the participation of the University of Siena, the Institut Francais d’Amanagement et d’Architecture of the Université de Rouen and the Museu de l’Aigua of the Ayuntamiento de Salt.

<sup>3</sup> Not only the criteria used by the Italian Istituto Centrale del Catalogo e della Documentazione (ICCD), but also those of the Fitxa “Inventori del patrimoni cultural del projecte Alba-Ter/Ave”, prepared according to the guidelines of the EU Earth program; the cataloging form of the “Inventaire Général des monuments et des richesses artistiques”, produced by the Ministère de la Culture together with the French “Institut National de Recherche en Informatique et en automatique” (INRIA), with the contribution of the ERCIM (European Research Consortium for Informatics and Mathematics) and of the European Commission.

As regards the activities of dissemination and promotion, both on and off line products were developed. Among them, the web-site, which was prepared in order to be further implemented, updated and divided into thematic sections allowing different levels of detail. Beyond the video “Siena and its places of water”, presented at the 3<sup>rd</sup> World Water Forum, held in Kyoto in 2003, was also produced an interactive CD-Rom whereby one can virtually visit a part of the Bottino Maestro of Fontegaia and then emerge in the famous Piazza del Campo. All along the path – which is displayed on suitable maps and aerial photos giving the virtual visitor’s exact location – insights concerning historical, architectural, hydraulical and geological aspects are included. Furthermore, the amount of collected documentation finally also allowed the creation of several thematic guides, illustrating both the whole system and its individual elements.

Finally, the EU project “Siena city of water” allowed to make detailed measurements of the monumental fountain of Pescaia, by using innovative techniques (a special photographic equipment and sophisticated software of image processing) to reproduce the elevations. Starting from such survey, restoration works were carried out and a preliminary design for a Museum of Water was subsequently developed.

## 5.2 Further implementations: the Museum of Water (towards the territorial museum)

The EU project “Siena city of water” was an important moment of knowledge and of renewed sensitivity of the public administration on a public heritage that had been forgotten for so many years. A further effect was an increased awareness towards the many issues related to water as a primary resource, as an object of nature and subject of culture, matrix of landscapes, places, systems and architectural artifacts. Such new awareness of the Administration has been manifested through the creation, into the monumental fountain of Pescaia, of the Museum of Water, opened to the public in 2007. The museum was seen not only as a structure for tourist use, but as a museum of the city, where the water system could become the fundamental key to understanding the urban structure. In addition, the museum was intended in the broadest sense as the museum of the community, i.e.: a laboratory in which the local community could identify, represent its aspirations and develop new cultural strategies towards sustainability.

As the museum merges the multiple outcomes of the research conducted within the EU project, this has contributed to a successful integration of traditional museum functions (i.e.: conservation, exhibition, public services, scientific research and pedagogical purposes) and innovative communication tools (e.g.: multimedia and virtual reality). On the one hand, therefore, the fountain of Pescaia is, at the same time, both the container and the main content of the museum: the site where it is located, its architecture and the hydraulic system are made intelligible and the *bottino* beneath becomes visitable. On the other hand, the museum is set up as a narrative device, which is able to tell both hydrogeological features and technological dimension as well as the collective construction of the urban identity by using a variety of languages and forms of representation for re-assembling the collected fragments of memory in order the re-reading stories and uses of places.

However, the idea of the museum as a multifunctional space focuses not only on the expositive-communicative dimension, but also on its potential as a cultural means towards the possible construction of a new collective awareness about the use of resources and common goods. In this sense, it is not configured as the final point of the process initiated with the EU project, but it is rather the starting point for the creation of a territorial museum. The latter is connected to the idea of water as a landscape matrix, being it an element of creative relationship among «context, concept and work» (Calzolari, 1991). The term «context» refers to «a set of tangible/intangible, natural/cultural, historical/contemporary components, situations and phenomena constituting the background for the single elements and claiming ideas». The term «idea» means «the thought, the creative act, the image, the memory». It «refers to a single person, but can also be understood as a dominant idea in a given situation or cultural context». The term «work», finally, concerns «the created object, the action, the result of good training and technical competence, of a good design, execution and management, the expression of intuition and imagination».

Through all the designed paths inside and outside the urban walls, marked by the presence of «works» – from monumental to minor fountains, from the *bottini* to cisterns and from these to the memory of the wool merchants’ shops; from the wells in the courtyards of palaces to the public fountains of each *Contrada*, to the wells of the rural farms in the valleys irrigated with the drainage water overflowing from the monumental fountains and, finally, to the springs and the most natural contexts – the goal is to build a system involving the museum, the city, the surrounding territory and the settled community, with water as a common thread.



The idea of a territorial museum was, however, already present in the EU project, whose results included, in fact, a series of proposals and concrete indications of the feasibility of the insertion of the Museum of Water in a network of internal and external itineraries connecting the various elements of the system: it was conceived as an expositive space belonging to a larger system involving both the city and the territory.

## 6 SMARTNESS AS LOCAL ACTIONABLE KNOWLEDGE

As conceived, the museum should trigger a process of collective re-identification, which is a prerequisite for developing a possible “active citizenship”, based on the overcoming of the dichotomy between public and private use, by introducing a notion of “common good” as related to the concept of “neighbourhood” (see: Gorz, 1994). In this sense, the historical relationship between the city of Siena, its inhabitants and water resources is an example of the possible process of building a community to be understood not as a historical fact, but as a project (Magnaghi, 2006), i.e.: as a whole of inhabitants/producers that relate in order to exercise both the care and the collective use of places where they live in durable and sustainable ways allowing “self-reproducibility”. In this sense, the focus is on the concept of self-organisation, i.e.: the inter-relationship between located social actors, capable of (self-)produce representations/interpretations (projects) on their own place (ecosystem), with a widening of participation in decisions concerning the management of resources (Scoppetta, 2009).

The process of social construction of the city of Siena around the theme of water of the *bottini* – which are, in turn, the result of the evolution of engineering techniques, but also of a collective knowledge handed down from generation to generation – can also offer interesting insights on the current rhetoric about the so-called «knowledge society» and «knowledge economy» (see, e.g.: EU, 2007), where the tendency is understanding knowledge as a resource to be sold within the context of global competition, i.e.: within a context that is different from that in which it is developed and concretely implemented. In this sense, the case of Siena is an example of Clifford Geertz’s well-known notion of «local knowledge» (1983), which is not to be generically intended as “wisdom”, but as real technical-practical knowledge which is locally developed and tested in order to solve concrete problems (such as a community’s water supply).

Rediscovering the *bottini* as a socio-spatial structure therefore may be the starting point for the community re-appropriates its own «actionable knowledge» (Friedman, 1987) as well as for its possible re-interpretation, which takes into account of current technological developments. The proposal concerning the restoration and re-use of irrigation channelling that directed water from the overflow of the monumental fountain of Pescaia to the valley belonging to the Contrada goes precisely in this direction. It is intended as a first step of a process of collective learning that can change not only the territory and its uses, but also individual behaviors and practices within a perspective where actors and context could co-evolve (see: Scoppetta, 2009a). Knowledge, in this case, becomes a resource for the «empowerment» of the community (Friedmann, 1987), allowing the passage from «exit», which is the prototype of the market (the consumer changes product), to «voice» (Hirschmann, 1970), which is the prototype of political action.

## 7 REFERENCES

- AMIN, A., COHENDET, P.: *Architectures of Learning: Firms, Capabilities and Communities*. Oxford University Press, Oxford, 2004.
- BECATTINI, G. (ed.): *Mercato e forze locali: il distretto industriale*. Il Mulino, Bologna, 1987.
- BECATTINI, G. (ed.): *Modelli locali di sviluppo*. Il Mulino, Bologna, 1989.
- BECATTINI, G.: *Dal distretto industriale allo sviluppo locale*. Bollati Boringhieri, Torino, 2000.
- BECATTINI, G.: *Dal settore industriale al distretto industriale. Alcune considerazioni sull’unità di indagine dell’economia industriale*. In: *Rivista di Economia e Politica Industriale*, Vol.V, Issue 1, pp.7-21, 1979 – Engl. ed.: *Sectors and/or Districts: some Remarks on the Conceptual Foundations of Industrial Economics*. In: GOODMAN, E., BAMFORD, J. (eds.): *Small Firms and Industrial Districts in Italy*. Routledge, London, pp.123-35, 1989.
- BECATTINI, G.: *The Industrial District as a Creative Milieu*. In: Benko, G., Dunford, M. (eds.): *Industrial Change and Regional Development*. Belhaven, London, pp.102-114, 1991.
- BECATTINI, G.: *The Marshallian Industrial District as a Socio-economic Notion*. In: PYKE, F., BECATTINI, G., SENGENBERGER, W. (eds.): *Industrial Districts and Inter-firm Co-operation in Italy*. International Institute of Labour Studies, Geneva, pp.37-51, 1990.
- BEST, M.: *The New Competition: Institutions of Industrial Restructuring*. Polity, Cambridge, 1990.
- BRENNER, N., PECK, J., THEODORE, N.: *Variiegated neoliberalisation: geographies, modalities, pathways*. In: *Global Networks*, Vol.10, Issue 2, pp.182-222, 2010b.
- BRENNER, N., THEODORE N. (eds.): *Spaces of Neoliberalism. Urban restructuring in North America and Western Europe*. Blackwell, Oxford and Boston, 2002.

- BRENNER, N.: Globalization as reterritorialization: the rescaling of urban governance in the European Union. In: *Urban Studies*, Vol.36, Issue 3, pp.431-451, 1999.
- BRENNER, N.: *New State Spaces: Urban Governance and the Rescaling of Statehood*. Oxford University Press, Oxford and New York, 2004.
- BRENNER, N.: The Urban Question as a Scale Question: Reflections on Henri Lefebvre, Urban Theory and the Politics of Scale. In: *International Journal of Urban and Regional Research*, Vol.24, Issue 2, pp.361-378, 2000.
- CALZOLARI, C.: *Natura, sito, opera: il caso del parco fluviale*. In: Casabella, 1991.
- CALZOLARI, V., SCOPPETTA, C.: *Cultura dell'acqua e identità del paesaggio*. Paper delivered at the IAED Conference (Rome, December, 4-6, 2013), unpublished.
- CASTELLS, M.: *The Rise of the Network Society, The Information Age: Economy, Society and Culture, Vol. I*. Blackwell, Oxford-Cambridge, 1996.
- CASTREE, N.: Neoliberalising nature: Processes, effects, and evaluations. In: *Environment and Planning A*, Vol.40, 153-173, 2008b.
- CASTREE, N.: Neoliberalising nature: The logics of deregulation and reregulation. In: *Environment and Planning A*, Vol.40, 131-152, 2008a.
- CEC-Commission of the European Communities: *Europe 2020: A Strategy for Smart, Sustainable and Inclusive Growth*. Brussels, Belgium, 2010.
- DELEUZE, G.: *Qu'est-ce qu'un dispositif*. In: EWALD, F (ed.), *Michel Foucault philosophe*. Seuil, Paris, 185-95, 1989.
- DONOLO, C.: *L'intelligenza delle istituzioni*. Feltrinelli, Milano, 1997.
- EU.: *Territorial Agenda of the European Union. Towards a more Competitive and Sustainable Europe of diverse Regions*. Leipzig, 2007, <http://www.bmvbs.de/en-1872.96336/Territorial-Agenda-of-the-EU.html>. Accessed September 13, 2013.
- FOUCAULT, M.: *Dits et écrits 1954-1988 (Defert, D., Ewald, F. eds.)*. Gallimard, Paris, 1994.
- FRIEDMANN, J.: *Planning in the public domain: from knowledge to action*. Princeton University Press, Princeton, NJ, 1987.
- GEERTZ, C.: *Local Knowledge. Further essays in Interpretative Anthropology*. Basic Books, New York, 1983.
- GORZ, A.: *La strada del paradiso*. Edizioni Lavoro, Roma, 1994.
- GRAHAM, S., MARVIN, S.: *Splintering Urbanism*. Routledge, London, 2001.
- GRAHAM, S., MARVIN, S.: *Telecommunications and the City*. Routledge, London, 1996.
- HARVEY, D.: *A Brief History of Neoliberalism*. Oxford University, Oxford, UK, 2005.
- HIRSCHMANN, A.O.: *Exit, Voice, and Loyalty: Responses to Decline in Firms, Organizations, and States*. Harvard University Press, Cambridge, MA, 1970.
- HOLLANDS, R.: Will the Real Smart City Stand Up? Creative, Progressive, or Just Entrepreneurial?. In: *City*, Vol.12, Issue 3, 302-320, 2008.
- IBM: *Smart Cities, 2010*, <http://www-935.ibm.com/services/us/gbs/bus/html/smarter-cities.html>. Accessed September 13, 2013.
- LAUREANO, P.: *La Piramide Rovesciata, il modello dell'oasi per il pianeta Terra*. Bollati Boringhieri, Torino, 1995.
- MAGNAGHI, A.: *Gli atlanti del patrimonio e lo „statuto dei luoghi“ per uno sviluppo locale auto sostenibile*. In: BERTONCIN, M., PASE, A. (eds), *Il territorio non è un asino. Voci di attori deboli*. Franco Angeli, Milano, 2006.
- MITCHELL, W.: *City of Bits: Space, Place, and the Infobahn*. MIT Press, Cambridge Massachusetts, 1995.
- MITCHELL, W.: *Equitable Access to an On-lineWorld*. In: Schon, D., Sanyal, B. and W. Mitchell, W. (eds.), *High Technology and Low-Income Communities*. MIT Press, Cambridge Massachusetts, 2001.
- MITCHELL, W.: *e-Topia: Urban Life, Jim but not as You Know It*. MIT Press, Cambridge, Massachusetts, 1999.
- MITCHELL, W.: *Me ++: The Cyborg-Self and the Networked City*. MIT Press, Cambridge Massachusetts, 2003.
- PECK, J., THEODORE, N., BRENNER, N.: *Neoliberal Urbanism: Models, Moments, Mutations*. In: *SAIS Review*, Vol.29, Issue 1, 2009.
- PECK, J., TICKELL, A.: *Neoliberalizing space*. In: *Antipode*, Vol.34, Issue 3, pp.380-404, 2002.
- PORTER, M.: *The Competitive Advantage of Nations*. Macmillan, London, 1990.
- SCOPPETTA, C.: *Immaginare la metropoli della transizione. La città come living machine*. Campisano, Roma, 2009.
- STORPER, M.: *Regional 'worlds' of production: learning and innovation in the technology districts of France, Italy and the USA*. *Regional Studies* Vol.27, 433-455, 1993.
- TICKELL, A., PECK, J.: *Making global rules: Globalization or neoliberalism?*. In: PECK, J., YEUNG, H. (eds.), *Remaking the Global Economy*. Sage Publications, London, UK, 2003.
- WCED-World Commission on Environment and Development: *Our Common Future*. Oxford University Press, New York, 1987.
- WOLF, A.: *Conflict and Cooperation Along International Waterways*. In: *Water Policy*, Vol.1, Issue 2, 251-65, 1998.

