GENERATIVE PROGRAMS FOR URBAN REGENERATION IN HISTORICAL SETTLEMENTS

DERIVING LESSONS FROM THE TRADITIONAL BUILDING SYSTEM IN CALABRIA, ITALY

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Abstract - English

The research focuses on urban regeneration as an approach and tool for the transformation of the city, in view of the growing diffusion of an ecological and systemic paradigm for urban planning. This new perspective has opened a path to get away from the rigid and top-down urban planning based on masterplans which can no longer grasp the complex dynamics of the globalized cities of the 21st century. On the contrary, urbanism has become an interdisciplinary practice with the aim of a human-oriented design in order to achieve a full and prosperous sustainable development at the system level, rather than aimed at controlling the urban form only. This new systemic vision of the world and the need to innovate contemporary urban governance tools frame the research from a theoretical point of view.

The thesis moves from the studies of Besim Hakim who have unveiled how the growth and shape of the historical cities of the Mediterranean and the Near East have occurred through a process of morphogenesis based on generative aspects that are also common to those of living organisms. Generative aspects led to building programs based on a simple step-by-step procedure, guided and coded as an information algorithm, similar to the one that drives the growth and change of a human embryo. In this analogy, the city is to be considered the embryo and the generative program the information contained in the DNA. The proven quality and efficiency of historical urban forms provide clear and validating evidence of the positive effects of the generative process in the field of urbanism.

This motivated the research investigation about the development of a method that supports the adoption of generative programs in urban regeneration processes for historical centres and heritage districts. More specifically, the underlying goal is to ensure the equitable equilibrium of the built environment during the process of change and growth. This can be achieved by establishing fairness in the distribution of rights and responsibilities among the various stakeholders through a generative program that has a set of ethical principles, rules and a decision-making system more responsive to the needs of civil society.

Thus, the thesis proposes a new approach to urban regeneration based on generative programs. To this end, the research process was conducted through the case study of the Calabria region. Written documents, on-field surveys of historical centres, and in-person interviews were the sources of research that allowed unveiling the traditional building system in vogue in Calabria until the early twentieth century. The study of the components of this building process allowed deriving lessons for the development of a first prototype of a Generic Generative Program for urban regeneration in the Calabria region. This forms the basis of reference for replicating the study for areas that share a similar historical environment, such as the countries of the Mediterranean area. Furthermore, the Generic Model is a starting point for further research focusing on the application of generative programs in modern urban environments.

The research concludes by providing information on how to promote today a generative program for urban regeneration initiatives, and how and in what field the adoption of generative concepts derived from local traditions can be used to innovate aspects of urban governance.

Abstract - Italiano

La ricerca si concentra sulla rigenerazione urbana in quanto approccio e strumento per la trasformazione della città, nell'ottica della crescente diffusione di un paradigma ecologico e sistemico per la pianificazione urbana. Questa nuova prospettiva ha aperto una strada per allontanarsi da quell'urbanistica della prima epoca, rigida e top-down basata sui masterplans i quali non riescono più a cogliere le complesse dinamiche delle città globalizzate del XXI secolo. Al contrario, l'urbanistica è diventata una pratica interdisciplinare con l'obiettivo di una progettazione orientata alla persona al fine di raggiungere un pieno e prospero sviluppo sostenibile a livello di sistema, piuttosto che finalizzata al controllo della forma urbana. Questa nuova visione sistemica del mondo e la necessità di innovare gli strumenti della governance urbana contemporanea inquadrano la ricerca dal punto di vista teorico.

La tesi muove dagli studi di Besim Hakim che hanno svelato come la crescita e la forma delle città storiche del Mediterraneo e del Vicino Oriente siano avvenute attraverso un processo di morfogenesi basato su aspetti generativi che sono anche comuni a quelli degli organismi viventi. Gli aspetti generativi hanno portato alla costruzione di programmi basati su una semplice procedura step-by-step, guidati e codificati come un algoritmo informatico, simile a quello che guida la crescita e il cambiamento di un embrione umano. In questa analogia, la città deve essere considerata l'embrione e il programma generativo l'informazione contenuta nel DNA. La comprovata qualità ed efficienza delle forme urbane storiche forniscono prove chiare e convincenti degli effetti positivi del processo generativo nel campo dell'urbanesimo.

Ciò ha motivato l'indagine di ricerca sullo sviluppo di un metodo che supporta l'adozione di programmi generativi nei processi di rigenerazione urbana per i centri storici. Più in particolare, l'obiettivo di fondo di un programma generativo nel settore dell'urbanistica è di garantire l'equo equilibrio dell'ambiente costruito durante il processo di cambiamento e crescita della città. Ciò può essere ottenuto stabilendo equità nella distribuzione dei diritti e delle responsabilità tra i vari soggetti interessati attraverso un programma generativo che ha una serie di principi etici, regole e un sistema decisionale più rispondente alle esigenze della società civile.

Pertanto, la tesi propone un nuovo approccio alla rigenerazione urbana basato su programmi generativi. A tal fine, il processo di ricerca è stato condotto attraverso il caso studio della regione Calabria. Documenti scritti, indagini sul campo dei centri storici e interviste sono state le fonti di ricerca che hanno permesso di svelare il tradizionale sistema costruttivo in voga in Calabria fino all'inizio del XX secolo. Lo studio delle componenti di questo processo di costruzione ha permesso di trarre insegnamenti per lo sviluppo di un primo prototipo di un programma generativo generico per la rigenerazione urbana nella regione Calabria. Questo costituisce la base di riferimento per replicare lo studio per aree che condividono un ambiente storico simile, come i paesi dell'area mediterranea. Inoltre, il modello generico è un punto di partenza per ulteriori ricerche incentrate sull'applicazione di programmi generativi in ambienti urbani moderni.

La ricerca si conclude fornendo informazioni su come promuovere oggi un programma generativo per iniziative di rigenerazione urbana, e come e in quale ambito l'adozione di concetti generativi derivati dalle tradizioni locali può essere utilizzata per innovare aspetti della governance urbana.

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Part 1 – Introduction

1.1 – Topic of the research: urban regeneration practices

After the Second World War, the governance of European cities started to rely more and more upon an urban planning based on top-down, centralized, rigid, high capital, and large-scale master plan (Hall 2014). That type of prescriptive tools for land-use governance failed to grasp the complex dynamics that characterize cities, and often they resulted ineffective in matching real community needs (Dreier et al. 2004; McLaughlin 2012). Simply, this model revealed to be not enough responsive to local conditions and changes that occur numerously in the actual dynamic and uncertain postmodern era (Jameson 1989; Lash 2000; Bauman 2007).

The use of top-down planning produced particular effects on historical settlements, such as in Italy where heritage districts are essentially frozen due to a land-use governance focusing mostly on the preservation of the built environment as it is, leaving little space for rapid interventions, self-management, and initiative of inhabitants (Di Stefano 1979).

The need of intervening rapidly on urban systems increased during the XX century, particularly in special circumstances of highly distressed urban environments (Roberts and Sykes, 2000, Porter and Shaw, 2009, Musco, 2009, Tallon 2010). That urgency led to the advent of a new way of transforming cities, known as *urban regeneration* that is based on comprehensive and integrated projects. This concept relies on an ecological paradigm where cities are theorised to function as living ecosystems of high complexity (Cardarelli and Nicoletti 1978, Batty and Marshall 2009; Su, Fath and Yang 2010; Tracada and Caperna 2013), therefore requiring a systemic approach and sophisticate tools and programs for its transformation and haling (Tracada and Caperna 2012).

Another relevant aspect interesting the revitalisation of distressed urban systems is the active citizenship that during the last decades reached the size of a worldwide movement recognised under the name of social innovation (Moulaert 2005; Mulgan et al. 2007). People gather around local bottom-up initiatives and claim for a bigger role in urban governance mechanisms regarding their living place (MacCallum et al. 2009; Smith et al. 2015). In Italy, that phenomenon is particularly intense in southern regions (Consiglio and Riitano 2015) where the urban settlements, and even more the heritage districts, are experiencing an intense pauperisation trend (Legambiente 2016).

This research focuses on regenerative intervention for historical settlements and heritage districts, a topic that in Italy, during the last years, has taken on significant resonance and the form of a large debate interesting the whole country (Berdini and Emiliani 2008, Lauria 2009; Stabile, Zampilli, and Cortesi, 2009; Zoppi, Gregorini, and Stella, 2017). This is due to the lowering conditions of historical centres that are mostly present in small towns (less than 5.000 inhabitants) constituting the 70% of the Italian municipalities (ANCI and IFEL 2015).

The research focuses on a new approach for urban regeneration that relies on *generative process* that is the one underlying the growth and changes of ecological systems (Wolpert 1991, 1997). That type of process favours emergent properties and works as an algorithm made of a guided step-by-step procedure within a reasonable time frame (Czarnecki and Ulrich 2005). The hypothesis of adopting this type of process for urbanism was introduced by Hakim (2007) who discovered how the traditional way of building in vogue in the Mediterranean area until the early XIX century relied on a generative system (Hakim 2001, 2007, 2008b, 2014). Therefore, the research inserts in an already existing research known under the general name of Mediterranean urbanism (Hakim 2014). It relyed on a past building systen that can be read as a *generative program,* simply a set of descriptive instructions similar to those contained in an embryo allowing it to grow and evolve (Wolpert 1991; Hakim 2008b).

Overall, the adoption of generative programs and processes is here proposed as ameliorative of urban regeneration practices. This is also alternative and in contraposition to the top-down prescriptive and rigid land-use regulations that characterise most of the today urban planning (Hakim 2007, 2008b, 2014). In particular, the research focuses on the regeneration of distressed historical centres, as a first step and experimentation toward a wider application in other type of urban context.

1.1.1 – Mediterranean Urbanism. Deriving lessons from the past for a contemporary new urban regeneration method based on generative aspects.

The Mediterranean Urbanism can be understood as a systematic category of the classification of cities, those recognized precisely in a common genesis of their urban form. This form is the product of centuries of evolution dictated by a system that binds the natural environment, people, and technical knowledge. The various local forms of these Mediterranean settlements emerged from a generative process that today we have interrupted or, more optimistically, put in pause.

Urbanism in the Mediterranean basin was characterised by a system made of common rules and codes that were followed during the building process, which included building activities at the neighbourhood level and a decision-making process that took place between neighbours. The outcomes are emergent urban and architectural forms that have resulted from a bottom-up organization following its own set of rules since before the sixth century (Hakim, 2008b, 2014). This concept has been developed by professor Besim S. Hakim, who identified such roots in the ancient urbanism of the Near East and Eastern Mediterranean. The first written evidence of this way of building cities is the architecture treatise of Julian of Ascalon, an ancient architect who wrote the work between A.D 531-533 (Hakim, 2001). Then, this system of rules was spread by intense cultural exchanges among the various Mediterranea civilties that refined and documented it such as in the case of the legal literature of Islamic culture (Hakim, 2008a, 2008b). States on the northern side of the Mediterranean Sea were influenced by the Islamic culture, inheriting and embedding several of its principles and rules in their customs, and continuously transmitting them until very recent times. This is confirmed by Guidoni, who unveiled that it is in southern Italy that Islamic influence produced the most incisive changes in modes of organization of space and territory, as well for labour and communities. Here, the presence of Islamic components in urban systems was a tradition that had experienced continuity until the industrial age (Guidoni, 1978, 1979). The south of Italy, and the Calabria especially, represent a special case of cultural contamination as the building knowledge of oriental origin (mainly Byzantine and Islamic) already present in the region merged with those of central and northern European cultures such as Longobards and Normans. Still today, historical villages in that area offer good opportunities to analyse the original urban and architectonical forms that have emerged from the traditional Mediterranean building system.

Traditional building rules originated from the need to solve specific issues between citizens, or are about specific functional purposes. The codes allow flexibility and various applications as a result of interpretation at the local level. They are also socio-generative as they push people to interact with each other in order to address and solve issues, resulting in the creation and maintenance of good, neighbourly relations. Those rules were understandable and enforceable by everyone, and formed a fundamental tool for people to peer-to-peer build the place they were inhabiting. Such norms can be seen as a generative program which can be defined as an encoded descriptive set of instructions for making a particular structure (Hakim 2008). It is like the one contained in the DNA of an embryo which allows it to grow and evolve (Wolpert 1991).

Overall, the study of traditional Mediterranean and Near-East settlements conducted by Hakim showed the past existence of bottom-up building rules based on social connections and commons rather than on a formal top-down blueprint envisioned by a central authority. As a result, the urban forms generated through such a process

represent optimal solutions, are deeply interconnected with the natural environment, human beings, and the of then social and economic model.

Today, it is possible to learn from past traditional building practices to derive lessons for contemporary applications in urban transfomation practices. Particularly, generative aspects underlying the old way of building reveals to be interesting for improving urban regeneration, first, in historical centres and heritage districts, and eventually, also in modern urban fabrics.

1.2 – Reasons of the research: the need of a new type of governance for historical centres and heritage districts

1.2.1 – The Italian heritage conditions

The Italian built environment is largely deteriorated, especially in the peripheries and historical centres. The wild and unregulated urbanization that started during the second half of the last century has left the new generations a damaged territory with plenty of second and third property houses, infrastructures, and industrial buildings, most of them illegally built and then regularized through a series of amnesty acts (Fig. 1.1). A considerable number of empty buildings, mostly in bad condition and of poor quality, are scattered along the main arterial roads, alternated by unused plots and abandoned fields that have originated a continuous ugly urban landscape (Minervino, M.F. 2010).
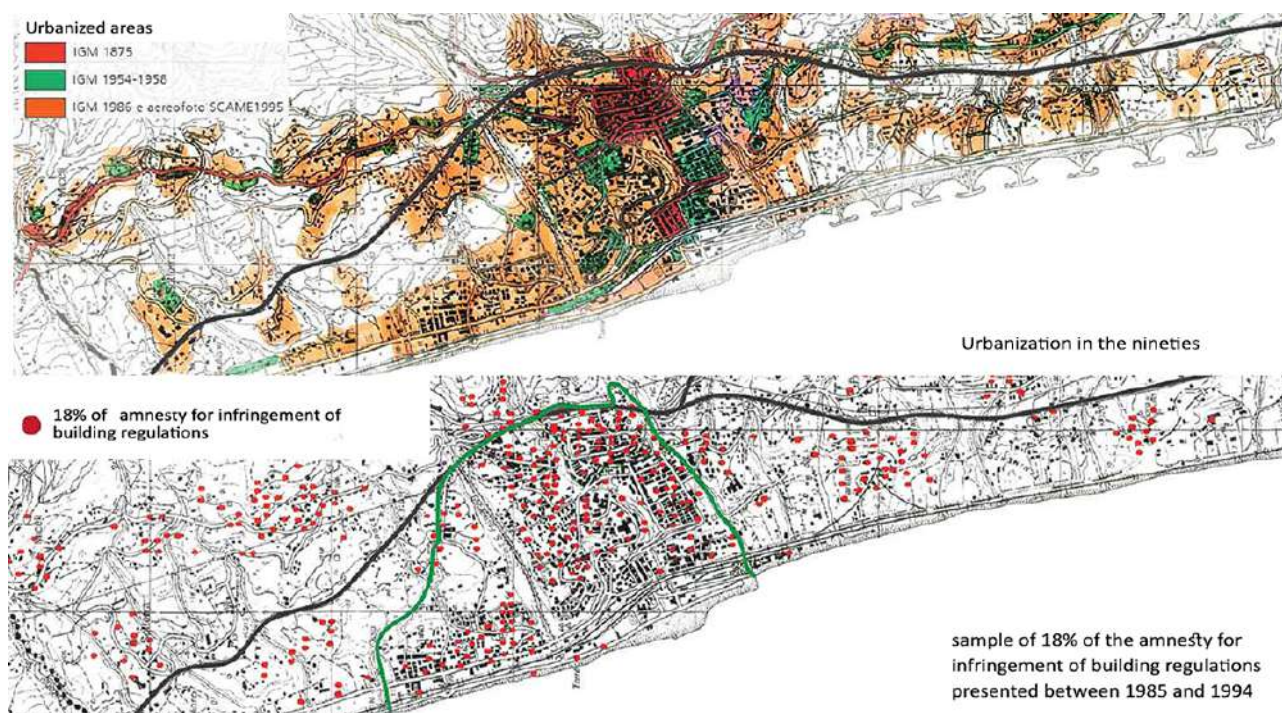
Fig 1.1 – The town of Paola (Calabria). The image above shows the rapid urbanization occurred during the nineties, while the image below shows a sample (18%) of the requests for amnesty for illegal buildings presented in the decade 1985-1994. Drawings by Guglielmo Minervino

How to utilize public and private unexploited assets is a long-running debate in Italy. The state's real estate values almost 60 billion Euros: over 47,000 inventories, 32,691 buildings and 14,351 areas, worth 54.1 and 4.78 billion, respectively (Agenzia del Demanio). There are not enough public funds nor an effective national strategy to maintain and put them into the economic system. Furthermore, recent selling programs of state properties have achieved results lower than expectations (Il Fatto Quotidiano 2016).

An even dramatic situation exists for historical centres where the concentration of unexploited assets is high, in a dreadful state, and mostly abandoned (Lauria 2009). Small Italian towns and villages up to 5,000 inhabitants (Table 1.1) present several issues, such as high inoccupation rate, strong out-migration, population aging, abandonment and deterioration of physical assets, lack of infrastructural investments, and lack of capability of local governments in facing contemporary challenges (Arminio 2012). These aspects have plummeted towns and villages on a pauperization trend that today reveals situations of distressed communities with substantial economic stagnation or decline that persists for decades under dynamics of no return (Consiglio and Riitano 2015, Legambiente 2016).

Regions	N° of municipalities	N° of small municipalities	% of small municipalities on the total
Abruzzo	305	249	81,60
Molise	136	125	91,90
Campania	550	335	60,90
Puglia	258	85	32,90
Basilicata	131	101	77,10
Calabria	409	323	79,00
Sicilia	390	205	52,60

Table 1.1 – Small towns and villages in the Southern Italian regions. *Source* Anci, IFEL (2015) *Atlante dei piccoli comuni.*

If refurbished, this huge real estate represents an opportunity for the reintroduction of those assets into the economy of Italian municipalities. But, to do that it is necessary to intervene at level of urban system, therefore through regenerative and development programs embracing the whole historical organism, meaning the social, economic, and physical system.

That type of intervention are complex and requires a powerful role by the public sector in activating and controlling processes in order to not end in mere private speculative operations. In Italy, the public administration is the principal actor that is demanded to develop and implement urban transformations. Yet, it finds difficulties in promoting effective public policies due to a lack of investment in new technologies for public offices, and in training programs for the human resources of the administrative apparatus which therefore results slow and inefficient (CGI Mestre 2017). Some innovative attempt in promoting local development has been started by the national Italian government that in 2014 initiated a national strategy relying on the Assed-Based approach as a way to put in contact local administration and communities, included privates on a common agenda. The Asset-based approach is meant to energize change and development from within a community building on its local assets (Kretzmann and McKnight, 1993). The national strategy focuses on the development of the inner areas which, mostly made of historical villages, constitute the 53% of the Italian municipalities, hosting the 23% of the Italian population (Italian Government 2014). Those areas suffered a marginalization process characterized by depopulation, unemployment, underused territory, and lack of basic public and private services as well as infrastructures. The situation is aggravated by hydrogeological instability and degradation of the physical and cultural heritage. The strategy is still at an early stage, and after the identification of the targeted areas, some of them have been chosen as pilots to test interventions.

1.2.2 – The inadequacy of the current system of urban governance for historical centres

Historical Italian towns have to face built environment transformations by procedures of intervention that are complex, bureaucratically intricate, and relying mostly on a top-down urban planning inspired to zoning, firstly introduced by the already in vogue urban planning law in 1942. Such prescriptive tools for land-use governance failed to grasp the complex dynamics that characterize historical cities, resulting ineffective and not responsive enough to local conditions and changes under the effects of globalization (Dreier et al. 2004; Bauman 2007; McLaughlin 2012).

The multi-level planning allows each administrative level to emanate its own plan within a hierarchical structure. Therefore, Italy is governed through regional plans, provincial plans, inter-municipality plans, municipality plans, and a number of sub-plans that usually respond to zoning areas. Almost all of those planning tools are developed by the public authority through a process that allows only few mechanisms for citizen participation and of scarce impact. It is a context of normative and administrative disorder, where roles of players in the decision-making process are vague, and the urban development is frequently governed through variation of the plans in an extremely costly and lengthy process which ultimately renders the original master plan irrelevant (Calavita and Caudo 2010). Those that suffer the most from that mechanistic governance are individual citizens and communities which role in the decision-making system is very little. Their claim for a more human-cantered

paradigm is growing and took on the form of local bottom-up initiatives challenging various issues related to urban governance (Orsi, Ciarrocchi, and Lupi 2009; Consiglio and Riitano 2015).

Communities of people were those that gave rise to the historical Italian cities over the past eight centuries. Even today, those centres live but suffering the impossibility of reacting to their slow decline. More issues for them come from a strict landscape restriction that subordinates any transformation within various types of zone areas to the issuance of a landscape authorization. The issue of this document by a central authority can take several months hindering a prompt intervention, and frequently its mechanisms are exposed to corruption. The general aim of such highly restrictive regulation is to preserve the Italian heritage, a positive purpose which, however resulted also in an essentially freezing of the Italian historical settlements (Di Stefano 1979).

The failure of this hierarchical and rigid planning model is evident in the fact that, even under this protective regulation, the historical built environment of almost all towns has been extensively compromised by illegal modern additions and unsuitable materials. This happened for the impossibility to control properly the whole Italian territory by a sole central authority which also lacks of economic and human resources. These irregular practices contributed to a depreciation of the market value of the real estate combined to a phenomenon of intense outmigration and lack of investment that resulted in a loss of public services and a deterioration of the urban environment. In the today dynamic society, the only positive aspect of the actual regulation model is that it has impeded the demolition and lost of a huge size of the Italian built heritage. This, also open for enormous possibilities in the field of urban regeneration and economic development.

Focusing on the heritage built environment, the main planning tool for its governance is a sub-plan of the municipality General Regulatory Plan, called Recovery Plan of the Historical Centre. It refers to a type of zone introduced by the law n° 457 of 1978 which has to be regulated by the "Piani di Recupero" (Recovery plans). The first article of the law says "municipalities identify, within the framework of the General Regulatory Plan, areas where, due to degradation conditions, it is appropriate to recover existing building and urban heritage through interventions aimed at conservation, rehabilitation, rebuilding and better utilization of assets same". From its principles, the Recovery Plan present positive aspects as it does not prohibit transformation, rather it allows the possibility to transform the heritage built environment within the legislative framework. The problem with that planning tool is that very few municipalities have developed it, leaving transformations in a grey zone where from one side, privates acts as they wish, even counter the law, and from the other side, the public cannot intervene promptly as is has not enough power, and resources to control.

Land use regulation forms have always been the object of critiques and proposals of modification which spanned between who advocate for having more flexibility and who argued that regulations have to guarantee predictability. According to Talen, sustainable city-building in the contemporary century will require achieving a balance between greater predictability and greater flexibility. Land use regulation reform took a path were codes, instead of only prescriptive rules, are used in order to help to create a built environment where space is defined by buildings rather than just occupied by them (Talen 2012).

The unveiling of historical traditional building principles, rules and codes that were based on performance rather than strict prescriptions can help that kind of reform. By their revision, when necessary, they can be made compatible with contemporary necessities such as on matters of building materials, technology, and infrastructure requirements including transportation (Hakim 2007).

Finally, it is positive that today there is an opinion movement aimed at the preservation and "regeneration" of those historical urban systems. It is well present among the civil society which is a growing player from the bottom of the urban system and that has not yet been adequately recognised as it was in the past traditional building system and urban governance of the Italian municipalities. At the moment, urban regeneration seems to still be in the prerogative of only architects that, however are not fully aware of the genesis of the historical urban

form that was precisely the outcome of a generative system where environmental and economic aspects, social and institutional organization were each other interrelated, and where building activities were mostly in the hands of people of that time, true authors and therefore demiurges of our historical cities.

1.3 – State of the art and research question

Contemporary society is characterised by an increasing dynamism that under the effects of globalisation produced conditions of high uncertainty in urban governance, pushing cities to face a transitional phase of profound structural change (Sassen 1988; Snook 2003; Bauman, 2007; Dahms and Hazelrigg 2012). To gain competiveness and not perish under the new globalised world-system, cities need to innovate the structure and mechanisms of their urban governance by shifting toward new models embracing the deep-ecology paradigm (Goldsmith 1992; Breuste, Feldmann, and Uhlmann 1998; Capra 2002) based on system thinking and sustainability (Brown 1981; WCED, 1987; UNGA 2005; Glomsaker 2012; Orr 2014; Mazmanian and Blanco 2014). The consideration of the whole urban environment under the ecological perspective led to view the city as a living organism, thus considered a hypercomplex system according to its internal and external dynamics and their mutual interactions (Geddes 1915; Cardarelli and Nicoletti 1978, Alberti 2009; Batty and Marshall 2009; Su, Fath and Yang 2010; Tracada and Caperna 2012, 2013; Salingaros, 2014; Mehaffy and Salingaros, 2015). In urbanism, Systems Theory has been taken in account by Christopher Alexander who presented in its studies a particular kind of "Order" which, whether in nature or human made, is the source of the coherence bounding any components of the world (Alexander, 2002). The validity of the Alexander's ecological vision of the urban system is particularly manifested in the existence of historical Mediterranean towns that are meaningful products originated from a generative process relying on a simple conceptual model made of ethical principles, local building rules, codes and customs deep related with the local urban ecosystem (Hakim 2007).

The embracing of the ecological perspective in urbanism is reflected in urban governance where it led to the adoption of a new approach characterised by holism, and the preference of strategies and programs ahead of technical drawings and rigid regulations that, instead, are now put subjected to the principles governing the ecosystem, including urban areas (Smuts 1926; Portugali 2006; Tracada and Caperna 2012).

On that premises, a new approach at urban transformation, named *urban regeneration,* came to the scene of XXI century urbanism. The main strength of urban regeneration is its operation through an incremental way based on specific projects and small interventions, guided by general ethical principles and within a general strategy, therefore, a practice very distant from the traditional urban planning (Quinn 1978; Castanheira, Bragança, and Mateus, 2013; Aveta & Castagnaro, 2015; La Varra, 2016; Carta, Lino, and Ronsivalle 2017; Carlson 2018). A second relevant characteristic is the giving of great relevance to the role of people as contributors to the ideation and creation of the urban environment. Overall, urban regeneration represents an evolution in the approach at urban transformation which is a practice in continuous improvement under the influence of student and professionals from all around the world.

One of the most innovative proposals to ameliorate the contemporary way of intervening on urban fabrics came from Hakim (2007) who envisage the adoption in today urbanism of *generative* concepts coming from the fields of biology (Wolpert 1991, 1997) and computer science (Krzysztof and Eisenecker 2005; Zittrain 2006). Hakim (2007, 2014) who highlighted how this concepts can be used to develop new tools for urban transformation and governance as an alternative to the top-down planning proper of the mechanistic worldview. However, the presence of generative aspects in urbanism is not new, on the contrary they characterised past traditional building systems such as those of the ancient Mediterranean and Near-East settlements (Hakim, 2001, 2007, 2008b, 2014).The study of those building systems allow for the recognisance of a series of principles that can be adopted and applied to today urban regeneration practices, both for historical and modern cities.

Among the best candidate countries to conduct that research path, Italy outstands as being a rich source of information due to its not yet studied traditional building systems from the point of view of generative concepts. Especially the south of the peninsula still preserve a good integrity of the old historical centres allowing high chances to find useful information to the purpose of that research.

Those considerations and state of the art in the literature lead to the research question of how and what we can learn from the past traditional building systems to improve contemporary urban regeneration. On that aspect, the main contribution of the research is the development of a method that supports the adoption of generative programs, characterising past way of building, in contemporary urban regeneration processes. The method is developed by conducting a case study on cities located in the Calabria region, South-Italy.

1.4 – Practical implication of the research

The research will provide the basics on theory and practice for developing and applying today a generative program for urban regeneration in historical settlements.

On that purpose, a practical and synthetic vademecum, under the form of step-by-step indications, is developed for public institutions and professionals, with in mind the idea of operating in small historical Italian towns that usually lacks of tools, resources, and strategies for effective urban governance. However, the vademecum will be a suitable base for the other Italian regions, and about its general concepts for the other European countries.

Overall, expected results of the research are:

- Verifying the possibility and validity of adopting generative concepts in for urban regeneration practicies;
- A Generic Generative Program Model to be used for developing local generative programs in the case study context, and as reference for application in other geographical areas.
- Indication on how to start or re-establish a generative processes for urban transformation, and develop a generative program, in particular for revitalizing historical towns and heritage districts within cities;
- Derived lessons from the past usable today to develop new mechanisms of urban governance more responsive to changes at local level;
- Uncovered ethical meta-principles at the base of traditional urbanism that can be recycled in contemporary and future urban and architecture design;
- Understanding the clabrian traditional building systems that can be useful to develop strategies for post-disaster reconstruction;
- Understanding the past decision making process on matters of urban governance, useful to develop more effective strategies and methods for community engagement and participation.

1.5 – Research work organisation

To answer the research question, it was adopted a methodology based on a case study, the Calabria region. The case was analysed by the point of view of generative systems to seek evidences of generative aspects in the past traditional building system of the region and, from that, to derive valuable lessons to develop a method that supports the today adoption of generative programs in urban regeneration processes. The model is then proposed to be used as base for developing local customised programs for urban regeneration in calabrian towns or as reference point for the development of an equivalent tool for other geographical areas.

The research is articulated in five parts plus a series of appendices that either provides a deep focus on various aspects of the research or present detailed contents outcome of the case study analysis.

The present introductive chapter presented the research. It introduced the Mediterranean Urbanism as central topic of the research and the reasons of deriving lessons from that ancient building practice for contemporary application within urban regeneration sector. It also clarified the reasons that led to focus on the South Italian territories and historical centres in particular.

The second part of the research provides a theoretical background by referring to the new ecological paradigm underlying the XXI century urbanism. Main practical implication of the new paradigm is the need for new type of models for urban governance and city transformation. In particular it is investigated the urban regeneration approach and how it can be improved by adopting generative concepts derived from the fields of biology and computer science. Generative programs are then presented as an alternative tool to the actual predominant planning model based on rigid masterplans proper of the past mechanistic view.
Finally, the part present how generative concepts can be adopted in urban studies under the form of Generative Programs for urban regeneration. On that purpose, a general methodology developed by the author is presented.

A third research part outlines the learning by analysis approach adopted for conducting the research through the case study. It also describes the sources of the research and the methodology of analysis of the case study.

Part 4 of the research concentrates on presenting results. The first three chapters concern outcomes from the case study analysis and the last chapter presents a Generic Generative Program for urban regeneration of historical settlements in the Calabria region, including provides indications on critical aspects linked to the adoption of such a tool, and its Practical implications for local policy decisions.

Conclusions are presented in the last part of the work through the key findings of the research, its limits, and indications for further research.

Eight appendixes completes the research by providing an outline of the formation and evolution of Calabrian settlements, relevant source contents, a computer dynamic system model that simulates the growth of a generic town by using a generative process, two practical initiatives of urban regeneration to which the author participated and that resulted a valuable source of experience for developing this research, a map with the analysed historical centre, and examples of generative programs from other fields of study,

Part 2 – Theoretical background

The new ecological perspective for urbanism and urban regeneration

2.1 – Toward an ecological perspective of the urban system

2.1.1 – A paradigm shift in XXI century urbanism

Contemporary society is characterised by an increasing dynamism that under the effects of globalisation produced conditions of high uncertainty in urban governance, pushing cities to face a transitional phase of profound structural change (Sassen 1988; Snook 2003; Bauman, 2007; Dahms and Hazelrigg 2012). Several new problems are challenging cities that find it difficult to answer because their urban governance is still based on the reductionist and mechanistic paradigm that is not effective in addressing the growing globalization that has put cities on a common ground of high competition like never before (Begg 1999).

The mechanistic worldview of Descartes and Newton isolates problems from the complex systems in which they exist, and simply treats the observed symptoms instead of healing the systemic causes (Quine 1951; Doniger 1999; Polkinghorne 2002). This paradigm was fostered by the rapid technologic advancement of XIX-XX centuries, and grew fast until became the prevailing way of thinking and operating, especially in computer science (Taylor 1992; Abadi and Cardelli 1996). Main critical aspect is the view of the human being as mere user and consumer with the effect of scarifying people rights to increase productivity (Signorelli 2016; Brera and Nesi 2017). That worldview weakened and frequently erased ethical and social values developed during Renaissance (Garin 1967) underlying the existence of a community – the *civitas* - where people had the role of active agent of growth and change within the urban system (Jacobs 1961). On the contrary, the mechanistic paradigm underlines the modern way of urban planning based on top-down, centralised, inflexible masterplans that failed to grasp the contemporary complex and dynamic urban systems, including social aspects and people that are seen as a simple parameter conditioning the urban form (Friedmann 2003; Cliff 1984; Devas 1993; 2004; Carta, Lino, and Ronsivalle 2017).

To gain competiveness and not perish under the new globalised world-system, cities need to innovate the structure and mechanisms of urban governance by shifting toward new models embracing the deep-ecology paradigm (Goldsmith 1992; Breuste, Feldmann, and Uhlmann 1998; Capra 2002) based on system thinking and sustainability (Brown 1981; WCED, 1987; UNGA 2005; Glomsaker 2012; Orr 2014; Mazmanian and Blanco 2014).

Having origins in biology, Systems Theory empathises the concepts of holism and organism over reductionism and mechanism, highlighting the inter-relationships between elements from which interaction the system manifests unpredictable emergent properties (Smuts 1926; Bertalanffy, 1968; Holland 1998; Steven 2001; Meadows and Wright 2008). In urbanism, Systems Theory has been taken in account by Christopher Alexander who presented in its studies a particular kind of "Order" which, whether in nature or human made, is the source of the coherence bounding any components of the world (Alexander, 2002). In its publication "A city is not a tree" Alexander shows that a well-functioning urban system is clearly a complex one, where its elements overlaps each other in several sets, involving not only physical elements but also social and economic (Alexander, 1965; Portugali et al. 2016). The consideration of the whole urban environment under this ecological perspective is based the view of the city as a living organism, thus considered a hypercomplex system according to its internal and external dynamics and their mutual interactions (Geddes 1915; Cardarelli and Nicoletti 1978, Alberti 2009;

Batty and Marshall 2009; Su, Fath and Yang 2010; Tracada and Caperna 2012, 2013; Salingaros, 2014; Mehaffy and Salingaros, 2015).

The Alexander's ecological Order in nature can be read as a "conceptual model" for architecture, which components (principles, properties, patterns) can be understood and used in designing process (Alexander 1977, 2002-2004). "Conceptual models" are based on simple principles and mechanisms allowing dynamism in the domain under the ecological worldview (Fig. 2.1a) (Failer and Gluch 2012). Once a concept model has been developed, it becomes a stable base used by designers to discuss and solve problems by finding the correct relationships between the different components of the model (Kung and Sölvberg 1986; Embley and Thalheim 2014). Conceptual models are alternative to static models that instead provide a point of reference to be followed every time the same issue come on the table (Taylor, Medvidovic, Dashofy 2009; Levin 2009). That way of thinking is proper of domains under the mechanistic worldview where every input is known and every resultant is predictable, or can be predicted on a linear process (Fig. 2.1b).
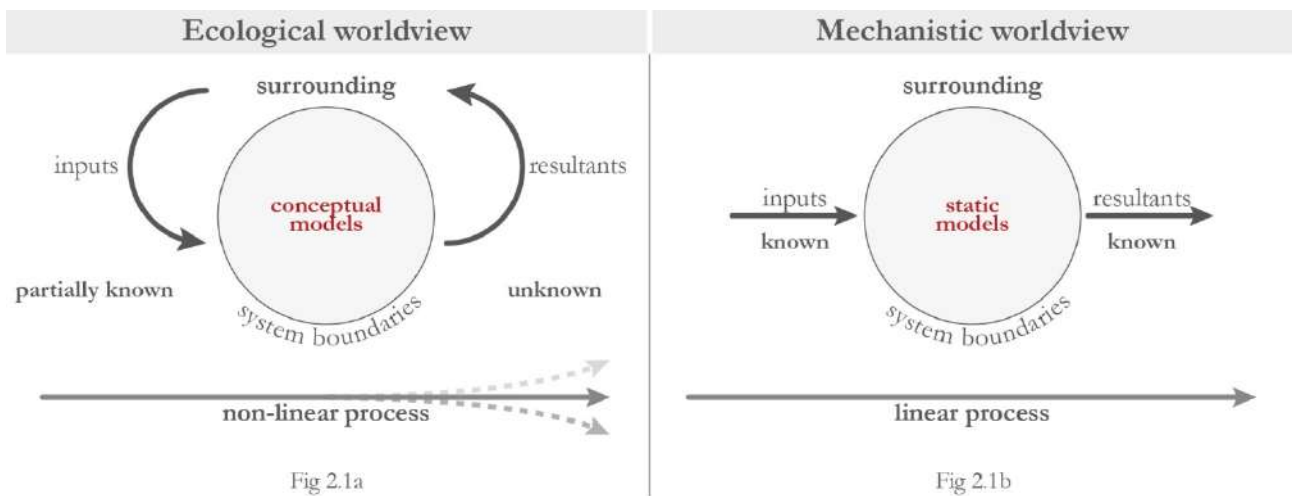
Fig. 2.1 – Differences between type of systems and models. Drawing by Guglielmo Minervino

The validity of the Alexander's ecological vision of the urban system is particularly manifested in the existence of historical Mediterranean towns that are meaningful products originated from a generative process relying on a simple conceptual model made of ethical principles, local building rules, codes and customs deep related with the local urban ecosystem (Hakim 2007). Generative processes constitute the base of that research and are extensively presented in the next chapter 2.2.

Overall, it is safe to state that today planning and transformation of cities has moved toward a comprehensive understanding of the urban context. Urbanism has gradually absorbed notions from different branches of science, such as sociology, anthropology, ecology, psychology, economy, politics, and biology (Salingaros 2013; Mehaffy and Salingaros, 2015). It has become a full cross-disciplinary practice which main goal is shifting from the control of the urban form and its growth toward a human-oriented design that matches the best qualities of the architecture and the urban planning of the past and the present, ground design on a wide scientific and epistemological vision, and finds a human centred path to the built environment of the future (Caperna and Serafini 2013; Moore Alexander et al. 2016).

2.1.2 – Urban regeneration. A new approach for urban transformation

The embracing of the ecological perspective in urbanism is reflected in urban governance where it led to the adoption of a new approach characterised by holism, and the preference of strategies and programs ahead of

technical drawings and rigid regulations that, instead, are now put subjected to the principles governing the ecosystem, including urban areas (Smuts 1926; Portugali 2006; Tracada and Caperna 2012).

A stimulus on that direction came from the most common problems challenging today cities, such as the presence of brown-field sites, neglected areas and buildings, obsolete infrastructure, gentrification, enclaves, social and economic inequalities, urban sprawl, slums etc. Having these types of issues in an urban ecosystem led to a decrease of the quality of life in that areas, and when they last for a long time, also the surrounding areas become involved resulting in a likely ripple effect on the whole system. To prevent such a threat, any new urban transformation approach should produce the opposite effects of regenerate and revitalise the distressed area, and spread positive effects on the surroundings, in analogy with a cure to treat a living organism when and where it is affected by an illness or physically harmed (Lerner 2003). This type of approach aims to provoke a regenerative process that not only affects the neglected area but also all the connected elements of the urban ecosystem (Casagrande 2013). On that premises, *urban regeneration* came to the scene of XXI century urbanism as a new approach and methodology of intervention for urban recovery and transformation.

This approach well fitted, on concepts and practice, the new ecological paradigm. In fact, the term *regenerate* derives from the Latin verb *generare*, from *genus* meaning birth (Pianigiani 1927). It is also a metaphor that has roots in religion, sociology, and life sciences such as medicine and biology (Furbey 1999) where the regeneration is the process by which organisms replace or restore body parts (Johnson Goss 2007). Within that ecological worldview, regeneration processes have found a growing application in urbanism where, largely derived from European literature, urban regeneration is widely accepted as a systemic approach to intervene on the urban environment aiming to revitalise and improve the quality of the life of a targeted area which has been subject to negative changes (Roberts and Sykes, 2000, Porter and Shaw, 2009, Musco, 2009, Tallon 2010).

The main strength of urban regeneration is its operation through an incremental way based on specific projects and small interventions, guided by general ethical principles and within a general strategy, therefore, a practice very distant from the traditional urban planning (Quinn 1978; Castanheira, Bragança, and Mateus, 2013; Aveta & Castagnaro, 2015; La Varra, 2016; Carta, Lino, and Ronsivalle 2017; Carlson 2018).

A second relevant characteristic bound to urban regenerative practices is their giving great relevance to the role of people as contributors to the ideation and creation of the urban environment. For them, it has been to some extent opened a new possibility to participate and control urban changes and decide the characteristics of their living environment, a practice considered fundamental for achieving a true and vibrant living urban environment (Fera 2008; Ciaffi and Mela 2011; De Carlo and Marini 2015; Moulaert 2015;). Under the new ecological perspective local inhabitants are today back on the way for reacquiring their natural role as agents of their urban system metabolism (Ferrão, Fernandez 2013; Chrysoulakis, de Castro, and Moors 2014; Stroh 2015), like it was before the effect of the XX century widespread of the neoliberal economic model that impacted significantly on urban governance and city building.

Overall, urban regeneration represents an evolution in the approach at urban transformation, and that impacted differently in different society models. The following subchapter outlines how urban regeneration has been interpreted within two major models of today society (the market-oriented one, and the socially-oriented one), and how it supported new models for urban governance.

2.1.3 – Urban regeneration supporting new models for urban governance

The spread of neoliberal theories during the XX century (Saad-Filho & Johnston, 2005; Harvey, 2005; Chomsky, 2009) contributed to the emergence of two phenomena at city scale. On one side, there was a change in the role of cities and their internal governance which have made them similar to market-oriented enterprises (Harvey, 1989; Parkinson, 1991) needy of developing competitive advantages (Jensen-Butler et. al 1996; Saez Vegas & Periáñez Cañadillas 2013). On the other side, the beginning of the XXI century has seen an increasing

number of people committed to activate innovative processes based on social innovation for improving the well-being of society by putting at the centre people needs (OECD, 2011; Nicholls, Simon, & Gabriel, 2015). These two phenomena can be associated with two different urban governance orientations: 1) The first one is the city as a market-oriented enterprise, typical of Anglo-American countries, following the mechanistic paradigm where the idea of controlling the market is associated with growth and therefore society wellbeing (Gregory and Stuart 2004; De Simone 2006; Weil 2013); 2) On the contrary, the improvement of wellbeing as a consequence of addressing civil society needs responds to a city government inclination of European countries where the systemic and ecological worldview has deeper roots (Bartolini 2013; Hellström et al. 2015; Maccagnan et al. 2018). Overall, in market-oriented societies, the predominant logic is to minimize costs, while socially-oriented societies put forward the adopting of the best available solution, regardless of the costs.

Today, both urban governance models are challenged by the effects of globalization that exacerbated local dissonances and led to rethink the mechanistic paradigm. The worldwide shift toward the ecological perspective is thus significantly pushed by people movements that, also thanks to the new ICT, become more aware of their rights and role they can cover in urban governance mechanisms (Gupta et al. 2003; Seyfang & Smith 2007; OECD 2011; Nicholls, Simon, & Gabriel 2015; Tucci 2016; Smith et al. 2017).

Two different strategies can be observed in local city governance to respond to the new ecological paradigm, one in market-oriented societies, and another in social-oriented ones (Fig 2.2).
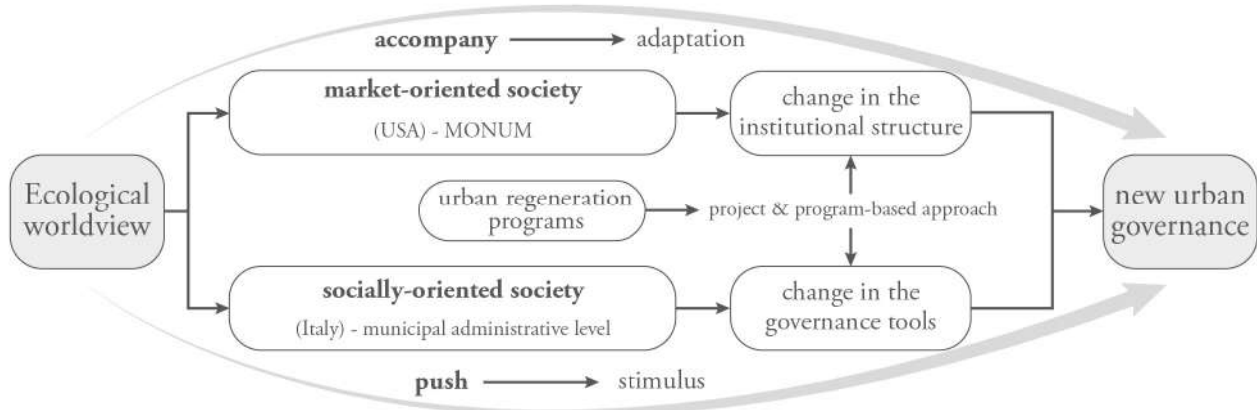
Figure 2.2 – Differences of strategy between the market-oriented and the socially-oriented societies. Drawing by Guglielmo Minervino.

The first case resorted to experiment an accompanying model of the new ecological worldview by restructuring its internal organization to become more responsive of civil society request; the second case promotes the adoption of strategic planning for various aspects in urban governance allowing more collaboration with bottom-up initiatives as a way to embrace and push the new ecological perspective. On these two types of society, the adoption of special programs and projects is crucial for their respective strategies, therefore urban regeneration become soon an accepted method for transforming cities, coherent with the ecological-systemic paradigm, and also allowing citizen participation.

With regard to the two different society paths, two case studies are briefly outlined: 1) for market-oriented societies, the Mayor's Office of New Urban Mechanics in Boston (MONUM); 2) for socially-oriented societies, the Italian municipal administrative level. The two cases help to understand how the two experiences reflect the different approaches to urban regeneration.

2.1.3.1 – The Mayor's Office of New Urban Mechanics in Boston[1]

The city of Boson offers a representative case of innovation in local administrative institution that can help to envisage a new model of urban governance more responsive to bottom-up inputs, therefore suitable for adopting generative aspects in operative projects and programs for urban transformation.

Boston is considered a leading city in fostering a social innovation ecosystem (Bloomberg 2016; Harrison & Gorman 2017), so much so that embraced the challenge of experimenting a new regime of urban governance by a horizontal collaborative approach to work, more inclusive of the civil society and addressing ethical values. To do so, the public administration of Boston developed a new form of public agency which differs from traditional apparatus in its organizational structure. In fact, it is more similar to a private R&D lab which approach is based on socially innovative practices. The R&D lab, named Mayor Office of New Urban Mechanics (MONUM), is a new type of public government agency focused on innovative evidence-based policies (MONUM, 2018a, 2018b). It operates exactly at the boundaries between the public sector, the private sector and the civil society (Fig. 2.3b), where there is more opportunity for the establishment of arrangements (Murray et al. 2010; Nicholls & Murdock 2012; Nicholls et al. 2015). In fact, the linkage among the three sectors of society offers opportunities for a new dynamic organizational pattern in urban governance based on a horizontal multi-sector collaboration between the actors (Fig. 2.3a) which recognize specific issues (Nicholls & Murdock 2012).
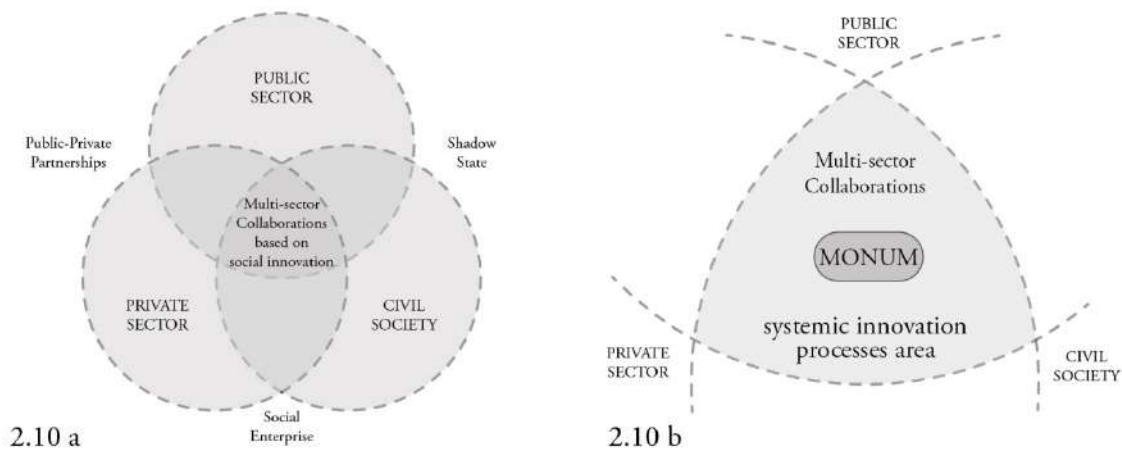
Fig.2.3 a) New dynamic organizational pattern in urban governance; b) MONUM area of operation. Elaboration by the author based on "Social Innovation as a boundary blurring across institutional logics" from Nicholls & Murdock (2012), p.11.

The crucial aspect of this experience is the identification of a common field of work that is working on projects addressing well recognized society problems in a way that also captures the interest of market operators and other public sector apparatus. Overall, the solution of introducing in the public administration an agency with "special" powers resulted in facilitating the dialogue with the civil society, leading to a more transparent and efficient listening activity of citizens, and the possibility to traduce their requests in operative projects based on collaboration. In the Boston's market-oriented society, a, urban regeneration program became exactly the type of project that well fitted a multi-sector involvement around which to experiment an innovative way of urban governance.

2.1.3.2 – The Italian municipal administrative level

Italy, since the early 90s, has found itself in a growing climate of economic stagnation as a result of the national economic model based on low labour costs to boost the economy, which has led the country into a vicious cycle of low wages, low growth in labour productivity, and lack of innovation (Perri 2013). When economic globalization hit the economies of the European states, the Italian governance, especial at the local level, found

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[1] That case was studied by the author, Guglielmo Minervino, during his one year PhD visiting at the Northeastern University of Boston in 2017.

itself unprepared and without any strategy to reshape its development model. Furthermore, almost no structural reforms have been made, at state level, to readapt the economy and the society to the new challenges (Nesi 2012; Sakurai 2014).

While the national government revealed to be unprepared and unable to set up a process for getting out from the crisis, citizens self organised at local level in bottom-up initiatives to find solutions through innovative activities (Archibugi and Filippetti 2012). Around the world, a large number of young people have been committed to collaborating on the effort of challenging complex issues by activating innovative processes (Kania and Kramer 2013). These people gather together in grassroots initiatives of social innovation that challenge social and environmental issues, often by empowering local communities (Smith et al. 2017). Today, particularly in the South of Italy there is an emergent phenomenon of community revival led by that type of initiatives (Consiglio and Riitano 2015; Caroli 2016) of which several promote urban regeneration strategies for their towns focused on the active involvement of citizens. Although the Italian social grassroots initiatives deals with a variety of issues, most embraced the challenge of revive their small historical centres, a topic very present in the Italian debate and people feelings (Part 4.4.2.3).

In Italy, the phenomenon of social innovation is not the only one that moved toward a new view of urban planning as a continuous process, thus requiring focusing on strategies instead of rigid land use regulation based on static masterplans (Friend and Hickling 2005). Also public municipal administrations started to develop their Strategic Plans by adopting participatory process meant to be the means to connect the civil society and the public administration on a common agenda that is local development (Angelini and D'Onofrio 2014). This view of turning to strategies embeds ecological and systemic concepts such as flexibility, adaptability, and resilience toward unexpected changes, as well as customisation, and responsiveness toward local context characteristics. Strategic planning is thus an organizational management activity responding to a general long-term shared vision for the future of a city, and it is used to set revisable priorities, strategies, and actions to achieve clear goals for a system (Mintzberg and Quinn 1996; Bryson 2018). The implementation of a Strategic Plan happens over several decades and through individual projects and programs for not only urban transformation but also social and economic policies. The Strategic planning is today a worldwide accepted tool for planning the future of cities and several of them have already developed their ones (New York, Boston, London, Lyon, Vancouver, and in Italy Bari, Cagliari, Cuneo, Firenze, Milano, Torino, Trento, Genova etc.).

Regarding urban regeneration programs, they became a growing practice proposed both, from the government side and from the society – citizens and technicians – because they fit well the Strategic planning concept within which it is necessary a high flexibility and capability of projects to react to unexpected event, making the strategic planning a powerful weapon against the contemporary uncertainty.

2.2. – Generative processes and programs applied to urban regeneration

2.2.1 – The theory behind generative systems, processes, and programs

Generative concepts derive from various disciplines, first of all biology (Wolpert 1991, 1997) and than computer science (Krzysztof and Eisenecker 2005; Zittrain 2006). Their existence in urbanism has been uncovered and studied by Hakim (2007, 2014) who highlighted how this concepts can be used to develop new tools for urban transformation and governance as an alternative to the top-down planning proper of the mechanistic worldview. Following paragraphs further present these concepts in order to frame the proposal of using generative process for contemporary urban regeneration purposes (Fig. 2.4).
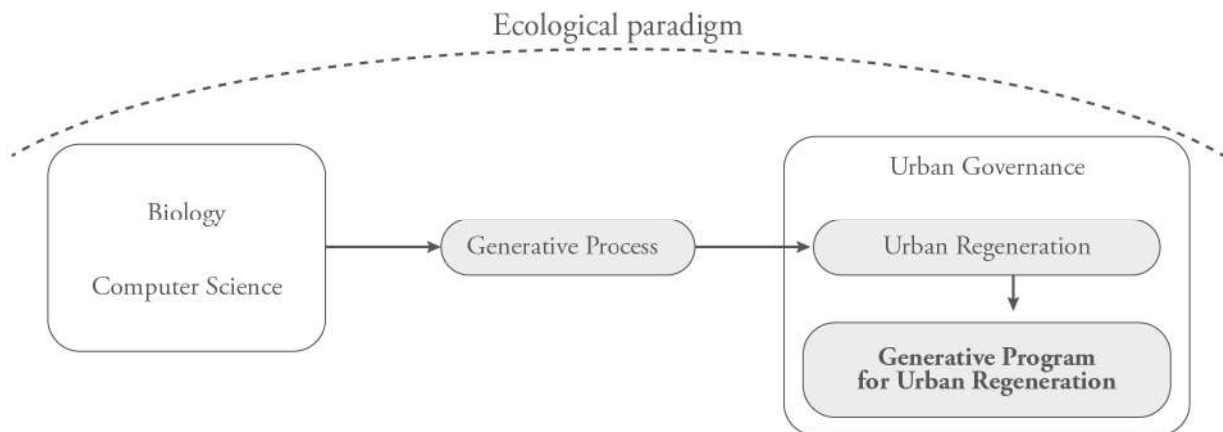
Fig. 2.4 – The proposal of applying generative programs for urban regeneration within the new ecological paradigm. Drawing by Guglielmo Minervino

In biology, generative processes underline the growth and change of ecological systems (Wolpert 1991, 1997). That type of process favours emergent properties and works as an algorithm made of a guided step-by-step procedure within a reasonable time frame (Czarnecki and Ulrich 2005). The phenomenon of emergence is common in nature, and happens in bottom-up models when a system of relatively simple elements self-organizes to form more intelligent, more adaptive higher-level behaviour, thus presenting properties that are not present in the single components of the system when they are observed separately (Bridgman 1927; Holland 1998; Johnson 2001; Bunge 2003; Fromm 2004;). That kind of process can be found in several natural phenomena such as the growth and social organisation of living organism, boiling liquid, chemical patterns, language, and growth of cities.

A similar analogy is readable in the evolution of the urban form of Mediterranean and Near-East historical cities that, although present similar characteristics at urban scale, they also have unique differences at local scale emergent from a generative building process relying on a set of principles and rules instead of detailed masterplans establishing in advance the end result (Hakim 2007). That wide variety of urban forms and, overall, their adaptability to changes depended from the nature of these principles, rules and decision making mechanisms.
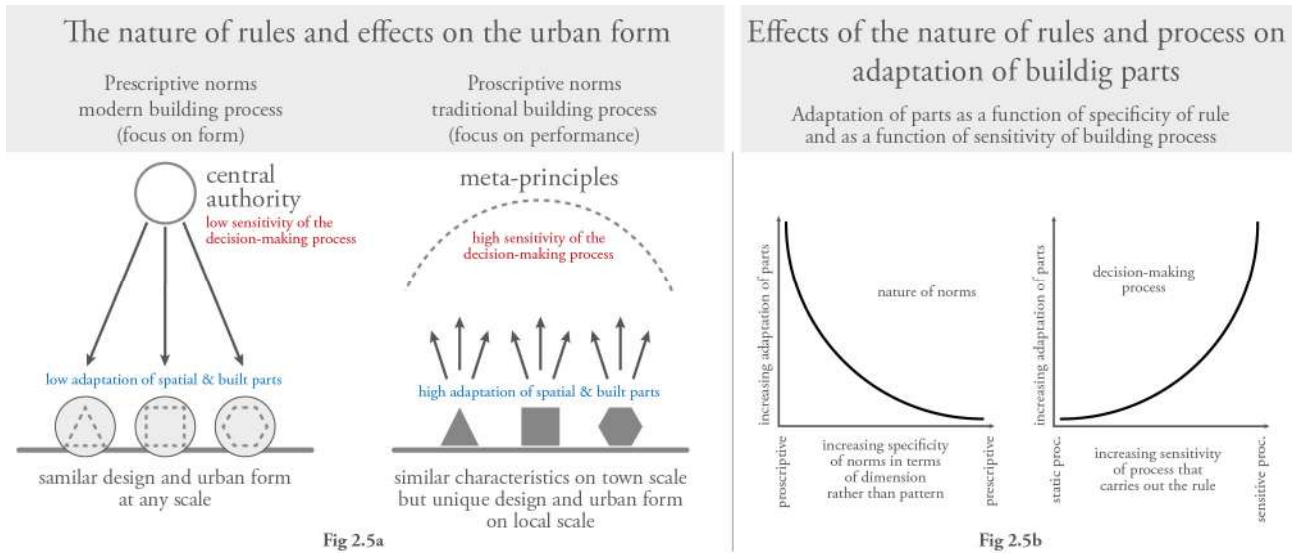
Fig. 2.5 – The nature of rules and building process, and their effects on urban form. Fig. 2.3a - Drawing by Besim S. Hakim. Fig. 2.3b – Drawing by Howard Davis (Journal of Architectural and Planning Research, 6(2), 1989). Both redrawn by Guglielmo Minervino.

Clear differences can be observed in the urban forms as a function of the nature of the rules governing the building process that originates them (Fig 2.5). Specifically:

– the more a norm is prescriptive (Fig. 2.5a, left graph), that specifies form in terms of precise dimensions and shapes, the more the produced place is made of parts that do not adapt to each other (Fig. 2.5b, left graph). On the contrary, the more a norm is proscriptive (Fig. 2.5a, right graph), that is based on performance to be achieved, the more the resulting space presents a high degree of harmony among its parts and with the surrounding (Fig. 2.5b, left graph).

– Similarly, the more the administrative/legal process that carries out the rule can allow sensitivity to individual and local circumstances, the more the produced place is made of parts that well adapt to each other and the surrounding (Fig. 2.5b, right graph). Conversely, a space would have a low harmony if the administrative/legal governance relies on a rigid regulatory framework with no space for local peculiarities (Fig. 2.5b, right graph). That last situation is typical of built environment subjected to a strict zoning regulation (Fig. 2.5a, left graph).

Hakim's work showed the past existence of bottom-up building rules based on social connections and commons rather than on a formal top-down blueprint envisioned by a central authority. As a result, the urban forms generated through such a process represent optimal solutions, are deeply interconnected with the natural environment, human beings, and the of then social and economic model (Fig. 2.6).
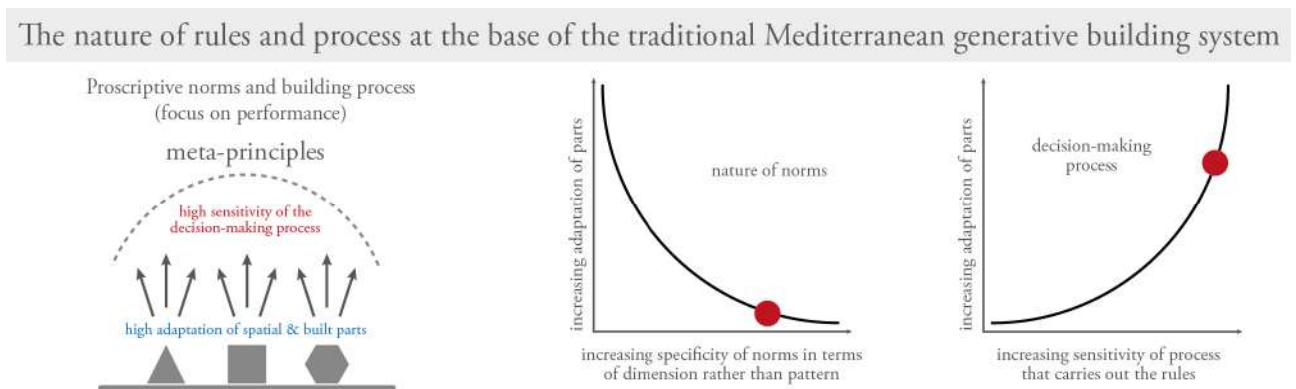
Fig. 2.6 – The nature of rules and process at the base of the traditional Mediterranean generative building system. Drawing by Guglielmo Minervino.

The main lesson we can derive from the past way of building cities is that in order to develop a generative program, and allow the revival of a generative process for transforming cities, we need to learn from the experience of previous eras and cultures that were able to produce high quality habitats such as those around the Mediterranean basin.

Overall, the study of traditional Mediterranean and Near-East settlements allowed for the recognisance of a series of principles that can be adopted and applied to today urban habitat, both historical and modern. A first attempt to list those principles was done by Hakim in his essay on Mediterranean urban and building codes (2008). Here, they are synthetically reported as general framework for the development of generative programs for urban regeneration purposes.

- *Complex Adaptive System* – The formation and design of a habitat, or housing, including its subsequent growth and change over time should ensure adaptive behaviour;
- *Self-Regulation* – The system must present self-regulating mechanisms;
- *Feedback* – The system must rely on feedback, especially allowing the existence of negative ones as necessary for the occurrence of self-regulation processes;
- *Generative Program* – The system must operate by a program based on algorithmic process and not descriptive.
- *Non-linearity* – The generative program should rely on decisions that are informed by feedback, this will ensure a non-linear nature or the decision making, and building processes.
- *Adaptive behaviour of Agents* – At the micro level, agents, that can be individuals or families, behave in adaptive ways, also forming a next level of Aggregate Agents such as association and organisations, who in turn form another layer and so on.
- *Distribution of responsibilities* – Agents at various levels should detain equal distributed responsibilities such as the possibility of assembling and sub-dividing land. To some extent, this aspect is already present in European countries, including Italy where the owner has the right to enjoy a specific asset in a full and exclusive way within the limits established by the legal system.
- *Performance-based regulation* – The rules and codes should primarily be based on intentions for performance and therefore should be proscriptive in nature. However, a minority of the codes might have to be prescriptive, particularly those related to technological elements such as the car and various infrastructure elements.
- *Dynamic system* – The habitat system resulting from the coexistence of these principles will be dynamic in nature, which means that emergent forms and configurations, particularly at the micro level, will be unpredictable.

Today, the return of a fully operational generative process that drives urban growth is difficult to predict but the generative aspects can be adopted and introduced in the form of programs developed for specific types of interventions such as urban regeneration.

Helping that purpose are concepts derived from computer science that is seeing a growing adoption of generative aspects in software programming. Within that sector, a program is a simple encoded descriptive set of instructions, under the form of an algorithm, for making a particular outcome such as a digital picture, a calculation, or even new software. Thus, generative programs differentiate from static programs because their capability of generating a needed component rather than working for its search (Krzysztof and Eisenecker 2005, p.11). For example, instead of selecting an existing model of a house, a staircase or front door from a "library", you can specify the desired properties and have the component generated by its construction in a way that fits the context and complies with local constraints. The simply specifying of the required properties raise the abstraction level of the program's code, in fact, a key feature of a generative program is that it can be made up of quite simple instructions, yet generate very complex forms (Wolpert 1991).

Overall, a generative program relies on a conceptual model that puts in relation, by an algorithmic code, the set of components of a generative system domain that has the ability to produce unexpected changes led by a large, varied and uncoordinated public (Zittrain 2006) (Fig. 2.7). This type of systems provide a common platform through which different actors can cooperate and directly or indirectly contribute to produce innovation occurring at varying levels (physical, network, application, content) (Power and Teigland 2013 p 205). This is exactly what used to happen in past Mediterranean society where every people had the potential to build and change its living place under the umbrella of clear principles and rules (Hakim, 2007, 2008b, 2014).

A generative system domain has three components (Krzysztof and Eisenecker 2005, p.5) organised and put in relationship by a generative program as shown in the fig. 2.7. They are:
- *A means of specification* (like a system for ordering a specific car model).
- the *implementation components* from which each member can be assembled (components to assemble a car or the libraries of a CAD software)
- the *configuration knowledge* that contains the information of how to assemble the components to produce the finished member (instructions on how to assemble car components corresponding to a given order or the set of information used by the BIM system (Building Information Modeling).
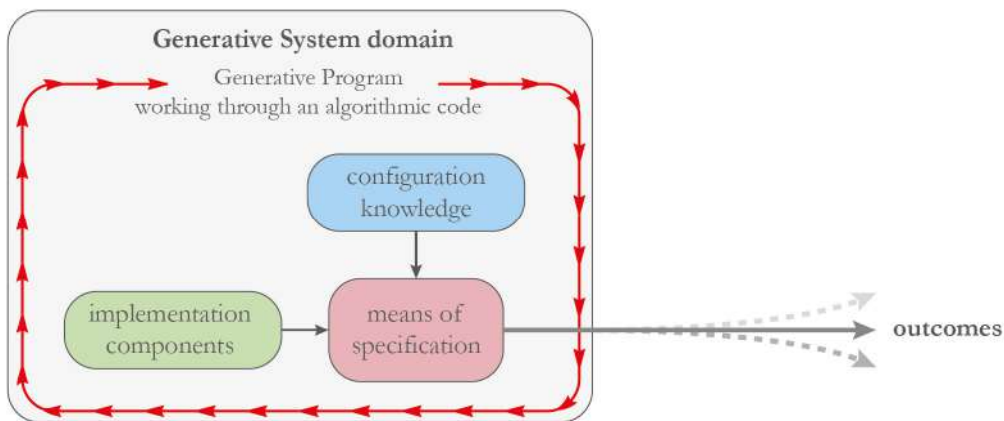
Fig. 2.7 – The conceptual scheme of a Generative System. Drawings by Guglielmo Minervino

The appendix 8 presents and describes some examples of programs from various fields having generative aspects.

That theoretical model is adopted by this research to seek effective evidences of generative aspects in the traditional building systems that shaped the ancient settlements of the case study (Part 4.3, and Fig. 4.32). To conduct that comparison within the field of urban studies, the three components of a generative system are described, by the author, as following:

- the *means of specification* corresponds to the decision making system to choose which type of building/urban structure and architectural solution to use.

- the *implementation components* are the available building materials and, eventually, the land morphology as it can be caved such as for troglodyte dwellings and low ground floors[2].

- the *configuration knowledge* is the set of principles, law rules, customs, and design language, including patterns, from the already existent built environment.

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[2] A typical exampe is the Matera town in Italy, or the caved dwellings in Near East such as from Iran.

2.2.2 – The Generative Program Model for urban regeneration in historical settlements

This paragraph introduces a prototype of Generative Program Model for urban regeneration in historical settlements and heritage districts. The underlying goal of a Generative Program for urban transformation "is to deal with change in the built environment by ensuring that minimum damage occurs to pre-existing structures and their owners" (Hakim 2014, p. 97). This ultimately ensured an equitable equilibrium of the urban system (built and natural environment, a society that includes control and management and economic system) during the process of change and growth, and the achievement and maintenance of harmony between the rights of neighbours. The establishing of a urban transformation system and process able to ensure again this equitable equilibrium is the main goal of any type of Generative Program for urban transformation in general, and regeneration initiatives in particular.

Knowing the local building system of a targeted area (a town or a region) it is possible to outline the related Generative Program for urban transformation by establishing its essential elements. Main components used as starting point of this research are already identified by Hakim (2007) and presented in its studies on the past generative system in vogue in the ancient Mediterranean area.

The essential components of a Generic Generative Program Model:

Meta-principles
A generative program must rely on meta-principles, including ethical that will inspire urban governance and building norms. A general rule is that those principles derive from the history and value system of the society for which the program is proposed. Principles, because their abstract and proscriptive nature, work within a generative program as an umbrella for any decision-making activity (Fig. 2.6).

Private and public rights are fairly and equitably exercised
Public and private sectors of a society have rights that should not be in contrast each other. Confusions about roles has to be avoided in order to prevent conflicts. Rights about the management and transformation of the built environment have to be clearly articulated and understood by both public and private subjects.

Private and public responsibilities are properly allocated and implemented
A clear distinction also regards responsibilities on the management and transformation of the built environment that have to be clearly articulated and understood by everyone. The establishing of ethical principles and norms concerning the sharing of responsibilities between public and private is therefore relevant for achieving effective and efficient urban governance.

Control and Management
The traditional building system was based on a bottom-up dynamic decision making system. It allowed control and management activities to be coherent with the meta-principles and intentions underlying the traditional building system, ensure that private and public rights are fairly and equitably exercised, and that responsibilities are properly followed by private and public parties. Control and management activities require specific figures to which resort in case of doubts about what to do, and to resolve divergences between inhabitants.

Rules and codes
Rules and codes are an essential component of a generative system as assures the existence of clear indications to be followed during the process urban transformation, and for resolving decision making eventual conflicts between involved parts concerning building and management activities. The set of rules and codes must be compatible with the ethical principles. Rights and responsibilities of private and public parties should also be

coherent with them. Rules and codes would also ensure continuity with traditional local customs that are still socially and technically viable.

Their nature should be proscriptive as much as possible, making sure that their intentions are clear. They have to be opened for interpretation in response to the peculiarities of each location and condition. However, certain prescriptive rules and codes can be necessary, such as for those related to technological elements and infrastructures or concerning safety matters.

2.2.2.1 – How the program works: the algorithmic process behind the program

As already introduced, the working of a generative program requires a generative urban system domain constituted of three components (Krzysztof and Eisenecker 2005, p.5): the *means of specification* that is the decision making system at the centre of the building system, the *implementation components* that are the available building materials, and the *configuration knowledge* corresponding to the set of principles, law rules, customs, and design language, including patterns, from the already existent built environment. A generative program ties together these components in a way allowing the functioning of a generative process.

The optimal solution for assuring this type of functioning is through an algorithmic process. The concept of algorithm dates back to the Greek mathematician Euclid and earlier (Heath and Heiberg 1926) while the term to the IX century Persian mathematician al-Khwarizmi (Serianni 2010, p. 104). Today, an algorithm can be intuitively defined as the prescription of a certain order in the execution of a set of instructions in order to solve a problem (Greimas and Courtés 1979). Also, as an ordered and finite sequence of elementary steps (operations or instructions) that leads to a well-defined result in a finite time (Moschovakis 2001).

The algorithm is a fundamental concept of computer science because it is a key element in software programming: having taken a problem to be automated, programming is the coding of an algorithm for this problem in the program, written in a certain language, which can then be effectively executed by a computer representing its processing logic.

An algorithm has some underlying properties:

- Atomicity - The constituent steps must be "elementary", i.e. not further decomposable;
- Finiteness – The algorithm must account a finite number of steps which execution must end after a finite time;
- Definiteness – Each step must be precisely defined and directly interpretable; therefore unambiguous;
- Inputs – Incoming data must be of a finite amount;
- Outputs – An algorithm has one or more outputs, which have a specified relation to the inputs.
- Effectiveness – All operations to be performed must lead to a univocal result.

On matters of urban studies, the algorithm concept is suitable for understanding and describing the logic behind a generative program that can be synthesized as a referencing set of instructions to decide and conduct building activities within a well defined generative domain system.

The following illustration (Fig. 2.8) is a possible generic algorithmic structure ensuring the functioning of a generative program for urban regeneration. By the use of a flow-chart it illustrates the components and their relationships, the decision making steps, and feedback processes.
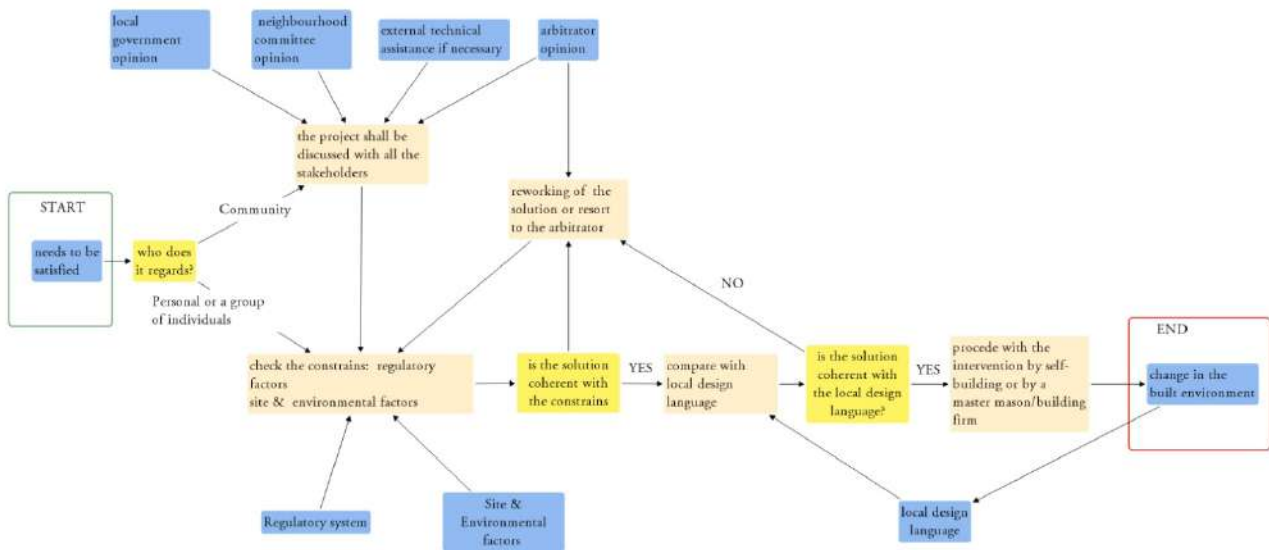
Fig. 2.8 – A possible generic algorithmic model assuring the functioning of a generative program. Drawing by Guglielmo Minervino

2.2.3 – Reasons and benefits of adopting a generative program in today urban governance

It is difficult to imagine a soon return to a way of building cities completely based on generative processes. It is much handier to introduce generative aspects in today urban regenerative programs for historic cities and heritage districts. This can also be seen as the first step toward a wider application, including modern urban environments. Within the field of urban governance, generative programs can be adopted and experimented in various sectors such as:

- Reconstruction post-disaster
- Private-public shared management of the built environment
- Performance-based regulations for building activities
- Simulation of future scenarios for urban governance

2.2.3.1 – Reconstruction post-disaster
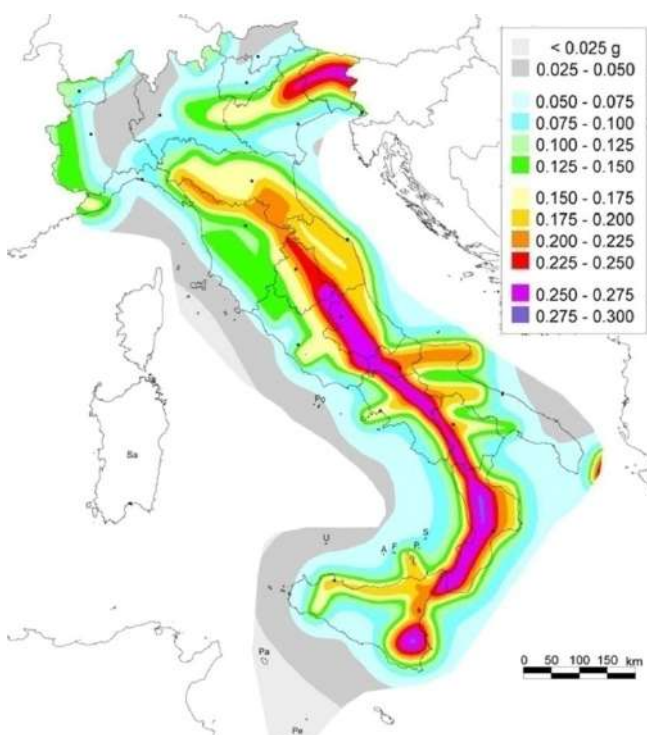
This research is built on a case study in the Italian peninsula, a sensible geographic area for natural hazards that historically produced significant disasters. Its most concerning phenomenon is the seismic risk, for which the Calabria region is one of the most sensible areas (Fig. 2.9). The last update of the Parametric Catalogue of Italian Earthquakes lists 2.984 intense seismic events between the year 1000 and 2006 (Rovida et al 2011). With more than 120.000 victims, the 1908 earthquake of Messina and Reggio Calabria places at the seventh position among the most disastrous earthquakes of the twentieth and twenty-first centuries (USGS 2008).

Fig. 2.9 – Seismic hazard map of the Italian national territory. Map by INGV at the year 2004, available at http://zonesismiche.mi.ingv.it/documenti/mappa_opcm3519.pdf

Devastating events such as an intense earthquake produces sensible changes not only in the geographical and economic system but, sometime, also in the regulatory structure of a country. This was the case of the 1783 earthquake in Calabria that led to a significant change in the way of building cities due to the introduction of the first anti-seismic code in Italy (Ruggieri 2016a) by the Bourbon dynasty (Appendix 1).

Today, post-disaster planning usually focuses on two main objectives, the restoration of normal living conditions and the economic system within a reasonable time-frame, and the protection of the community from the impact of future hazards. Seven issues useful for planning associated with post-disaster reconstruction (Alexander, D. 2004) establish a question framework within which a generative program can provide a contribute.

(1) What are the strengths and weaknesses of post-disaster reconstruction in the modern age?
(2) What is the role of reconstruction planning in the wider field of urban and regional planning?
(3) How can reconstruction work around the problem of "geographical inertia", the persistent occupation of hazardous locations?
(4) How necessary is it to preserve the spirit of a place, its genius loci, in reconstruction, and how can this best be done? Furthermore, what is the symbolic value of reconstruction?
(5) What constitutes sustainable disaster mitigation and how can it be incorporated into reconstruction programmes?
(6) Can reconstruction planning be carried out before disaster strikes in order to anticipate future needs and reduce the time required to set reconstruction in motion after disaster strikes?
(7) What makes a reconstruction programme efficient and effective?

Reconstruction can become a catalyst to improve people's lives and make communities safer by creating sustainable disaster mitigations (Cuny 1983). In fact, mechanisms provided by a generative program regarding the sharing of responsibilities between private and public on the management of the built environment reinforces the social networks among people with positive repercussions on disaster survival and recovery as consequence of mutual aid behaviour among members of a community (Aldrich 2012, 2014, 2015).

Because their simple and understandable mechanisms, generative aspects can be easily incorporated into reconstruction programmes to re-build a town in accordance with its historical peculiarities. On that aspect, a generative program will be enhanced by the use of new technologies such as laser scanning that permits to rapidly and precisely produce a 3D digital reproduction of the built environment. In situations where the hazard destroyed large part of the town, if previously done, a digital reconstruction can work as reference "library" of the local design language for a generative program, otherwise lost forever.

2.2.3.2 – Private-public shared management of the built environment

A generative program requires the study of the historical referencing urban system from which deriving simple intentions and principles that can be reused today for urban governance purposes. One of the lessons learned from historical towns is that "shared responsibilities on the maintenance of the public built environment" between private and public were established (Hakim 2007, 2008a, 2008b). Today, mechanisms of urban governance based on that principle would reduce costs of management of the public built environment from public institutions (Minervino and Canturi 2017) which, nowadays, experience difficulties in properly addressing this task due to the reduction of financial sources, long phases of crisis in the housing market, and constrictions in the possibility of managing their own resources (Chiades and Mengotto 2016).

Clearly, the allocation of responsibilities shall be defined on balanced benefits for both citizens and the public, for example, based on a trade-off between taxes and services delivered by the residents. Italy recently developed a legislation that goes in this direction (GU Rep. Ita 2014) while international examples shows as the application of that kind of mechanism is already in vogue, like in Boston where the "Boston Code of Ordinances" regulates the use of public streets prescribing that property owners must clear snow, sleet, and ice from sidewalks and curb ramps abutting their property (City of Boston 2015).

This model based on cooperation between private and public shows how old principles that shaped our historical towns can still be efficient today when embedded in urban governance mechanisms. The development and

application of a generative program could offer a reliable operative tool for establishing certain type of private-public cooperation around the governance and transformation of built environment.

2.2.3.3 – Performance-based regulations for building activities

For a contemporary adoption of performance code-based regulations, private and public rights that affect decisions about the built environment have to be clearly articulated and understood by everyone. Nowadays, those rights can be conveyed under the form of codes, similarly to the way used by ancient societies. Those codes could be made of concise texts and graphical explanations referring to already existent situation present in the place object of the generative program, in order to guarantee a large understanding. An example can be the one used for form-based codes to implement Smart Growth (Fig 2.10) (Local Government Commission 2013, Somerville 2017). This reference to smart-codes shall not be confused with their approach to urban regulation as they are still based on top-down decision making, although they are preferable to zoning codes. Instead, the definition of performance-based urban codes would benefit from a participation process, then they can be implemented as a municipal regulation, in coherence with existing planning tools or integrated during the developing process of a new plan.

12. Row Houses

a. Lot Standards b. Building Placement c. Massing & Height d. Uses & Features

Site Dimensions	
Width (min/max)	62 ft 250 ft

Lot Dimensions		
A	Width (min)	–
	Interior Lot in Sequence	–
	No Driveway Access	24 ft
	End Lot in Sequence	
	No Driveway Access	29 ft
	Side or Rear Driveway Access	29 ft
	Front Driveway Access	32 ft
B	Depth (min)	80 ft

Lot Development		
C	Lot Coverage (max)	65%
D	Green Score	–
	Minimum	0.35
	Ideal	0.40

Building Setbacks			
A	Primary Front Setback¹ (min/max)	10 ft	20 ft
B	Secondary Front Setback¹ (min/max)	10 ft	20 ft
C	Side Setback (min)	5 ft	
	Party Lot Line	0 ft	
	Side Lot Line	5 ft	
D	Rear Setback (min)	20 ft	

Parking Setbacks		
E	Primary Front Setback (min)	20 ft
F	Secondary Front Setback (min)	10 ft

¹ See §3.2.13.a Contextual Front Setbacks

Main Body			
	Facade Build Out (min)	70%	
A	Width per Rowhouse (min/max)	24 ft	30 ft
B	Depth (min/max)	34 ft	60 ft
	Rowhouses in Sequence (min/max)	3	10
C	Building Height (min)	2 stories	
	Building Height (max)	3 stories	
D	Story Height (min/max)	10 ft	12 ft
	Ground Floor Elevation (min)	2 ft	
	Roof Type	Flat, Gable, Mansard	

Facade Composition			
A	Ground Story Fenestration (min/max)	20%	50%
B	Upper Story Fenestration (min/max)	20%	50%

Use & Occupancy			
	Dwelling Units per Site (min/max)	3	10
	Dwelling Units per Row House (max)	1	
	Outdoor Amenity Space (min)	1/ DU	

Fig. 2.10 – An example of graphic code-based regulation from the new Sommerville's zoning code. Photo from "Article 3 – Residential Districts" published on https://www.somervillezoning.com/

Italy would be a fertile context where to experiment this type of regulation as, although the strict norms governing urban transformations, the historical built environment are still being altered through ways alternative to those envisioned by the actual legislative framework. In fact, several small historical centres are the stage of a phenomenon of space reclaim driven by local communities. The built environment is gently transformed and managed by inhabitants through incremental micro-interventions motivated by individuals and community necessities that mostly regard urban quality.

Overall, communities living in small historical centres still preserve traces of an informal and shared model of urban governance that is related to ancient ethical principles answering to the community wellbeing need. Therefore, they focus on day-by-day improving qualitative aspects that local administration find difficult to address, especially through rigid planning tools that are not capable of addressing unexpected changes, especially minor aspects that regards local situation as the maintenance of a street, public green areas, or the refurbishing of small public spaces. In fact, it is not rare that, even when just outside the law framework, people are let free to operate by the public authority. This is because there is a shared recognisance of the positive intentions behind these refurbishing activities, and against which public officials and local politicians prefer to not intervene by rigidly applying the law.

2.2.3.4 – Simulation of future scenarios for urban governance

Developing future scenario is essential to modern urban planning since the XIX century when Ildefons Cerdà realized the need to plan the Barcelona's expansion. The practice of foreseeing a future possible reality has always been supported by technologic advancements and computer science allowing the possibility to conducts more and more sophisticated analysis involving a huge amount of data. The generative system theory could be applied to future scenario analysis for urban system by developing models allowing the test of generative aspects.

Appendix 5 presents an example of dynamic model simulating the traditional urban growth of a generic Calabrian historical town. That basic model, developed with the software STELLA, was then used to simulate the reaction of the urban system to earthquake impacts.
The model is fully available at:
https://exchange.iseesystems.com/public/guglielmo/minervino-historical-town-earthquake.

Fig. 2.11 – Interface of the model available at https://exchange.iseesystems.com/public/guglielmo/minervino-historical-town-earthquake

2.2.4 – The aim of the research, approach and methodology for the adoption of Generative Programs for urban regeneration

The main contribution of the research is the development of a method that supports the adoption of generative programs in urban regeneration processes. The method is developed by conducting a case study on cities located in the Calabria region, South-Italy.

In order to develop a research methodology, the author adopted the approach "learning by analysis" that, as opposed to the imitative approach, it is proposed to carry out a process of urban regeneration in continuity with the past (Fig. 2.12). That approach relies on the study of the past local traditional building process, instead that only on the analysis of the actual urban form. Within the sector of urban transformation, that is innovative as focuses on the process that led to the emergence of the actual urban form, therefore deriving from it lessons and principles to be recycled for contemporary urban regeneration interventions. This will establish a continuity of the building process with the past, increasing the chances to have an outcome, the urban form, of high quality level because more coherent with the existing urban system as a whole. In synthesis, the fundamental principle

ensuring the existence of a generative approach is to avoid the imitation of traditional design and replace it by a process of learning by analysis (Fig. 2.12)
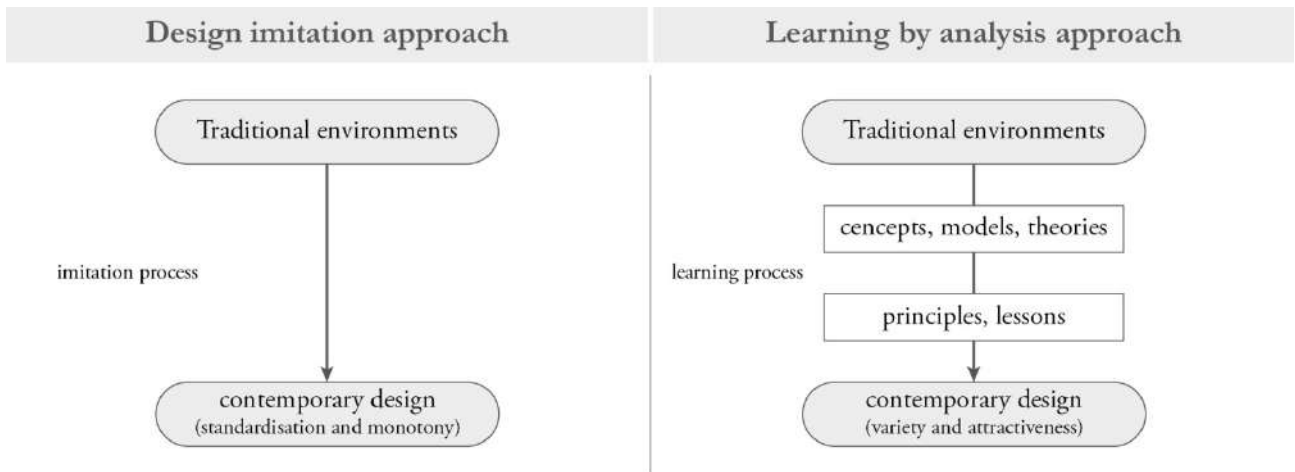
Fig. 2.12 – Design imitation approach versus learning by analysis approach. Drawing by Guglielmo Minervino, based on the figure in Hakim (1991) Urban design in traditional Islamic culture. *Cities*. 8 (4): 276

Based on the learning by analysis approach, the author developed the research methodology shown in fig. 2.13 guiding the adoption of generative programs for urban transformation. The methodology is based on the preliminary identification of the principles and intentions underlying the "traditional building system" obtained by combining a series of data from documentary material, site inspections, and interviews (Part 3.2).
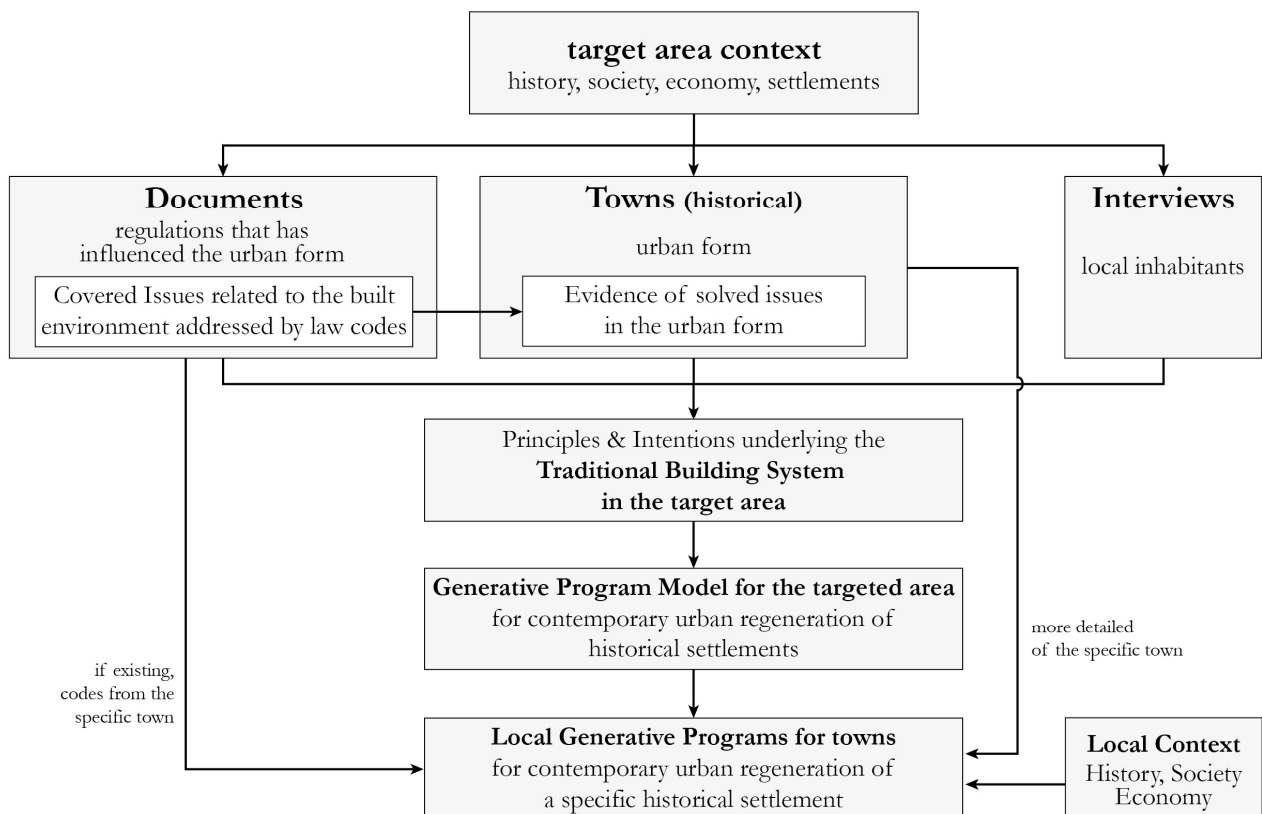
Fig. 2.13 – Synthetic scheme of the methodology related to research parts. Drawings by Guglielmo Minervino

Figure 2.13 summarises steps of the research that explained in detail below.

- The research started with an historical background of the targeted area (the case study, Part 3.1) necessary for the successive analysis of towns and documents related to the case study. The urbanization process of

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the target area is outlined through an overview of the urban settlements and elements that influenced the urban structure for each main historical period, from the VI to the XIX century (Appendix 1).

- Knowing the regional history, it allowed identifying main sources of the research that are written documents and representative historical centres, both capable of revealing principles, rules, and codes of the past generative building process. Face to face interviews to key inhabitants were complementary research sources (Part 3.2);

- The study of sources allowed for the reconstruction and understanding of the local traditional building system in vogue in target area until the early XX century, meaning its principles and intentions, components and their relationships, decision-making system (Part 4.1, 4.2, 4.3).

- Knowing the regional building system it is possible to outline a prototype of Generic Generative Program Model for historical towns in the target area (Part 4.4). The model shall be developed relying on the indication furnished by Hakim and on its essential components (Part 2.2.2) that has to be verified and adjusted for the targeted area.

- At this point, the Generic Model developed for the specific targeted area is ready to be used for customise Local Generative Programs for urban regeneration for specific towns, or to start a similar work for other regions and geographic areas;

2.2.5 – How to develop a local Generative Program for a specific town, and in other geographic areas

Once a generic program model is established, specific programs can be customised for specific sites. Therefore, the generic model developed for the Calabria region can be applied, with adjustments and changes where necessary, for a town in that region. A similar generic model and relative local application can be developed for other Italian regions and, eventually, other countries. The following is a list of steps and indication to undertake that type of study.

Step 1 – Uncovering the local traditional building system

The first operation is to understand how the local traditional building system was working. It can be done firstly at a regional level, in order to identify general aspects and mechanisms, than for the specific town target of the program.

- First of all, it is necessary an overview of the history which allows to identify the actors involved in the process, especially in decision making systems. For a specific place there are sometime available publications of local history.

- Historical law sources and technical treatises must be checked looking for rules and customs that covered issues related to the built environment. Written sources and also contain information on the past decision making system. For Italy, useful sources can be considered those antecedent to the 1861, year of the unification of the country and change of the governance system.

- Another essential source to be analysed is the built heritage environment. Its observation can be useful to identify urban and architectonic solution respondent to law codes and rules contained in the documental sources. Also, its configuration can unveil other local non written customs.

- All the above activities can benefit from interviews to local inhabitants, especially elders that still preserve memory of past customs. Key sources are passionate individuals about history and local master masons. Frequently they have useful information not easily findable in books. The snowball technique is very suitable for research on field when involving people (Goodman 1961; David and Morgan 2008; Metens and Wilson 2012).

Step 2 – Deriving local principles and rules

Information derived from the analysis of written documents, and urban form of towns allowed deriving principles and intentions underlying the traditional building system in the area analysed. Principles shall be listed in a small number to facilitate their interpretation and feasibility.

Rules and codes shall also be collected and grouped under categories. Indication of possible categories can be derived from the covered issues by law codes addressing the built environment. Principles, rules and codes will be part of the generative program.

Step 3 – Understanding the contemporary town system and future trends

Not all of the principles, rules and codes are suitable with the actual value system of the society. Also a town can be experiencing particular phenomena hindering its normal functioning, such as population ageing, out or in-migration, strong degradation of the real estate and public space environment. These and other conditions must be considered when developing a generative program to avoid the deterioration of certain phenomena and, on the contrary, to favour their improvement.

The analysis of the actual urban system and governance also allow verifying if there are all the necessary conditions for the working of the program, in particular the presence of individuals and organisation that can contribute to the developing of a bottom-up decision making system.

Step 4 – Developing the generative program

Once the above information is sufficient, the local generative program can be developed by specifying its essential components that are:

- Meta-principles
- Private and public rights are fairly and equitably exercised;
- Private and public responsibilities are properly allocated and implemented;
- Control and Management;
- Rules and codes.

These components work together through a process that has algorithmic properties. It can be supportive to illustrate that process by a graphical diagram.

Part 3 – Methodology and case study

To undertake this study, the research used a deductive approach. By starting from the available backgound theory about Mediterranean urbanis, a methodology was developed to seek evidences of generative aspects in the traditional building system of a case study that is the Calabrian region. In the case of positive results, lessons form the past would be derived for developing a *Generic Generative Program* that can be used for urban regeneration practices in Calabria, and as reference for developing similar research in other geographical areas.

A summarizing graph of the general methodology is reported in Fig. 2.13 in Part 2 of the research. Here, there are described reasons and benefit of chosing as case study the Italian peninsula, and the Calabria region specifically.

3.1 – The case study: the Calabria region

Best candidate areas to undertake this research are the European historical centres, particularly those around the Mediterranean basin because their historical, cultural, and law framework still presents a number of links to the past way of building cities that facilitates the research process (Hakim 2014).

Among the Mediterranean countries, the historical built environment of Italian settlements represents a high-quality achievement. Another relevant peculiarity in continuity with the past is the strong sense of community and well developed social networks present among the Italian people, all elements that were crucial in the past society that given origin to the historical European towns (Alianelli 1873; Calasso 1929; Caglioti 1988; Galetti 2012; Gamba 2012). All the mentioned elements are significantly present in southern Italian historical hill towns where inhabitants still remember and, to some extent, practice several of the old customs, including mechanisms of decision making, regarding the built environment, that are based on cooperation, mutual assistance, peer to peer manage and control feedback[1]. These elements constitute a valuable help for those aiming to experiment the introduction of generative aspects in urban regenerative practices.

However, few studies have been conducted for Italy about principles and rules underlying the traditional building system. Some have been done about cities in the North (Bocchi 1990) while the South of Italy, and specifically the territories belonged to the past Kingdom of Sicily (1130-1816), are rich of towns and documents that still needed be fully investigated from this research point of view.

In Southern Italy, the Calabria region has 404 municipalities and almost all of them have an historical nucleolus, either still alive or in some case abandoned. They dated back not later than the XVIII century, after the big earthquake of 1783 (Principe 2001), most of them to the X-XI century, and several have even ancient roots to Byzantine, Roman, and Greek eras. Also, Islamic influence was significant in Calabria where there used to be an Emirate (846-886) named Manti'a/al-Manti'a in the actual town of Amantea on the Tyrrhenian coast (Turchi 1981; Tonghini 1997).

The Calabria region inherited and embedded in its building practice several principles from all of the cultures that ruled over it, resulting in the formation of a building system that was continuously transmitted until very recent time. The earthquake of 1783 represented a turning point in time from the traditional building model based on incrementalism to a modern one based on prescriptive spatial planning principles. That shift took place in the southern part of the region, more affected by the earthquake, while the northern part, where towns were

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[1] During the research for the present doctorate thesis, the author visited several Calabrian historical centres (Appendix 7) where he met and interviewed a number of inhabitants. From their depositions it emerged as the elders still preserve a large part of the traditional knowledge. This is also the case about building practices that still living old master masons were glad to share with the author. Few intervievs were recorded and stored in the personal archive of the author. They are available on demand.

damaged but not completely destroyed, the traditional building system experienced a longer life until the second World War when the Italian legislation intruduced modern urban planning tools by the state urban law in 1942.

So far, the most relevant finding for Calabria about traditional building system is a manuscript named *Prochiron Legum* dated to the X century, during the reign of Basil II (Brandileone and Puntoni 1895; Hakim 2014).
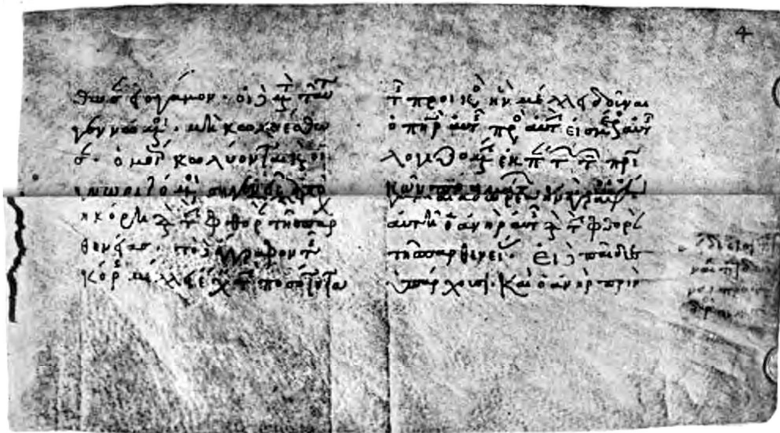
Chapter 33 of this law code addresses a number of rules, and it is likely that its content was reproduced in successive law texts such as Statutes of free municipalities (*Universitas*) in the Calabria region.

Evidences of application of the *Prochiron Legum*'s regulations and other sources are verified by this research in the built environment of Calabrian historical towns. The period of time which goes from the manuscript until the XIX century is also investigated to uncover principles, rules, and codes that characterised the traditional building system in Calabria in order to derive lessons for contemporary application in urban regeneration interventions.

Fig. 3.1 – Sheet n° 4 (above) and 60 (below) of the Prochiron Legum as published by Brandileone and Puntoni (1895)

Summarizing, reasons that led to pick up Italy and the Calabria as case study are:

1) Italy is one of the best candidates among the Meditarranean countries for this research as it was for long time at the centre of the scene for what regards the spread and use of traditional building rules and codes around the Mediterranean basin (Guidoni 1979; Hakim 2001; 2014);

2) Italy in general, and the Calabria in particular, present a well preserved historical built environment that allows for a directly study of it as the outcome of the traditional building system;

3) A continuity with the past of the strong sense of community, a crucial characteristic at the base of the ancient urban governance;

4) The existence in Calabria (from Soverato) of a written documental source dating back to the X century, known as the *Prochiron Legum*. It addresses the built environment governance on the base of laws already in vogue during previous centuries in the Italian peninsula (Brandileone & Puntoni, 1895; Brandileone, 1895);

5) the presence in historical centres of living communities and local master masons to be interviewed;

6) Finally, the italian origin of the author, and his living in the Calabrian region made possible and affordable the necessary on field researches and study of ancient documental sources;

3.2 – The sources of the research and the method of analysis

Three types of sources are used in the research: Italian pre-unification written documents, the historical towns form the point of view of their urban form, and in-person interviews.

3.2.1 - Written documents

Main sources of this research are regulatory documents in force before the unification of Italy, 1861. Along with state law texts and municipality statutes, the study also considered technical treatises, and at that time descriptive texts of Calabria and its towns containing useful information to identify rules and customs influencing the built environment of the region until the contemporary era. The following table lists all the analysed text documents.

Geographical area of interest	Text sources	Period (1st ed)
Roman territories	**Regulae Juris**	Roman era
Soverato	**Prochiron Legum, ch. 33**	980-1050
Kingdom of Two Sicilies	**Assizes of Ariano**	1140
Kingdom of Two Sicilies	**Constitutions of Melfi**	1231
Kingdom of Two Sicilies	**Consuetudines neapolitanae**	1306
Cosenza & casali	**Statute of Cosenza**	1333-1557
Laino Castello	**Statute of Laino**	1470-1475-1535
Arbëreshë towns	**The Kanun of Lek Dukagjini**	XV century and earlier
Arbëreshë towns	**The Kanun of Skanderbeg**	XV century and earlier
Southern Calabria	**Istruzioni**	1784

Tab. 3.1 – Text sources of the research

Historical documents contain information to identify rules and customs that influenced the built environment. For the research case study, the Calabria region, this was since the turn of the X century, the period when the main and starting documental source of this research, the *Prochiron Legum*, was written. All the written sources are separately presented in the appendix 2 through a description of the contents, source of the document, the referencing territory, matters regarding the built environment, and a list of significant articles covering issues related to the built environment along with their transcription and translation in English.

The information derived from the analysis of written documents allowed to identify covered issues by law codes related to the built environment in the target area.

A qualitative content analysis technique was used to identify and analyze the occurrences of issues and their message characteristics embedded in documental text sources (Fig 3.2) (Frey, Botan, and Kreps 1999; Kuckartz 2014). Texts of codes was manually analysed as in the following example from the code n° 4 of the *Prochiron Legum*. Codes can address more than one issue, therefore belong to more categories.

> We decree that <u>anyone who wishes to renovate an old building shall not change the old plan of the house,</u> <u>nor shall he be permitted to deprive his neighbors of light and view</u> <u>unless perchance he has either by contract or agreement a servitude which grants and permits him to change the form of the building as he may like and wish.</u> <u>For the person who has this right of 'servitude' may build without hindrance as he wishes even if perchance he prejudices his neighbors since the servitude was constituted by contract or agreement.</u> <u>When two houses stand 'over against' one another, that is to say are placed contiguously to one another, a space of 12 feet must intervene between them beginning from the foundations and be so separated from the adjoining house.</u> <u>And each party can raise his building as high as he wishes and</u> <u>open prospect windows</u> <u>whether he builds a new house or rebuilds an old one destroyed by fire.</u>

Categories of issues related to the built environment
— Land use — Houses — Private property — Light and Views

Fig. 3.2 – The analysis of the code n° 4 of the *Prochiron Legum*. The English version is from the book Mediterranean Urbanism (Hakim, 2014: pag 174).

The content analysis was guided by the categories of issues already identified by Hakim (2014, p. 98), for the whole Mediterranean area, in his study on sources from Greece, Spain, and Italy, including the chapter 33 of the *Prochiron Legum*.

- *Land use*: location of churches or mosques, public baths, artisanal, workshops, bakeries, and socially offensive uses
- *Views*: for enjoyment such as the sea, mountains, and public gardens
- *Overlooking*: visual corridors that compromise privacy generated by the location of doors, windows, openings, and heights
- *Houses and condominiums*: involving acts that debase the value of adjacent properties, walls and floors between neighbors, and condominiums in multistory buildings
- *Walls*: abutting and sharing rights; ownership rights and responsibilities
- *Drainage and hygiene*: rain and wastewater drainage; responsibilities for cleaning septic tanks and removal of garbage
- *Planting*: of trees, shrubs, and other vegetation
- *Streets*: open-ended streets, cul-de-sacs, projections on streets, servitude, and access
- *Animals*: cattle, sheep, chicken, birds, and bees

Those categories were refined accordingly with the sources of this research in order to build a list of categories related to the case study. The codes not relevant to the purpose of the research were not taken into consideration, therefore, the related categories excluded. Categories were kept few to facilitate the interpretation of sources and for the purpose of generalisation. Each one of the ten categories groups the related codes, progressively numbered accordingly with their order in the original text documents (appendix 3).

The identified covered issues by law codes related to the built environment in Calabria are here listed under ten categories, from those addressing urban-scale matters to those related to specific urban and architectonic elements:

- *Land use*: location of buildings (residences, public, military, industrial) and spatial relationships between them. Also, property boundaries;

- *Public space and accesses*: building, restoration, and maintenance of open-ended streets, cul-de-sacs, squares. Projections on streets and squares. The right of way and accesses. Occupation of streets and public areas;

- *Houses*: rights and restrictions to build. New buildings, rebuilding, expansions, alterations, and renovations. Height, and size of buildings;

- *Private property*: involving acts and burdens that debase the value of adjacent properties, lands, walls and floors between neighbours, and apartments in multifamily buildings;

- *Light & Views*: right to get natural lights and views. Views are intended for enjoyment such as the sea;

- *Overlooking*: visual corridors that compromise privacy generated by the location of doors, windows, openings, and heights;

- *Walls, stairs, beams, and roofs*: abutting and sharing rights. Ownership rights and responsibilities on renovation and maintenance;

- *Drainage & hygiene*: responsibilities for cleaning and maintenance of rain and wastewater drainage (included fountains, aqueducts, and cisterns), and keeping clean the urban environment;

- *Planting*: planting and maintenance of trees, shrubs, and other vegetation within the city boundaries;

- *Codes not strictly covering the built environment*: some codes do not strictly cover physical issues related to the built environment, but they are still relevant for understanding the decision-making process of the building system. Those codes usually address the relationships between inhabitants and consequently acts that might impact on the built environment to some extent, such as buying and selling of real estate, usufructs, usucapio, and other ownership transfers of property, boundaries' issues, communication regarding building activities, certain servitudes, and agreements between individuals.

3.2.2 – Historical towns

Issues addressed by law codes or technical treatises can be individuated and verified by looking at the urban fabric of Calabrian historical settlements.

Historical towns were studied at two levels (Part 4.2). The first one at the urban scale in order to identify the general elements characterising the urban form of target area historical settlements. The second level was at the human scale for verifying on field the covered issues by law codes related to the built environment.

While the first operation was done for the whole Calabria, and based on literature, the second operation was done by surveying 54 historical settlements in the target area (Appendix 7) and documenting the evidences by photos taken by the author. This operation allowed identifying typical urban and architectonic patterns and estimating the geographical diffusion of building rules and customs.

The 54 towns were chosen among those from the northern Calabria as they were less of not influenced by the earthquake of the 1783 that completely destroyed the towns in the south of the region. Those were re-found accordingly with the new regulations introduced by the Bourbons, after the earthquake. Because of this, southern historical towns result, today, less mature in terms of complexity of the built environment compared to towns in the northern Calabria that thus represent a better case for the understanding of the traditional building system.

Each survey was conducted by walking through the urban fabric. Non surveying plan was prepared in advance apart two guiding principles: (i) to cover as much as possible the extension of each town, and (ii) to prefer town either having a written document object of analysis or close to a town having it. Some of the centres have been object of more than one survey due to unexpected occasions presented to the author to get to the place for external reasons of the research.

3.2.3 – Interviews

Complementary to written documents and town analysis, a number of informal interviews were conducted to inhabitants of the surveyed towns. Interviews were not planned in advance but followed the principle of interviewing elders, and local master masons as preferential subjects because they are those more likely to have knowledge about old local customs, traditions, and building practices. The snow ball technique was adopted to identify the best candidates as possible (Goodman 1961; David and Morgan 2008; Metens and Wilson 2012), while questions were not pre-established as they depended of the context, the evidences in the built environment present on the place, the behaviour and confidence of the interviewed as well as their education. Elders inhabiting the historical centres are frequently poorly educated, most of them only speak of the local dialect, and their confidence shall be gained by an informal engagement strategy. When possible, interviews were recorder by the use of a smart phone and stored in the personal archive of the author. They are available on demand.

In general, topics of the interviews were local building practices, and decision-making mechanisms underlying the construction process, as well as on ancient local customs and laws.

Part 4 – Results

A Generic Generative Program Model for urban regeneration in historical settlements

4.1 – The evolution of the building regulations that influenced the traditional building system in Calabria

That chapter outlines the evolution in the regulatory framework about building activities in the Calabria region between the VI and the XX centuries. That evolution was derived from the literature and the research sources documents which administrative level of application represents the criteria through which the evolution is here presented. The figure 4.1 shows a synthetic view on the timeline evolution of building regulations and their temporal relationship with the dominant cultures that ruled on Calabria through time.
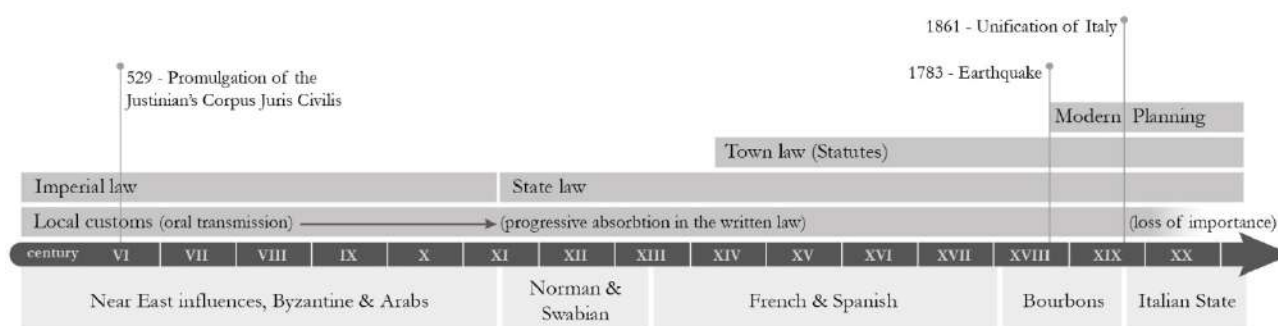

Fig. 4.1 – The relationship between dominant cultures and the regulatory evolution that influenced the traditional building system in Calabria. Drawings by Guglielmo Minervino

For what we know, the foundation and growth of Calabrian settlements was for the most part in the hands of the same people that would inhabited the towns. Interventions of authorities generally limited to the indication to found, and reinforce military infrastructures or religious buildings. The growth and expansion of the urban fabric was instead a product emerged from the traditional building system following rules and customs of ancient origin and transmission. Those pre-existing regulatory elements were, in general, recognized by the royal authorities who, after the Byzantines, initiated a process of unification of southern Italy for which the integrity and respect among the various inhabited populations had to be a fundamental concern to avoid disorders and promote a new centralized organization of the territory. Consequently, the Norman kings and the succeeding rulers allowed, with the new state legislation, to continue to use the existing customs, including those relating to construction activities.

Since the advent of Normans, the south of Italy always sees the existence of a state law, the only element unifying a vast territory inhabited by several cultures and ethnicities. Once the cities began to acquire freedom, coming out of a long feudal regime, local laws began to appear in the form of town statutes that collected and put in writing all the customs and regulations in force up to then. The statute soon becomes the symbol of the independence of a city and a guaranty of better living conditions. Still today, all the cities in Italy have their own statute that establish the basics set of rules for the management of the community, yet much less independent from the state government as it was when municipalities raised for the first time.

Building rules were always linked to the fate of the cities and most of them have been written down too to clarify to everyone what was allowed and what was not, first of all in the interest of the community as a whole, which

safeguard remained a primary concern until the Second World War. After that dramatic episode, the modern urban planning started to take root, fostered by the state legislation that welcomed and adopted it.

4.1.1 – Large territorial scale regulations: State and kingdom laws

The fall of the Western Roman Empire marked a turning point in the history as it saw a new contribution of different cultures and identities that partly merged and partly overlapped with classical Roman law. In the south of Italy, there were well established the Longobards, and Byzantine customs. However, Roman laws were not cancelled and constituted the basis of the jurisprudence (Jolowicz, Hazard et al., 2018). The Germanic kings themselves, aware of the value and role of Roman law, kept the existing bureaucratic and administrative apparatus alive. It was in fact evident that the German law was too simple and based on customs to be suitable for regulating the social and political life of the kingdoms born from the disintegration of the Roman Empire. The "principle of the personality of the law" was then imposed (Guterman, 1966), according to which each person had to comply with the law of the people of origin and according to that law he had to be judged[1]. That allowed for the maintenance and continuity of local customs, and the result of the evolution of such different law orders (Roman, barbaric, canon, etc.) is the birth of the "common law" (*lex communis / ius commune*) that towns adopted for their daily governance (Calasso, 1954; Caravale 1994; Cortese, 1997).

For the Calabria, on matter of building activities, the most important reference of supra-municipal law is that of Justinian, the *Corpus Iuris Civilis*, which, having been lost in its entirety, reappears only at the end of the XI century when it comes back into vogue becoming the basis for the "common law" (Augustyn, 2018). The Justinian codex inspired several later law text such as the *Ecloga*, a normative codex drawn up by Leo III Isaurico, between 726 and 741, was very important especially in the extreme south of Italy. It is a compendium of norms drawn from the Institutiones, the Digesta, the Codex and from the Novellae Constitutiones of Justinian. The work consists of 150 chapters, also woven by Byzantine customs. It is in fact a code with many introductions from Eastern sources. The *Ecloga* and the later *Procherios Nomos*, by Basil I, are at the base of the Calabrian *Prochiron Legum* which chapter 33 addresses building principles and practices for the using of the local community for which the text was issued (Brandileone, 1895; Brandileone and Puntoni, 1895; Hakim, 2014).

The Calabria region was, in fact, under the Byzantine influence until the advent of Normans in 1056, much later than the other Italian regions that experienced the Longobards domination. It is reasonably that the building prescription contained in the Prochiron Legum continued to be in place for all the Norman-Swabian period as local customs and existing laws were recognised and safeguarded by the state Norman law which formation derived its precepts not only from the Normans and French legislation, but also from Muslim and Byzantine legal theories, especially from the Justinian code.

That practice of safeguarding the local customs by new state laws likely moves the continuity of use of local building practices to the XV century and later, when the advent of the Spanish rulers coincides with the emerging of the Calabrian middle class that claimed the independency of towns from the feudal system and started the issuing town statutes, a new source of law complementary to the state law.

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[1]The germs of the personality of the law were contained in the dualism of rights existing in almost all the Roman states -barbaric. In fact, given the equal subjugation of all the people to the state law, various national laws were all equally recognized: so each was governed by the law of his own nation, determined by origin and, with exceptions, immutable. This applies only to the western side of Europe. In the East, where the Eastern Roman Empire still existed, the emperors continued to emanate constitutions and lex.

Sources: Treccani enciclopedia, "Legge", "Consolidazioni", "Capitolazione", "romano-barbariche, leggi"; Guterman, 1966.

4.1.2 – Large territorial scale regulations: treatises on architecture and building matters

From the historical analysis of large size monumental cities, it is possible to read continuity in the transmission of building principles dating back to the Roman treatise *De Architectura* written by Vitruvio in the 15 BC. The work became the theoretical foundation of Western architecture, from the Renaissance to the end of the XIX century. It constituted the main reference for the XV century *De re aedificatoria,* a Renaissance treatise made by Leon Battista Alberti. The Alberti's work was at the same time an attempt to realize the first modern architectural theory treatise, in which to explain how to construct buildings without resorting to explaining pictures, but fixing by words concepts and instructions in order to result autonomous and absolute where, instead, the images could be missed or be deformed. However, the treatise remained a work reserved only for educated people because its Latin language. A greater diffusion of the Alberti's work took place after the Italian translation published in the XVI century, then reprinted during the XVIII century.

While those treatises were popular among educated professionals, therefore applied in big size work requiring the employee of architects, the urban fabrics of small size and less important cities, towns, and villages were continued to be developed by recurring to models coming from traditional building practices and customs, especially used for domestic architecture. This is clearly evident in regions like Calabria that, except for few relevant cities such as Cosenza, Catanzaro or Reggio Calabria, certainly did not experienced a comparable flourishing with the one that interested the central Italian cities. The Calabria was made prevalently by rural villages, for long time under the rule of feudal lords that were not interested in developing them. Apart for military architectures, the knowledge deposited in Renaissance treatises didn't see application in Calabria until the late XVIII century when the huge earthquake of 1783 made the royal authority thinking about new models of urban development, of which promotion was appointed a significant number of foreigner technicians sent to the region for reconstruction purposes.

4.1.3 – Local laws: from customs (consuetudines) to town statutes

The transmission, application, and reuse of practices belonging to the traditional building system find its primary, and most ancient, evidence in the local customs on matters of building.

The custom law (Lat. *consuetudo*) is one of the sources of positive law (unwritten law) that is the one that is realized in the constant, uniform and general observance of a norm of conduct, carried out by the members of a community with the conviction of its legal obligation[2]. If in primitive jurisprudences the custom was the only source of law, later, with the advent of the written law, this condition has been profoundly modified as the written law, first contrasts the custom and then prevails over it. Thus, in the most ancient Roman jurisprudence, the custom prevails, and in the Germanic one, the custom (*cawarfrida,* disposition of peace) is, for a long time, the only source of law. In Muslim law, the custom (*Urf*) has also great importance as those from the various countries serve the application of the Koran, a book that is not only religious, but also of moral and juridical rule (Hakim 1994, 2008a Appendix 1).

This condition of things changed when, with the law of Constantine, the custom is deprived of the power to repeal the existing law. However, after the feudal dissolution, the custom resumes to be used, then predominates, according to the principle of territoriality of law, the *consuetudo loci* (local customs). A distinction was introduced between the local use (*usus loci, usus terrae*) and the general use (*usus regni*). Thus are formed the customs of the cities and castles, which the central authorities (feudal lords, kings, the emperor or the Church) did not delay in recognizing and approving. This safeguarding practice fostered the formation of the vast and complex body of customs that, since the centuries XI-XII, the Italian cities began to put in writing, thus constituting a customary law, which prevails over the statutes and other laws. That practice, initiated under the Norman king Roger, was, in fact, replicated during the French rule by Charls II of Anjou who appointed a special commission to gather

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[2] Solmi, Arrigo, Mohlberg, Uniberto, Degni, Francesco, and Bertola, Arnaldo. "Consuetudine" In Enciclopedia Italiana. Roma 1931

and merge all the customs present in the kingdom. The result was a collection named *Consuetudines neapolitanae* issued in 1306 under the supervision of Bartolomeo da Capua who had the license to make all the modifications he deemed necessary. The publication soon assumed notable prestige in several areas of the Kingdom, so much so that was assumed as a model for the drafting of other collections of customs, such as that of Sorrento from 1309, Naples, Salerno, Amalfi, Bari, Messina, Palermo, Catania.

But with the development of the statutes and with the resurgence of Roman law the custom again loses importance. Thus, being entered into the series of municipal laws, the unwritten use is valid only if the municipal law is missing. The custom, therefore, becomes a subsidiary source of law. That phenomenon seems however interesting less those customs related to the building practice as municipal statutes, and even less the state laws, only have few references on private building matters, and mostly concentrate on the management of the public space, revealing once again the centrality of the community.

The emerging phenomena of town statutes coincided with the second half of the XV century when the Calabrian municipalities experienced a remarkable flourishing. The growth of the bourgeoisie class found a fertile context in public cities which reorganisation of their public apparatus also concerned the issue of town statutes, a set of local shared law codes regulating the organization and functioning of the municipality. Town statutes could be considered local variations of the "common law" (based on the Roman law), addressing issues concerning the relationship between people and the public administration: public offices, elections, inheritance, workplaces, civil, commercial and criminal matters. Town statutes also contain already in vogue local customs until then orally transmitted or collected in compilations.

Although all the central government efforts in trying to foster a legislation common to the whole kingdom, there was no uniformity in statutes among towns due to the previous principles of the "personality of the law", and the "territoriality of law". However, it was a common practice to get inspiration from already existent statutes for the writings of new ones. Examples of cities with popular statutes are the city of Catanzaro that, having got the status of public city after the revolt of Centelles, in 1473, issued its statutes *I Capitoli per lo bono quieto et pacifico vivere di Catanzaro* (the chapters for the quiet and peaceful living of Catanzaro), and the city of Cosenza that since the 1333 initiated to collect and issue the obtained privileges in its statutes known as *Privilegii et Capitoli della citta de Cosenza et Soi Casali* (the privileges and chapters of the city of Cosenza and its *casali*) (Fig 4.2).
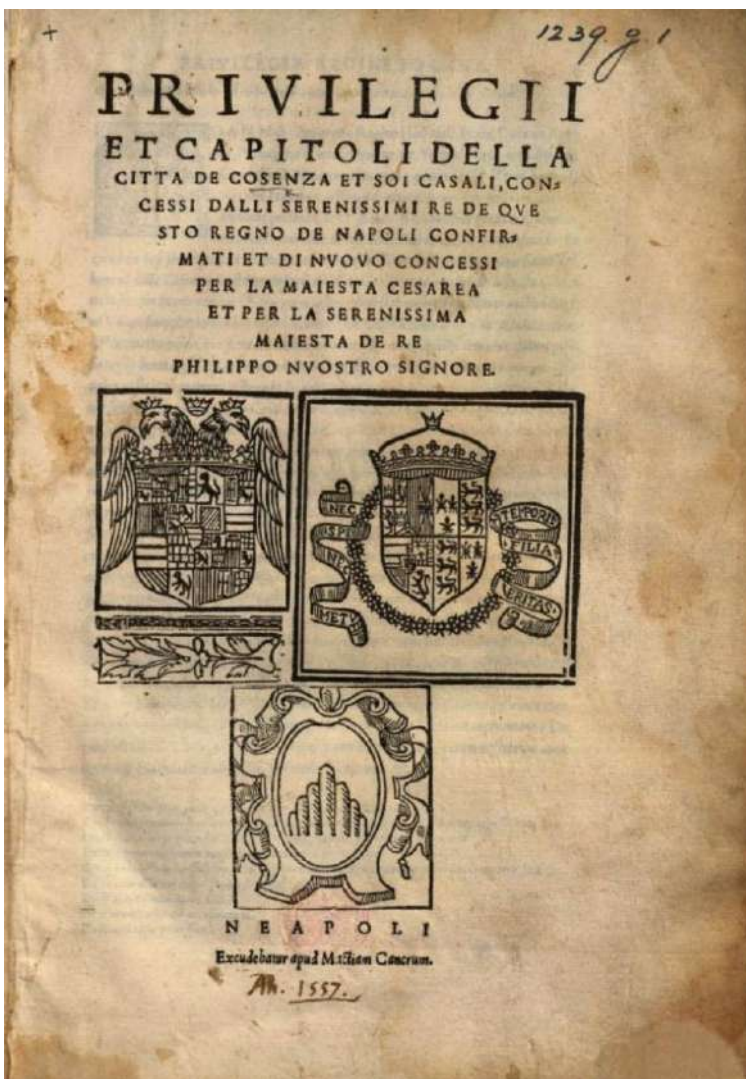
Fig. 4.2 –The front page of the Cosenza and Casali statute. Title: Privileges and chapters of the city of Cosenza and its Casali.

4.1.4 – Local laws: servitudes

The servitude is one of the most common subjects addressed by law codes, thus deserving a special consideration. In general, the servitude is a needed mechanism allowing the rapid solving of necessities and issues between proximate neighbours without resorting to the official law and a third part arbitrator.

Specifically, it is the limitation of the right to property of an asset for the benefit of another asset (Sabatini-Coletti 2011). Articles 1027-1099 of the Italian Civil Law Code addressed the predial servitude as a burden imposed on a land-property (servant property) for the usefulness of another land-property (dominant property) belonging to a different owner. In fact, the most common and widespread type of burden by a servitude concerns the right of way. Other types of servitudes can regard various matters such as water flows, smells, **noises**, views etc (Fig. 4.3).
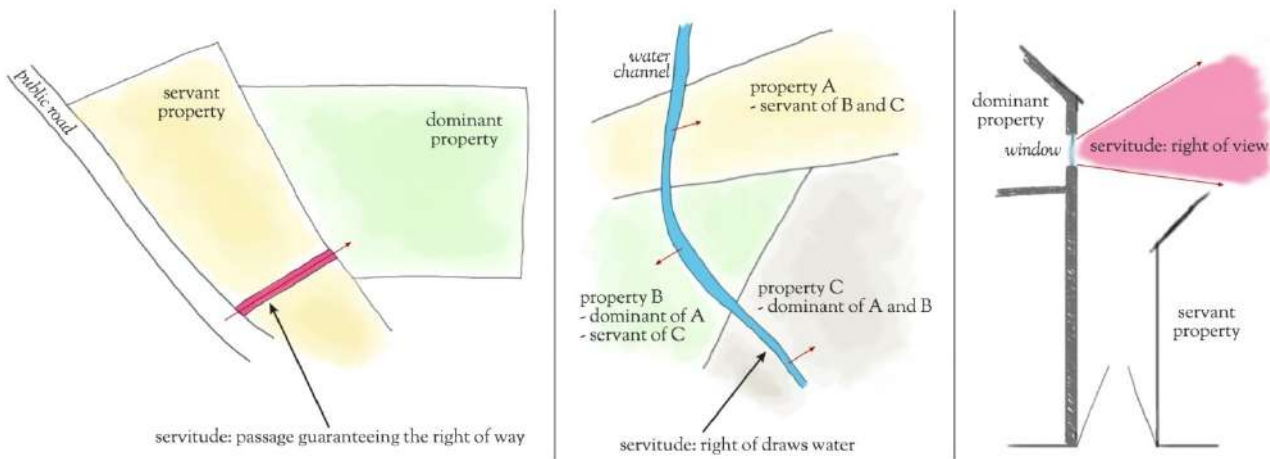

Fig. 4.3 – Examples of servitudes. Drawings by Guglielmo Minervino

4.1.5 – Local laws: the historical "regolamento dell'ornato" (ornate regulation) and the modern "regolamento edilizio" (building regulation)

In Italy, the regulation of the urban-building aspects has historically been brought back to two complementary instruments: the *Regolamento Edilizio* (building regulation), and its evolution, the *Regolamento dell'Ornato* (ornate regulation), the last one in vogue before the unification of Italy in 1861. These types of regulation were developed for a specific town by local local administrations, therefore the number of these regulations is equivalent to the number of towns that developed them. At the moment of the development and and well as for town statutes, it was a common practice to take inspiration and copying entire parts from regulations already present in other towns.

The oldest type of regulation, in vogue before the 1861, the *Ornate Regulation,* was meant as urban-legislative instrument designed to protect as much as possible the historical architectural elements that compose and distinguish for their originality the city, nowadays identified in the historical centre but once the only existing city. It is unsure when in time it started to appear but, a *Regolamento dell'Ornato,* constitutes for a town the main point of reference for interventions as recognizes, codifies and presents, by recurring to drawings and texts, the architectonic and decorative models existing in the related historical centre, and adopted by the past generations. Contemporary Ornate Regulations generally address façade interventions, exterior finishing elements (doors, gates, fences, balconies, terraces...), interventions in coverage (chimneys, gutters, skylights, cornices ...), technological systems, commercial equipment (plates, signs , windows ...), urban furniture[3].

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[3] Its organization and way of presenting those rules is very similar to contemporary Smart Code regulations, proposed as an alternative to the conventional planning codes which are rigid and focus on single-use zones (Duany and Talen 2001). According to Talen, sustainable

While traces of this view can be found in Italian pre-unity municipal regulations, they gradually disappeared as a modern type of urban planning took place. When still existing, the today Ornate Regulations follow the general principle of conservation, they are designed to favour minimal intervention, maintenance, and restoration rather than reconstruction. They become complementary, but not essential, to the Recovery Plans of the Historical Centres. That transformation is evident in successor type of regulative instrument that substituted the Ornate Regulation, the so called *Regolamento Edilizio* (Building Regulation).

Similarly to its precedent in time Regolamento dell'Ornato, a *Regolamento Edilizio* is a normative, but not planning, instrument that regulates at municipal level the building activity, ensuring compliance with the technical, aesthetic, sanitary, safety and liveability regulations of buildings and their appurtenances. The municipal administrations have full discretion in the formation of that Regulation, limited only by specific state and regional norms that dictate the general principles.

In particular, a *Regolamento Edilizio* defines the building parameters and their measurement criteria, also the related bureaucratic procedures such as the request and presentation of building permits. It is therefore a town scale tool that integrates with the general master plan which, instead, deals with the forecasting aspects, establishing the land use regime and other constrains. Similarly to what happened in the passage from the Ornate Regulation to the Building Regulation, there is a progressive passage of the technical rules of the Building Regulations to the rules for implementing the master plan which absorbed them. Among the parameters defined by the *Regolamento Edilizio* there are: distance between buildings, height of buildings, window surface (aero-illuminating ratios), minimum size of the real estate unit, gross floor area, height of habitable rooms, minimum size of habitable rooms, minimum and maximum dimensions of garages, and ceilings, the discipline and composition of the building commission, the documentation and graphic drawings necessary to issue a building permit.

In conclusion, both those not-planning type of regulation result interesting for the contemporary reuse of principles and intentions underlying the traditional building system in vogue in Calabria and other Italian regions. They are also relevant to understand the passage from the oral transmission of building rules to their written form, especially in cases when town statutes do not address construction matter.

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city-building in the contemporary century will require achieving a balance between greater predictability and greater flexibility. O that view, land use regulation reform took a path were codes, instead of only prescriptive rules, are used in order to help to create a built environment where space is defined by buildings rather than just occupied by them (Talen 2012).

4.2 – The urban form of Calabrian historical settlements

Towns of the medieval period are able to convey a sense of harmony and unity to anyone who experiences a walking through their narrow alleys, around the housing clusters clung to cul-de-sacs, and up to the majestic cathedral or castle embracing the small residences covering the hill slopes which ancient population chose as their new living place[4].

Apart from buildings hosting special functions, the Calabrian medieval towns were not designed in advance, nor following a master-plan of any kind. Their built environment is instead the reflection of the at that time life, cantered around the sense of community that tightened together all the individuals, and social and economic dynamics. At the same time, the physical city had socio-generative properties as its shape influenced the daily life, and habits of the inhabitants whose were daily struggling each other with a decision-making process concerning the growth and management of the city. The decisions of the people who shaped those cities were informed by the concern for the needs of the community, and guided by a pragmatic common sense bound by respect for the environmental conditions of the site and by the customs and regulatory laws in vogue locally. Such an interrelationship between individual and community needs, and the shaping of the built environment shows the existence of an organic evolutionary process that achieved an equitable equilibrium of the whole urban system (Hakim 2014), and between it and the surrounding natural environment.

The Middle Ages was a period of increasing urban activity when favourable conditions encouraged the political freedom of the growing bourgeoisie that has driven with itself the city as a new institution independent from the feudal power. Regarding the Mediterranean area, in continuity with the previous epochs, the medieval society developed an advanced and complete system of social legislation (Pirenne 1939), included indications and prescription about the management and build of the physical town (Hakim 2014).

Despite the central Europe started to experience a city oriented society, in the territories of the Southern Italy persisted for a longer time the feudal regime initiated under the Normans that, however, generally recognised and guaranteed the local regulatory peculiarities. Therefore, this sympathetic state-view did not limit the development of a modern society, at least for the Università that were the free cities, which become examples to be mimed by the other surrounding towns. This allowed for a continuity of the traditional building system until the Second World War, and, for the Calabria, even later where the modern urban planning struggled to be rapidly applied, especially in the small forgotten hill-towns inner land located. There, the building activities were still in the hands of local master masons and other specialists, some of which is still alive.

Most of the studies on the historical settlements concentrated on major architectures such as churches, castles or big size palaces designed by famous architects. However, the larger part of a town is made of the residential area which has been less studied. But it is exactly the domestic space, both public and private, which can reveal us the generative principles at the basis of such an exceptional product that is the historic city. Principles that can be reused today for the revival of those towns.

The structuring of the city was done for human use, by the inhabitants for their social and economic needs, therefore the produced environment results to be important for the shaping of the people personality, the attainment of personal goals, and the quality of interpersonal and family relationships as well as for those regarding groups and community interactions. Moreover, the health of people is directly influenced by the built environment, which response toward its inhabitants manifests in the scale and proportions of the physical elements, their position in the urban fabric and each other interrelationship, the lights, colours, the used building materials.

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[4] Text descriptions of the Calabrian towns can be verified in the selection of photos distributed in thath part – 3.2 – of the research.

From the observation and analysis of the historical urban fabric, the first characteristic that is noticeable is that all is organically interrelated, that no one element appears isolated from the rest. The public space is not really separated from the private, they merge each other resulting suitable for certain social and economic activities that are conducted in front of the houses, on the open air stairs and landings. In private courtyards the human environment is connected with the nature through the agricultural activities necessary for the family sustenance and economic purposes. Overall, between the private and public domains there is a gradual transition taking the form of terraces, balconies, staircases, lodges, courts, and a number of smaller architectonic elements of water and hygienic systems. Repetitiveness of the models and variety in the elements contribute for the creation of a complex urban system that was incrementally developed on a period of time spanning for more than eight hundred centuries.

People who lived in such environment, experienced a general sense of well-being, in particular, a sense of continuity during their movement, of safety and belonging among the tall stone walls and under their shadow, a sense of ease and comfort in social interaction. All this, despite the awareness that threats and dangers that could at any time have put the daily life into turmoil.

4.2.1 – Element characterising the urban form

The typical and easily recognisable urban form of the Italian historical settlements is due to a series of element that modified the way of building cities in place during the Greek and Roman time. Along with the fall of the Western Roman Empire also the protection provided by the imperial borders disappeared, leaving the Calabria and the other Italian regions to a long period of instability due to the constant assaults by populations coming either from the central Europe or from the other side of the Mediterranean basin. The necessity to have a safer place to live forced people to move on uplands, and that led to a drastic change in the form of towns. Consequently, building techniques adapted to the new environment and new architectonic solutions were developed, resulting in the formation of new housing typologies. However, the urban form was also affected by other factors such as the limited economic resources of households, a climate of high uncertainty due to the numerous invasions and political changes, the depressing regime of feudal governance, and, not lastly, by periodical disasters generated by earthquakes that impacted not only on the physical city but also on the economy and society that suffered the loss of workforces.

The following are the most significant elements that characterised the urban form of historical Calabrian towns.

4.2.1.1 – Hill-top geographic location

During the Byzantine period, people who were living on coasts had to move to inner lands, in places more easily defensible from the assaults of enemies coming from the sea. The process of encroaching on the hills continued under the Normans. It took the name encastellation (Toubert, 1973; Hubert 2002), common during the XI-XII centuries to the Calabrian towns and other European historical settlements.

The new foundation places had to have certain requisites, such as to be an easy spot to defend, possibly not easily identifiable from the sea but in a good position to spot any threats coming from it, and close to a water source. In these circumstances, the building techniques had to adapt with a new environment, excogitating architectonic solutions to deal with a regime of limited space, frequently on steep slopes, few types of available building materials in the surrounding, and a difficult accessibility to other centres.

In general, the new geographic location of urban settlements affected significantly the form of towns for the next eight-hundred years, resulting today among the first reasons of abandonment of such historical centres as less convenient living place rather than coastal modern towns.

Fig. 4.4 – A view of Tortora, the last Calabrian town at the north. Photo by Guglielmo Minervino.

4.2.1.2 – Harmony in the size scale of urban elements and with the surrounding

Looking at a typical historical town, its hill-top space is occupied by the military fortification that can be of various sizes, from a big castle to a simpler watchtower. That element is usually the largest in size, followed by the cathedral and the noble palace if any, usually located in a central position and surrounded by the residential buildings. Apart rural buildings, houses were in fact the smallest type of buildings which rarely went beyond the three or four floors.

The difference in sizes between the residential fabric and the special function buildings is evident. It is in place a relationship where the bigger an element is, the less is its number, therefore a historical town always present few big size buildings, having special functions and located at the highest point, and a great number of smaller buildings, usually residences. That configuration is in harmony with the morphology of the town foundation place, providing the optic effect of a town as an extension of the hill.

Fig. 4.5 – San Fili. Photo by Guglielmo Minervino.

4.2.1.3 – Compact built environment

Defensive needs of Medieval settlements, that led to found them on hill-top limited space areas, forced the generation of a tightened urban fabric made of small plots, included vegetable gardens. The limitation of the available building space was overcome by resorting to the practice of building the houses in adherence to each other. That building solution is bounded with the practice of servitude through which two or more owners can achieve agreement on various issues, including building matters. A typical example of that type of servitude is the

sharing of a wall for the construction of two independent housings[5]. Furthermore, if the expansion of a house was urgently needed, the construction of suspended rooms on public roads was allowed under the condition of guaranteeing the underlying right of way.

That achieved compactness of the urban fabric resulted in positive emergent properties for the living of the urban environment. For instance, the narrowness of the streets provides shadow, and activates a circularity of cooling wind flows. Also, it reinforces the strength of the structures that result more resistant to earthquakes. Nevertheless, precisely the numerous deaths due to the earthquake of 1783 were attributed to the narrowness of the streets that prevented an easy escape or the possibility of saving many people buried by rubble.

Regarding building materials, there were mainly stones, woods, and clay elements such as shingles and water pipes. It was also common the practice of spoliation of ancient buildings which provided low cost materials.

Fig. 4.6 – Civita. Photo by Guglielmo Minervino.

4.2.1.4 – The basic housing module and building typologies

The historical urban fabric is based on plots each of which meant for hosting a single housing unit. The activity of houses restoration and rebuilding was a common practice that, combined with the incremental additions and alterations of the original units, produced a city-palimpsest that is a single compact and inseparable entity. The existence of such urban subjects is an indication of a high flexibility of the basic housing module adopted for the building of houses. The process combining this architectonic module with the prescriptions from law codes has allowed for an organic growth of the urban settlement, resulting in the generation of a functional urban ecosystem over a long period of time, and perfectly integrated with its natural surroundings.

That process of incremental urban growth, common in all the Italian regions, assured the formation of a recognizable character common to all the historical towns. However, the geographical specificities combined with the slow and incremental small transformations occurred around the basic housing module gave each city different characteristics that can only be recognized by an internal visit. That variety and complexity at local level is also influenced by local customs that reflects the culture of inhabitants and the design language knowledge that is transmitted through generations.

In the past Italian society, the basic housing module was made of one single room hosting an entire family (Fig. 4.7) that could be made of 6-7 people and more. It was not rare that the space was shared with some domestic animal such as a donkey.

The basic housing module has a regular shape which sizes depended on the used materials for building floors and roofs. Most of the floors were made with a simple structural one layer beam-framework, having a maximum span of roughly 4-5 meters width on the street side, supported by perimeter stone walls which thickness could be more

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[5] See the paragraph "Abutting walls" for futher explanations

than one meter for multi-storey buildings (Fig. 4.7). The basic housing module coincides with a room that was mostly rectangular shaped according with the plot. However, trapezoidal rooms are frequent in housing additions due to the necessity to adapt to the available space. Whereas the width of a room depended on the used floor beam, the length could be much longer. Special cases are registered for big size buildings such as churches and castles for which the economic capability of the client allowed the use of longer beams. Beside the use of wooden materials, certain low ground floors and staircases of palaces present a masonry vault.

Fig. 4.7 – The reproduction of old living condition in a typical one room apartment, from the museum of Gallicianò, and the generic room section with structural elements. Photos and drawings by Guglielmo Minervino.

The new Medieval housing module probably originated from the Roman *domus solarata* which, due to its organisation as multi-storey building, allowed to the separation of domestic functions. Since then, work activities and storage spaces were located on the low ground, whereas private life activities were on the first floor (Hubert 1990). This organisation represents the turning point in the housing evolution from the ancient Roman typology to the new Medieval one although the existence of this type of building is already documented in the III century.

The typical Medieval house is generally single celled and on two floors built for hosting one family. Generally, the houses has facade on a public street of 4-5 meters of length, and some buildings have on the opposite side a small, pertinent private open space used as vegetable garden (Fig. 4.8) (Wallach 2000). The low ground entrance to the workshop opens on the road, and a staircase of access to the upper level residential part is located on the side or in the back (Bascià 2000). In Calabria, the practice of building in attachment prevented the use of the house side for hosting the staircase which, instead, is usually on the front side, adjacent the ground level door (Fig. 4.8). The use of the side is common in rural isolated buildings.
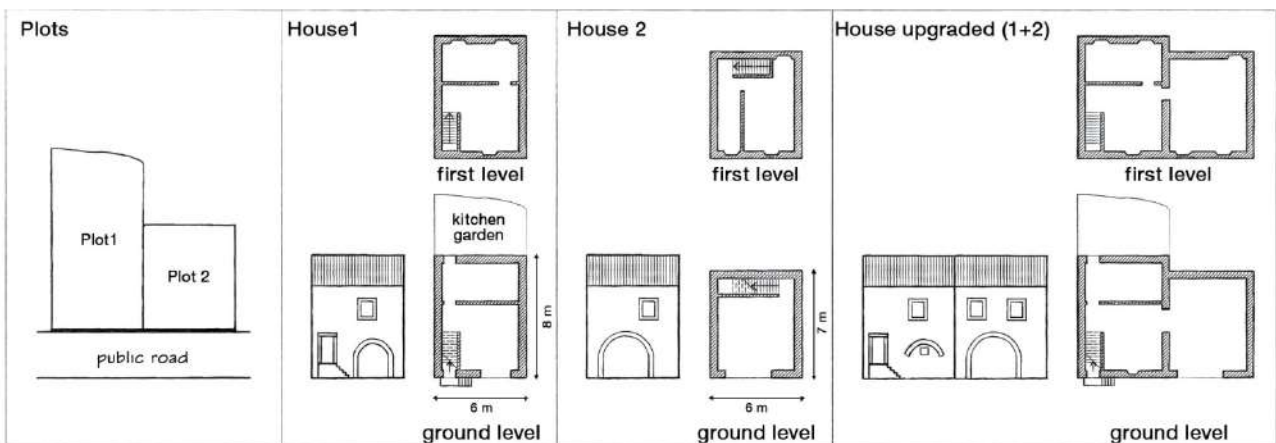

Fig. 4.8 – Hypothetical basic housing module, and relative aggregation. Drawings by Guglielmo Minervino.

The work room on the low ground its one of the main features of medieval houses (Fig 4.9). It was a really flexible space in terms of geometric shape as it has been easily adapted both to the ground morphology and to the public urban space. Frequent uses of this ground floor room, generally called cellar, were as warehouse, stables, timber-yard, storehouse, or workshop. Apart as stable, the other domestic functions are still in vogue nowadays, plus the use as garage for motorcycle and cars in cases of large rooms.

The low ground ambient present frequently one or more rocky walls that work as house foundation and sometime as walls. Other room walls were shaped with stones and bricks, ending in a groined vault or, more simply, with a flat floor of timber beams. That difference of techniques also suggests a different status and wealthy of the owners. From these observations it results evident that the ground level floor has not only a business and domestic function, but also it is a structural element working as basement to level off the surface, preparing it for building the house (Fig 4.9). The low ground module could be considered like a hinge that harmoniously links the natural environment with the human habitat.
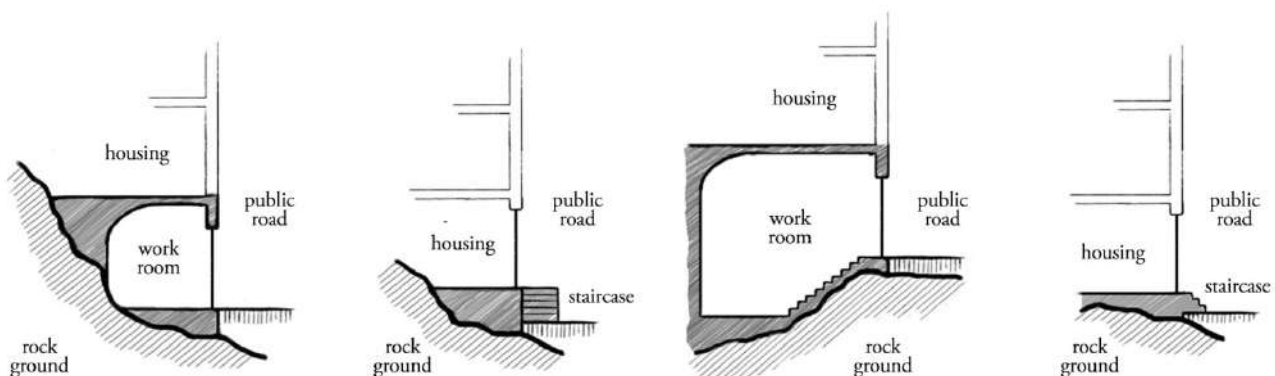
Fig. 4.9 – Low ground room, working as workshop and basement for the house. Drawings by Guglielmo Minervino.

Overall, the basic housing module has a character of repetitiveness that makes it easily combinable on all sides. This occurs whether in the case of building on pre-existing lots or new allotments. A strong element of the generated urban fabric is the dimensional correlation between the plot size and the plan of the house. The coincidence of the house size with its plot usually originates a square or rectangular building which width is determined by the road building side: the more the width is short the more is the length on the long side in order to reach an area between 25 and 36 square meters (Bascià 2000). Moreover, this module easily allows to enlargements or upgrades in both the case of a detached house, with adjunctions, and terraced houses, with purchasing or acquisition of adjacent housing or rooms. There are also cases of new raised up storeys, but generally in later centuries. This flexibility is evident in several mutations of the basic module (Fig. 4.8).

In general, the typical Medieval house was small and tower-shaped. Etienne Hubert (1990), noticed that in the XI century, urban courts disappeared, from the documentation, coinciding with the spread of the tower-house as a residence of the aristocracy. In Calabria, the phenomenon of building tall towers is not present as the feudal system lasted much longer than in the central and northern Italy. Instead, aristocratic families used to live in three-four storey palaces (*case plaziate*) that are the result from the merging and modification of several basic units (Teti 2000).

4.2.2 – Evidence of covered issues addressed by law codes in the Calabrian built environment

Since now, the research focuses on towns from the northern Calabria as those were less of not influenced by the earthquake of the 1783 that completely destroyed the towns in the south of the region. Those were re-found accordingly with the new regulations introduced by the Bourbons, after the earthquake (See Part 2.5). Because of this, they result, today, less mature in terms of complexity of the built environment compared to towns in the northern Calabria that thus represent a better case for the understanding of the traditional building system.

Issues addressed by law codes or technical treatises can be individuated by looking at the urban fabric of historical settlements. Over time, the spatial and architectural solutions developed to address specific issues combine and build upon one another (Fig. 4.10). Such incremental building process generates complex patterns that can be recognised and analysed (Alexander 1977, 1999; Kostof 1991). Some of those patterns become characteristic of a town or clusters of towns where they are repeated in large number and with many variations. When a pattern becomes widely used, local cultures recognise it by giving a name that usually provides clues on its origin and functional purpose.

The spatial organization and architectural form of a pattern address one or more of the ten identified categories of issues related to the built environment, resulting in having multiple functions that integrate with social and economic activities of the town community.
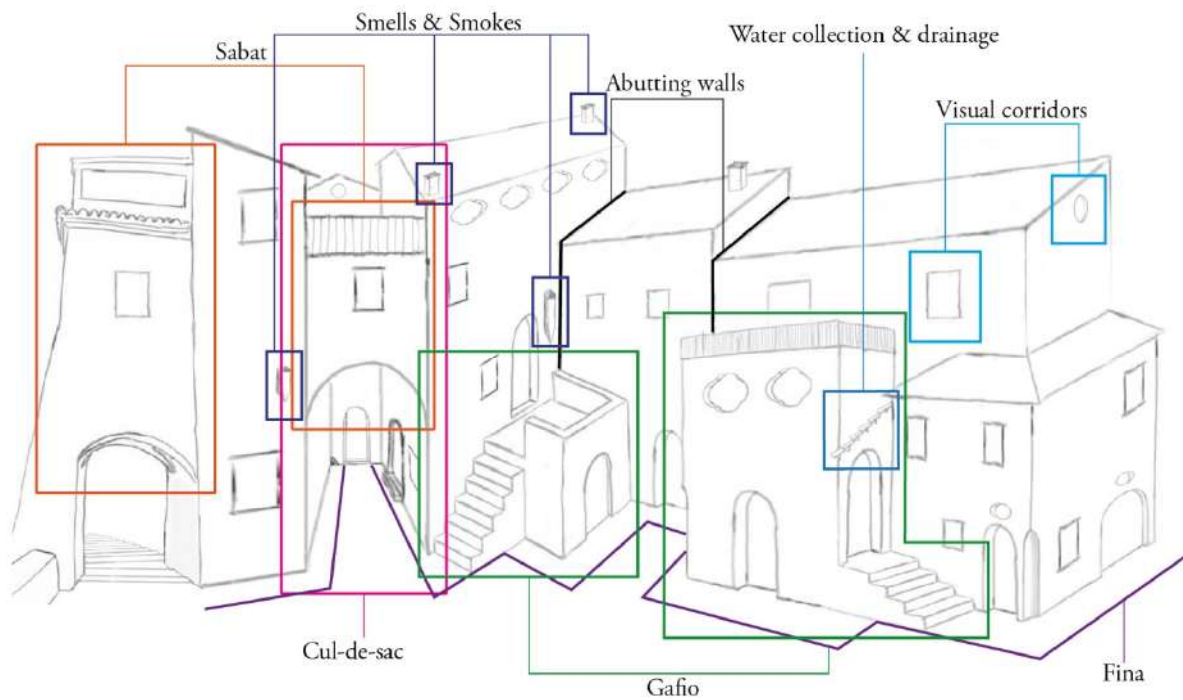
Fig. 4.10 – A representative example of an historical urban fabric generated by the integration of several spatial and architectonic patterns.

The following paragraphs present the most common urban and architectonic patterns identified in Calabrian historical settlements. The description of each pattern takes as reference the general structure for urban patterns presented by Alexander (1977), integrated as following:

- a representative picture of the pattern;
- a description of it (origins, name, purpose, geographical presence out of Calabria);
- the issue the pattern addresses by referring to the ten categories of issues covered issues by law codes;
- the possible solutions and a related diagram (urban and spatial organization of the pattern, its architectural elements, used building materials, relation to the social and economic sphere);
- the relationships with other patterns.

4.2.2.1 – Cul-de-sacs and courtyards

Fig. 4.11 – Cul-de-sacs from Aieta, Aieta, Civita, Cerisano, and Dipignano. Photos by Guglielmo Minervino

The Islamic culture had a significant impact on the Calabrian urban environment. Not much is left from the intangible inheritance but Muslims legacy is still recognisable in the urban organization of historical towns and in the certain spatial aggregations, above all the road network, hierarchically organised in main and secondary streets, eventually, further branched out in local cul-de-sacs serving housing aggregations (Guidoni 1979) (Fig. 4.12). Cul-de-sacs where shared by several residential units and used as private space so much so that is not rare to find gates at the entrance of them (Fig.4.11, 4.13) (Guidoni 1978). Over time, most of the cul-de-sacs have been opened or altered for defensive purposes, allowing a easier escape, hygienic reasons or as result of the incremental process of urban transformation.

Cul-de-sacs directly affect issues related to *Land use*, *Public space and accesses,* and *Private property*.
In historical urban fabrics, housings aggregate in clusters around cul-de-sacs that provide the access to them. The narrow and short sizes of cul-de-sacs encourage privates to use them as an outdoor extension of the private domain, although they are public spaces to all effects. Being such a mixed private-public space, the alteration of a cul-de-sac would impact on all the private properties served by it, therefore its maintenance and transformation is subjected to the agreement of all the resident of housings opening on it. In Muslim societies consensus of all households, that have access from the cul-de-sac, must be achieved before any changes are made

Fig. 4.12 – Map of Longobucco with cul-de-sacs and courtyards in red. Drawing by Guglielmo Minervino

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A cul-de-sac usually originates from a secondary road, although it might also be opened directly on the main arterial road. Its length and shape varies as a cul-de-sac is generated by the incremental addition of buildings that would design its perimeter. The inner articulation of the space also depends of the housing needs of access. Cul-de-sacs that have a circular-like shape are more similar to courtyard and some time they present a gate with a masonry arch without door (Fig. 4.13). In Muslim societies the cul-de-sac is considered as private property co-owned by all who have access from it. In Calabria, for what results from statutes, this aspect varied from town to town. Public roads are sometime listed and do not include roads leading directly to houses, however, such roads could likely be cul-de-sacs. Today, they are not private unless part of a private cadastral parcel.

A *cul-de-sac* is part of the road network. Therefore it is strongly related with the *fina*, *sabat* and *gafio* patterns as all of them could rest on it. Moreover, it might embed *water collection and drainage* systems.

Fig. 4.13 – Cul-de-sacs under the form of semi-private courtyards in Aieta (above) and Cerchiara di Calabria (below). Pictures on the left are taken from the entrances of the courtyards, pictures on the right shows the inner areas. Photos by Guglielmo Minervino.

4.2.2.2 – Fina

Fig. 4.14 – Examples of *Fina*, from the left in Aieta, Cerchiara di Calabria, Belmonte Calabro, Cerisano, Altomonte; Photos and drawings by Guglielmo Minervino

With the term *fina* it is identified a semi-public space of roughly 1-1.5 metre wide running alongside all exterior walls of a building, also extending vertically (Hakim 2007, 2009b) (Fig. 4.15). The *fina* (or   ) is an Arabic term that also refers to the inner courtyard of a building, and its concept is present in the old Islamic jurisprudence (*fiqh*) that largely addressed the built environment (Hakim 2009b; Nooraddin, 1996). In Calabria, although that space is not identified by a proper name, it characterises the road networks of all the historical centres, and its width varies from few centimetres to roughly 1 meter due to the narrow alleys.

If we compare the modern and historical built environment, sidewalks can be considered the analogous of the *Fina*, both for location and use. They might be seen as an evolution of the *fina*, which had to undergo change due to the advent of the automobile. Therefore, the modern version of the *fina* is materialised above ground under the form of sidewalks, resulting in a loss of flexibility in favour of a safer area for pedestrians.

The *fina* is a simple concept concerning the public space. However, its application also affects the private domain, giving origin to a complex spatial network of architectonic patterns running on the sides of streets. In fact, the *fina* addresses various issues related to the categories of *Land use, Drainage & hygiene, Public space and accesses,* and *Houses*.

Concerning the land use, the *fina* belongs to the public space but it is mostly used by privates for temporary purposes of various types. About drainage and hygiene, it is the space were housing water drainage systems empties, external chimneys are allocated, and that conveys rain water to the centre of streets allowing faster water dispersal. The *fina* can be occupied by permanent staircases for housing access, adapting its width in a way that guaranties the right of way in the street. Occasionally, it can be used for housing expansions as long as the existing passage is not compromised.

Overall, the use of the *fina* responds directly to the principle that "private and public responsibilities are properly allocated and implemented" (Hakim 2007): citizens were allowed to utilise the *fina* when needed, as long as the use would not impede the passage on the street or cause harm to anyone (Fig. 4.15). Residents were also responsible for keeping the *fina* clean. Nowadays, the traditional allocation of private and public responsibilities is lost as the maintenance of the public space is a public concern. In fact, citizens have strong limitations in using the public space for private activities as it is subject to a strict regulation and taxation for the private occupancy. Nevertheless, in historical centres, people still take care of the maintenance and decoration of their immediate *fina* and street, keeping alive the ancient custom (Fig. 4.14).
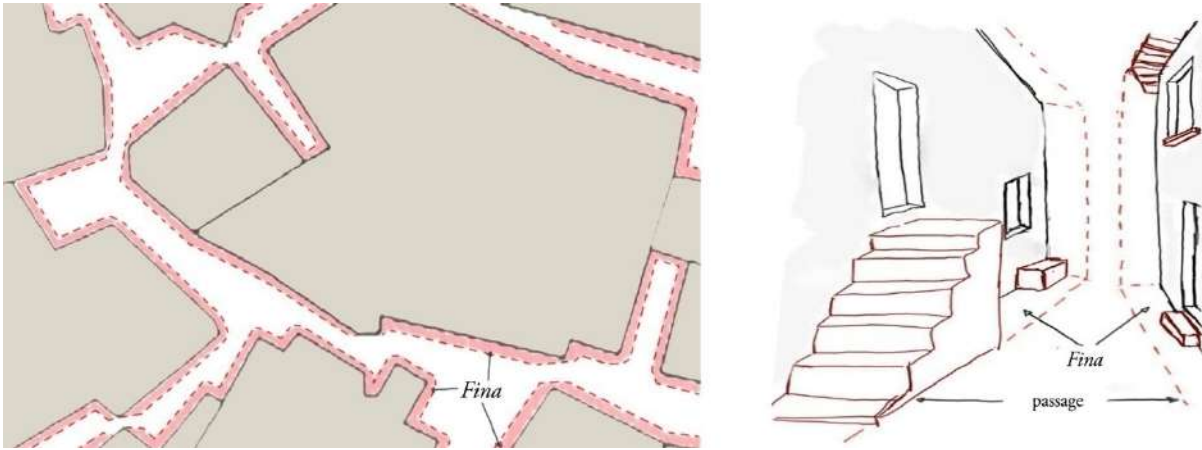
Fig. 4.15 – The *fina* concept applied. Drawings by Guglielmo Minervino

The architectonic pattern related to the *fina* is generated by permanent and temporary uses of it (Minervino and Canturi 2017). Permanent uses of the *fina* are usually represented by built-in structures whereas the second is recognisable by the presence of removable objects or social and work-related uses of the space. Common permanent architectonic elements are staircases, thresholds, landings, and balconies. In addition, the *Fina* is utilised for water related infrastructures that serve as rainwater collectors for domestic purposes, or to prevent rainwater flow from entering houses.

Temporary uses are related with domestic activities and decorations such as flowerbeds, lights, firewood, working tools, and wall decorations. Finally, technological infrastructures, such as public lighting, electrical and telephone cables and boxes, satellite dishes and exterior plumbing, are modern examples of the use of the *Fina*. In general, from the type and intensity of temporary uses of the *fina* it can be determined the presence of inhabitant and deriving indications on their social and cultural aspects.

Finally, the most particular use of the *Fina* is represented by rooms bridging the street which are called *Sabat*, in Arabic (Hakim 2007, 2008b). This architectonic solution respects the public right-of-way in the street and allows owners to build large expansions of their houses.

Social aspects of the *fina* are very relevant for ancient communities as most of the daily life took place outdoors and in a limited urban environment with very few squares. Therefore, the *fina* space was used as working place by the women for knitting, to prepare food preserves, for interweaves baskets and making other objects, also resting and meeting other people.

The *fina* integrates with all streets, especially *cul-de-sacs* where the regulatory division between public and private space is not fully respected by inhabitants. About its permanent uses, it is strongly connected with *sabat* and *gafio* that occupy it. Lastly, it is used to facilitate *water collection and drainage*, and the dispersion of chimney *smokes*.

4.2.2.3 – Sabat

Fig. 4.16 – Examples of *Sabat* with underneath walkways, from the left in Aieta, Scalea, Mendicino, Cosenza, San Marco Argentano. Photos and drawings by Guglielmo Minervino

The *sabat* is an extension of the concept of the *fina*, materialised in a room bridging a walkway in compliance with the underneath public-right-of-way (Hakim 2007) (Fig. 4.16). That architectonic element allows the creation of additional housing space attached to a building.

The number of *sabat* present in a town is an indicator of the building density, as the available lands for the growing of medieval cities was constrained by land morphology, defensive infrastructures, and building materials and techniques limiting the maximum number of stories, and forcing people to recur to different housing expansion strategies.

The *sabat* concerns the private domains and the possibility to expand it. Its building addresses issues related to the categories of *Public space and accesses, Houses*, and *Private property*.

Being an extension of the *fina* concept, a *sabat* is a built projection on underneath streets, therefore it is subjected to limitations of width and height functional to the guarantee of the right of way. A *sabat* is also the proof of a right to build housing expansions when other options were not practicable. Concerning private property issues, certain *sabat* physically connect two separate buildings either of one or two different owners. In case of different owners, the presence of a *sabat* can indicate that good relationships occurred between neighbours as one of them had allowed the other to build attached to his building. Therefore, *sabat* are more easily built in building aggregation shared by family members.

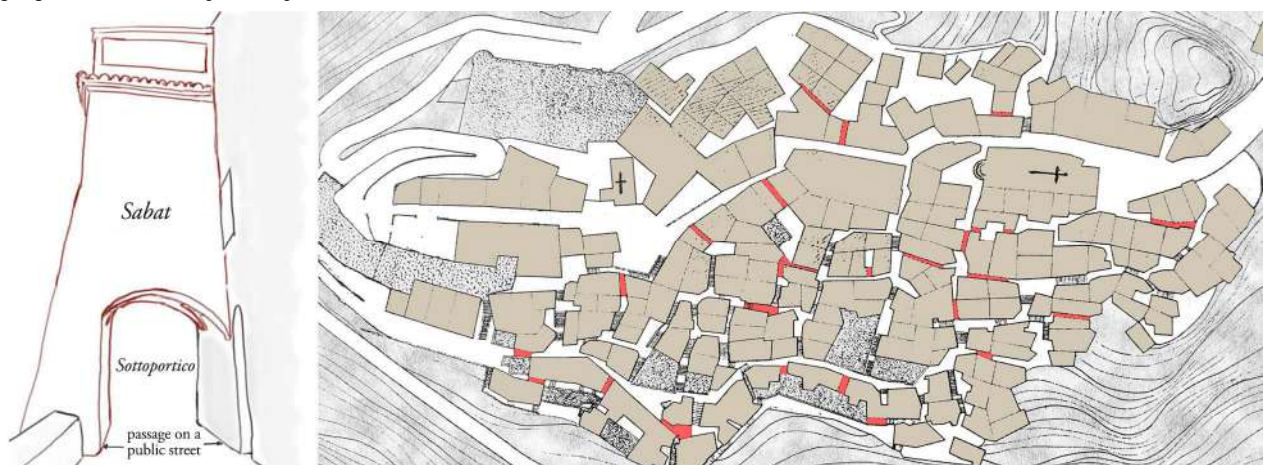Fig. 4.17 – A scheme showing the relationships between the *sabat* and the public domain, and a map of *Sabat* (in red) in Belmonte Calabro. Photo and drawings by Guglielmo Minervino

While in Islamic settlements a *sabat* is frequently supported on one or both sides by columns, assuring a structural independency from the buildings (Hakim 2007), in Calabria this practice is not observed as *sabat*

seems to be all built on facades, taking a direct support from the building walls. More *sabat* built side by side can origin to covered corridors called *sottoportici* (Italian), very common in the northern Calabrian towns (Fig. 4.17). Sometime, a window opens on the wall over the street. In Calabria, a *sabat* is built in masonry and supported by a structural arch or a wooden beam slab inserted in house walls.

The *sabat* integrates with all streets, the *fina*, *gafio*, and *abutting walls* patterns.

4.2.2.4 – Gafio

Fig. 4.18 – Two examples of *gafio* in San Lucido. On the left, a complex one of landing-type with a long staircase serving ten different openings; on the right, a small one of loggia-type. Photos by Guglielmo Minervino

The word *gafio* refers to a cantilevered wooden balcony embedded in the wall, more frequent in Central Italy, or a covered passage, in the South (De Blasi 2009). In villages built in mountainous or hilly areas, the *gafio* has the function of supporting the part of a house built on the lower part of a slope. Its original meaning derives from the Longobard word *waifa*, "common, belonging to no one". Accordingly to Sabatini (1963), it refers normally to a tract of land that divides two buildings, or to a landing with an external staircase. That interstitial space between buildings is mentioned by statutes of towns in the Latio region (Ferentino, Segni) when they refer, by the world *trasenna*, to a narrow space surrounding the house, usually for the collection of sewage waters, dirty waters etc. (Carlotti 1998). That spatial definition corresponds to the original meaning of *waifa* proposed by Sabatini. The *trasenna* matches also with the roman *ambitus* that is the land strip surrounding houses having the purpose to ensure adequate distances between buildings and for external dripping purposes. In their original meaning, the *gafio*, *trasenna*, and *ambitus*, seems to refer to the same urban space running alongside the exterior walls of a building.

The word *waifa* was transformed into the southern Italian dialects of Puglia, Calabria, Basilicata and Campania in *gafj*, *gafiu*, *yafio* or *cafiu* (De Blasi 2009). Finally, the *gafio*, as an architectonic element, is widely present in the entire Italian peninsula, especially in southern regions, France and Greek islands.

The *gafio* pattern concerns the space between private and public properties, therefore addressing issues related to the categories of *Public space and accesses* and *Houses*.

In its original meaning *waifa*, it assumes a spatial configuration as an alley separating two buildings (Fig. 4.19a). With time, the term *gafio* has been associated with architectonic elements occupying the common interstitial space at the origin of the term *waifa*. Under the architectonic form, its most common function is either to provide access for upper level housings (Fig. 4.19c) or to support a protruding room/space facing the public street (Fig. 4.19b,d,e). The guaranteeing of the right of an owner to access and expand its house, and the right of way of inhabitants through a public street, masons had to adapt a *gafio* to pre-existing circumstances of the built

environment by recurring to different architectonic solutions, resulting in a number of local variations depending of building materials, weather, and housing typologies.

The main characteristic of the *gafio* as an architectonic element is its protruding form over the public street, usually occupying the *Fina* spacee. That aspect becomes a paramount concern in the legislation of statutes from central Italy (Teramo) which regulated the construction of the *gafio* that often cumbersome so much so to rising problems of urban planning. Thus, the construction of the *gafio* begins to be subject to limitations when there were established, first in Naples and then in the rest of the Kingdom, strict building laws under the Spanish viceroy Pedro de Toledo, in the XVI century (De Blasi 2009).
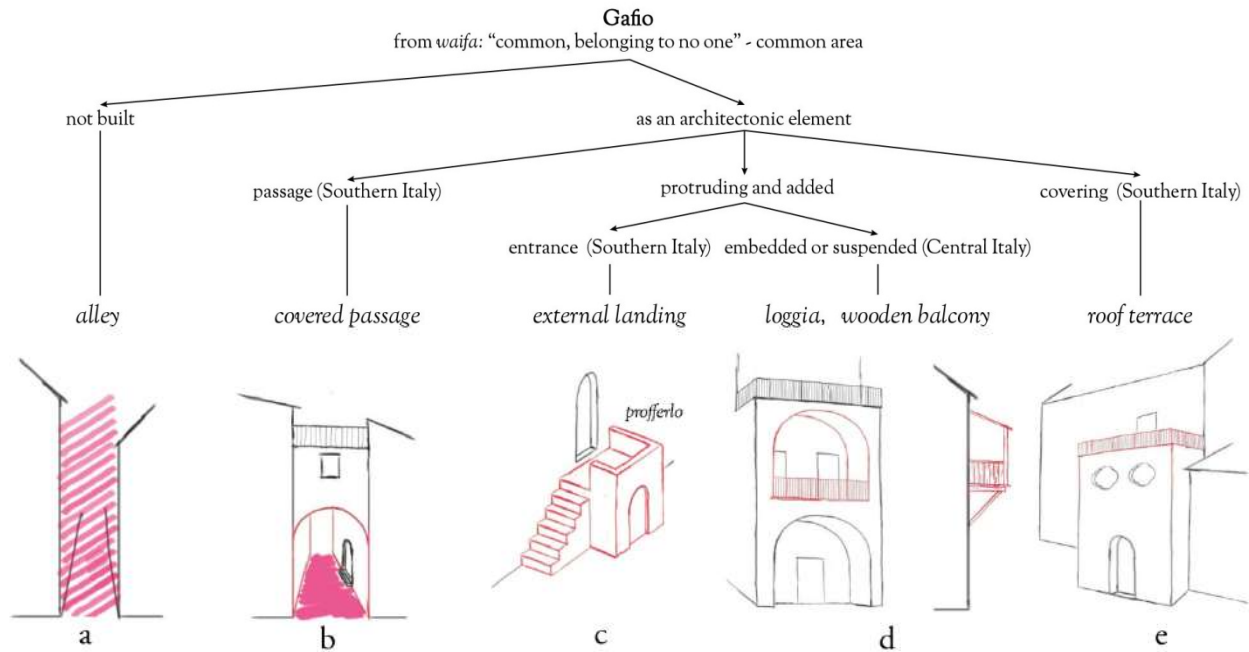
Fig. 4.19 – Typologies of *gafio*. Graph from Fracassa 2011, translated by the author. Drawings by Guglielmo Minervino

Covered passages, balconies, landings with staircases, loggias, and roof terraces are the most frequent architectonic variations of the *gafio*. In Calabria, it usually indicates a masonry landing under the form of a small terrace with an external staircase serving to give access to upper level housings. On the terrace there opening two or more rooms, such as in the complex example present in S. Lucido where a *gafio* serves ten separated domestic environments (Fig. 4.18). In the city of Crotone the *gafio* indicates a common roof terrace covering a building that often contains different dwellings.

The *gafio* as external landing architectonic element is also equivalent to the *profferlo,* from the latin *proferŭlum*, derived from the Greek ροφερής, «front place». In that case a *profferlo* has also a small room for commercial or crafting purposes placed beneath the staircase. That small unit used to be a recovery place for domestic animals while nowadays is frequently used as under-stair storage room for firewood, domestic workshop or garage for motorcycle. Finally, g*afio*'s landings and staircases were used as working place by women of the house for knitting and to prepare food preserves while the social function as daily resting and meeting place is still maintained today.

Elements of the *Gafio* are related to the *Fina* as they occupy. As a covered passage, it presents similarities with the pattern of the Islamic *Sabat*, a bridging room over a public street. Lastly, a *gafio* might abut different properties walls, and embeds systems of water collection and drainage accordingly with its form and location.

4.2.2.5 – Abutting walls

Fig. 4.20 – Houses built joined one each other in Carolei, Cerisano, Papasidero, Zagarise, and S. Pietro in Amantea. Photos by Guglielmo Minervino

Historical towns are characterised by a compact built environment, a necessity due to the limited available space on hill-tops location where people find a safer place from the threatens from the sea. The practice of building in attachment is old and widespread in the whole Mediterranean basin. Already addressed by Muslim treatises (Ibn al-Rāmī and Hakim 2017
), entails the existence of a decision making process between owners of the two or more adjoined properties. The owner of a pre-existing building had to allow the other for the construction of the new building or the rising of a new storey. That possibility to build in attachment is guaranteed by the right to build constrained by limitations ascribable to the prevention of harming another person or the value of the pre-existing property. For instance, the building of an abutting wall could have been prevented if there was a window opened on the wall or by the safeguarding of the right of view. These examples are confirmed both by the analysis of the built environment and the interviews to local master masons and inhabitants that still remember such practices in vogue until the half of the nineties when new planning regulations were introduced.

The practice of building *abutting walls* concerns the private domain and the possibility to build and expand it. It is related to issues of *Land use, Houses, Private property, Overlooking, walls*, and *light and views.*
The possibility to build in attachment affects the land use management allowing for the generation of a compact build environment by the following of rights and restrictions to build houses. Some restrictions on where and how to build an abutting wall prevent the harming of another private property, including the safeguarding of visual corridors and the right to get natural light. Finally, the building a new abutting wall concerns shared rights on the housing facade in common between two owners, and responsibilities on the maintenance of it.

Fig. 4.21 – Set-up for wall connections in Aieta, San Donato di Ninea, and Scalea. The wall section on the left shows the location of connecting stones that are put on the corner of buildings. They indicate where other buildings are allowed to be build in adherence. Red arrows indicate connecting stones in the three different situations. Photos by Guglielmo Minervino

An evidence of the right to build in attachment to another property is clearly represented by the existence of protruding connecting stones placed on building corners (Fig 4.21). Facades between corners with connecting stones are generally left empty of windows, and when a window is opened, the eventual future building to be built in attachment must reach a maximum high that is the level of the window. In rare cases, also holes for the insertion of roof beams were set-up in a wall allowing the future building of a new attached unit or the expansion of the first one.

Fig. 4.22 – *Pagamuro* on walls in Cerzeto (first from the left), and Civita (second to fifth). Photos by Guglielmo Minervino

In towns of Arbëreshë origin, the decision making process concerning the building in attachment is physically evident in the practice of leaving a small triangular hole in the wall left available to be adjoined by another building (Fig. 4.22). That hole is usually opened only on the external facade and it is made of two shingles. Accordingly with interviewed local master masons, the name of the hole is *pagamuro*, literally "pay wall". In fact, the function of the triangular hole is to make evident that the wall had an owner that must to be paid if someone wants to use of it for its hose to be built in attachment. From interviews it emerged that the payment had to be proportionate to half or the cost of the existing wall having the *pagamuro*, and for the extension of the new wall to be built in attachment. In the knowledge of the author, the *pagamuro* practice seems to be existent only in towns of Arbëreshë origin, yet some other system is likely to have existed for the other towns as building in attachment was one of the most common practices characterising the old built environment.

Abutting walls integrate with every architectonic component, especially with *sabat* that require supporting walls for its building.

4.2.2.6 – Visual corridors

Fig. 4.23 –Views of landscape and sea from private houses in Civita, Aieta, Gallicianò, and Samo. Typologies Drawings by Guglielmo Minervino

Natural lights and landscape views, of the sea in particular, were relevant for inhabitants of the Greek, and Byzantine cultures. Already in the VI century, the Julian of Ascalon's treatise addressed the preservation of the view of the sea (Hakim 2001), and the Calabrian X century *Prochiron Legum* dedicates several articles to matters of light and views (Hakim 2014, Appendix 2). Law texts present such codes, devised to protect the right of view evidently applied in the configuration of the historical Calabrian built environment. Right of views and receiving natural light impacted significantly on the urban form as its observation affects the maximum height of buildings when other pre-existing buildings are present in the surrounding.

Visual corridors depend of the right of getting natural light and having view that directly affect issues related to *Light and Views* and *Overlooking*. While the Calabrian built environment shows evidences of the first category, overlooking issues are less addressed in term of privacy prevention. This was because ancient town communities didn't feel that necessity as people were deeply interrelated by family and friendship relationships carefully built over time (Bedini 2009).

Fig. 4.24 – Relationship between views and height of buildings, and window views free of obstructions in the town of Mendicino. Drawings by Guglielmo Minervino

Windows for light and views purposes were of various sizes and forms. Their location also varies in function of the surrounding built environment, sun and wind exposition. The study of openings reveals a great attention to local climate by ancient communities which relationship network of its inhabitant affected the decision making process during building activities: people carefully evaluated if and were to open a window, balcony or an entrance paying attention to neighbours rights.

Visual corridors integrate with issues related to *Abutting walls* as the presence of a window would have prevented or limited the building of a wall in attachment to the one having the window.

Fig. 4.25 – Examples of openings for natural light in Cosenza, Civita (the two small window open internally inside a fireplace occupying the whole room, with the chimney in the middle), Aieta, Carolei, Mendicino, and Zagarise. Photos by Guglielmo Minervino

4.2.2.7 – Smells and smokes

Fig. 4.26 – Various types of chimney from Calabrian historical towns. Photos by Guglielmo Minervino

Among the activities that could create damage to a neighbour there are smokes and odour caused by domestic activities. Old communities had a fireplace and frequently a wooden oven within their housing, used for cooking and make bread. The fireplace was also used as light source for night working activities.

Smokes and smells produced during the domestic activities had to be carried outside in the most efficient way and not provoking damage to anyone. That was a significant issue as every building could have several fireplace sources of smokes.

The production of *smells and smokes* concerns primarily *private property* issues that could debase the value of adjacent properties resulting in a deterioration good neighbourly relationships.
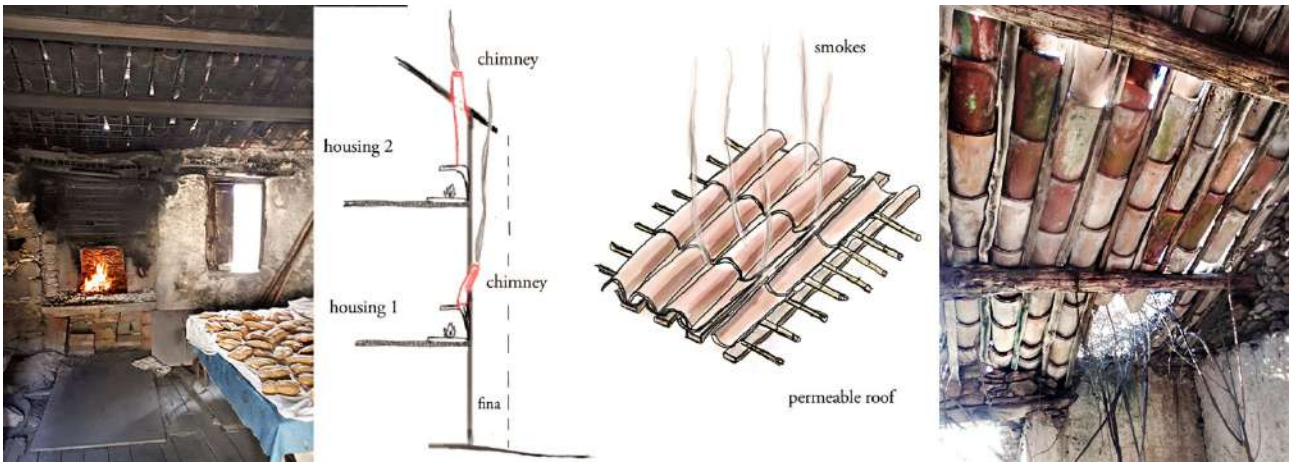
Fig. 4.27 – On the left, relationship between the chimneys and the *fina* space. On the right, permeable roof allowing dispersion of smokes. Drawings by Guglielmo Minervino

Architectonic solutions to possible issued due to smokes were simple. A chimney could come out from the roof, in the case of last-floor housings, or directly from the wall hosting the fireplace in cases of lower apartments. The second case is related with the use of the *fina* as the protruding chimney always remains close to the house facade (Fig. 4.27). Typological variations goes from the minimal chimney made of two shingles forming a pipe to a longer pipe running on the external facade up to the roof, made of shingles, or metal and other materials used in recent times (Fig. 4.27). Finally, the smoke ducts were incorporated into the walls of the apartment, exiting outside only for the last part of the system.

Another poorer system for smoke dispersion was to have the fireplace at the last floor and simply leaving the smoke goes up passing through the roof structure that was made of wooden beam, reeds, and shingles, without mortar (Fig. 4.27). That roof was very permeable for fumes coming from indoor but impermeable for rain water due to the use of two layers of shingles posed one opposed to the other.

Smoke and smells solutions integrate with the *fina* that constituted the external hosting space of fumes dispersion systems.

4.2.2.8 – Water collection & drainage

Fig. 4.28 – Above) water collection systems: (a,b) cisterns supplied by rainwater collected from roofs;(c) a well supplied by underground channel; (d,e) pipes collecting rainwater. Below) Drainage and dispersal systems: (f) concave road draining water from edges; (g) wall hole in a cul-de-sac to allow water dispersion; (h) grooves to allow dirty water from productive activities flowing out; (i,l) shingles used to prevent rainwater to drip on the housing access and on the road. Photos by Guglielmo Minervino

An historic city is a harmonious ecosystem that has achieved a great balance between human needs and the natural environment. The practice of taking into consideration the surrounding context for the design of architectural solutions has an ancient tradition observable in all cultures of the Mediterranean and the Near East (Hakim 2008a, 2009a). An example of those architectonic expedient are the narrowness of the streets, the protruding of balconies, and the built of covered streets that provide shadow and wind flows in public places and on house facades. Another example showing such a responsiveness of the built environment towards the local climate is the collection and storage of rainwater by architectural elements to meet the consumption needs. The excess was efficiently dispersed thanks to a built-in drainage system in infrastructures through careful construction of roads, roofs, stairs, and drainage channels.

Water collection and drainage concerns primarily issues related with *public space and access*, *private property*, and *drainage and hygiene*. Systems developed to collect and disperse rainwater or wastewater originated from private homes and ended up on public land, often using roads that, in addition to access, were also designed to integrate these functions. Drainage systems were also designed to prevent the damaging of neighbouring properties or the cause of nuisance to pedestrians due to the dripping of rainwater from roofs.

Sewers were not present in every town, yet there are law codes that establish principles of hygiene to be respected by privates using the public space or having houses which water dispersal system could affect the public realm.
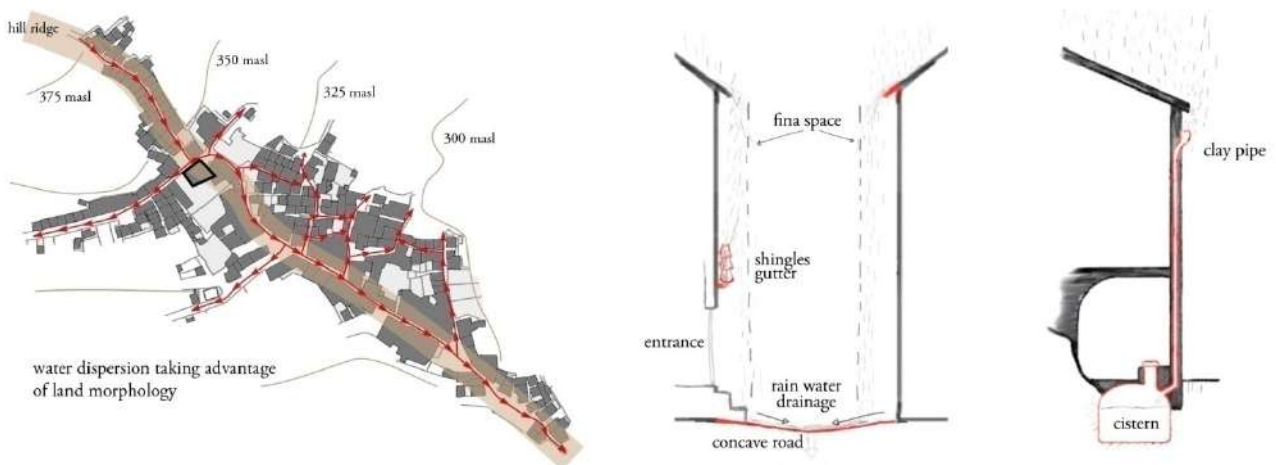
Fig. 4.29 – Water dispersion functioning, and rainwater collection. The plan refers to the town of Longobardi. The road section about how the Fina space relates with buildings elements can be considered generic and very common to all the Calabrian towns. The section showing rain water collection system is instead rare and showing a practice present only in towns that had no close water source. This is typical in monasteries. Drawings by Guglielmo Minervino

In Calabria, water supply used to come from natural springs and rivers as the foundation place of towns was carefully chosen in the proximity of a water source. Water was drawn on the place and daily carried to housing, however, some towns developed a more sophisticated system of water carriage for which channels from the water source to town fountains were built. Alternatively, or complementary, some buildings had a private system of rainwater collection storing it into underground cisterns (Fig. 4.28, 4.29). For water collection and drainage system it was used a waterproof hydraulic mortar made with a mix based of *pozzolana* dust and lime (Adam 1988). After the advent of modern infrastructures, these cisterns were filled with soil and sealed or, in the case of a very large cistern there are still used as cellar to store materials.

Water drainage at urban level was assured by the hill-top location of towns that took advantage of the natural land morphology facilitating the rapid dispersion of rainwater. Therefore, the road networks were never built in a way opposed to the natural slope of the hill, and streets were concave to assure a dry space in front of the houses (Fig. 4.28f). In case of cul-de-sacs ending on the lower side of the street, holes were left in house walls of opened underneath the buildings (Fig. 4.28g).

Water and drainage architectonic solutions integrate with the *cul-de-sacs*, *fina,* and the *gafio* pattern which is itself built in a way to allow water dispersion.

4.2.2.9 – Green spaces within the urban fabric

Fig. 4.30 – a) Belmonte Calabro town. Arrows indicate marginal green spaces conterminous with the historical center. (b) Inner green areas with various destinations. From the left: Cosenza, abandoned area; Belmonte, private relax area; Paola, private vegetable gardens; Belmonte, flowerbeds and public paths; Belmonte, private courtyard opened with opened access. Photos by Guglielmo Minervino

Centred on residential nucleolus, it is still recognisable a calabrian landscape made of concentric belts of decreasing productivity Toubert (1981). Margins of towns are frequently occupied by arboreal plantations, mostly vineyard and olives (Fig. 4.30a). Vegetable gardens occupy the areas immediate closer to towns, and insert within the urban fabric creating large courtyards surrounded by residences or small orchards in the backyards (Fig. 4.30). That strong connection between the built and not built environment is another clue of a past harmonious ecosystem between humans and nature of which, today, its functions are weaker when not obliterated.

Past generations used to produce locally most of the food they needed, and for that purpose was a common practice to preserve a piece of land close to their houses, or at the margins of the town. Today, those areas are mostly abandoned (Fig. 4.30b) or have been used to build over new residences. Yet, it is still possible today to see some of those vegetable gardens cultivated (Fig. 4.30c-f) while any use related to animals is disappeared due to modern hygienic norms.

Fig. 4.31 – In green colour, private green spaces within the urban fabric of the Belmonte Calabro historical center. Drawings by Guglielmo Minervino

Green spaces within the urban fabric concerns issues related with *land use, private property, drainage and hygiene,* and *planting.* A typical connection between housing systems and green spaces it that rainwater collected from roof was conveyed and dispersed into closer green areas. Similarly, wastewaters had to be disposed of in the green spaces owned by the house owner. Several Italian statutes were dedicated to planting issues as the concerning of branches or roots protruding in public spaces, or the minimum distances from walls to be respected for new arboreal plantations. Numerous servitudes also concerned green spaces of farming lands by establishing a variety of relationships between neighbouring owners, not only about the right of way through a property but also the right of having part of the production of a neighbour as compensation of some burden.

Green spaces within the urban fabric mostly integrate with *cul-de-sacs and courtyards* and the *water collection and drainage.*

4.3 – The Calabrian traditional building system

The historical overview (Appendix 1) and analysis of the case study (Part 4.1, 4.2) allowed recognising the elements that influenced the growth and evolution of the calabrian historical towns.

The long time cultural contamination, by various populations from Europe and Near East, produced the most significant impact on the organisation, management, and build of the calabrian urban system. This is reflected in the urban form that, as a palimpsest, constitutes a tangible proof of continuity of the traditional building system in place the Mediterranean area since the VI century and earlier. In Calabria, that building system lasted until the half of the nineties when the modern legislation left no space for the continuity of traditional practices. Today, the last traces of the old building system can be found in the urban and architectonic configuration of old cities or in the lessons of a few still living master masons.

The following graph (Fig. 4.32) summarizes the system and process of the traditional Calabrian urbanism through the elements recognised as those that influenced it the most. The description was conducted by adopting the Generative System model (fig. 2.7 in Part 2.2.1) derived from literature. The most significant result from the analysis is that components and organisation of that ancient building system can be overlapped to those of the theoretical model with a good coherence of the process linking all the components. That provides a significant evidence of the generative nature of the past traditional building system in Calabria.
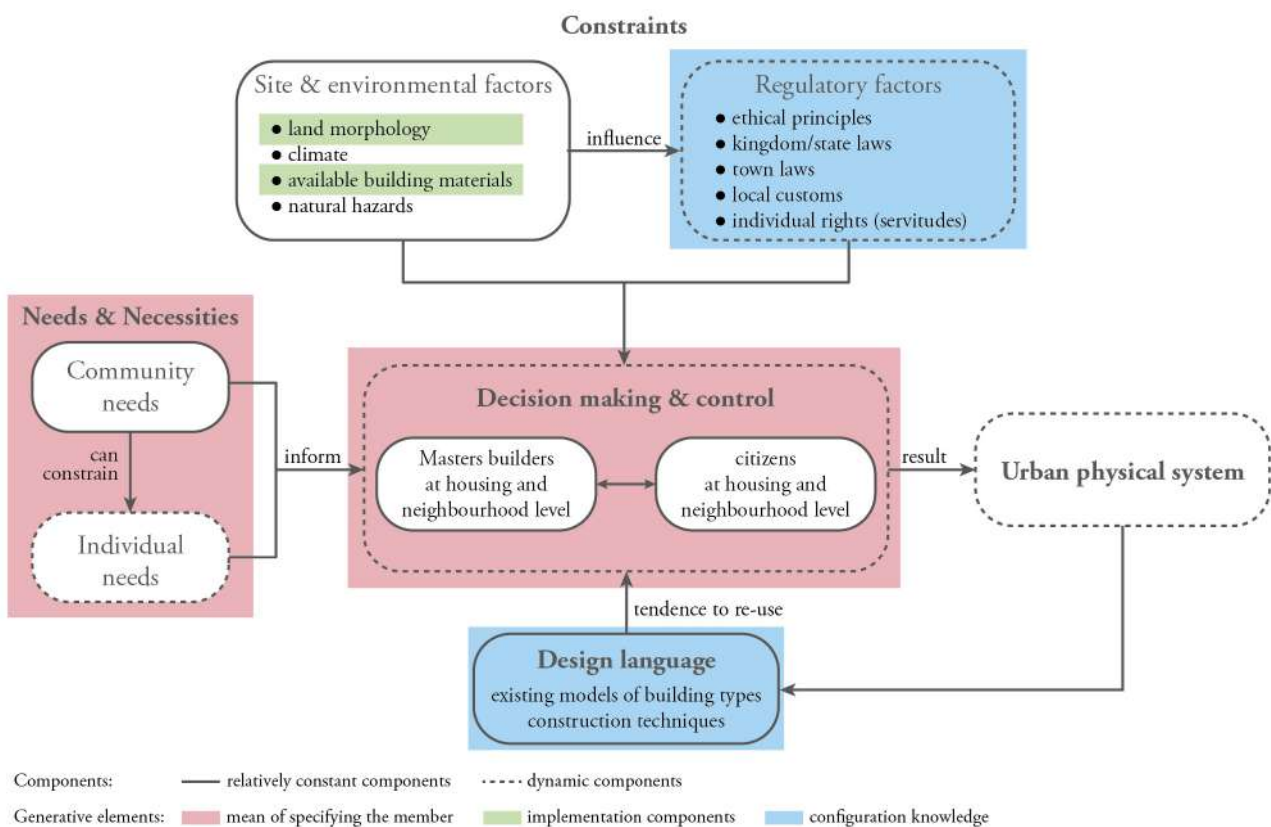

Fig. 4.32 – The traditional Calabrian building system and its generative components differentiated by colours. Drawing by Guglielmo Minervino

Components of the traditional calabrian building system and the corresponding generative elements are illustrated and commented on below.

4.3.1 – Components of the traditional calabrian building system

Needs and necessities

A typical Calabrian historical town was characterised by the existence of a strong community which used to behave as a sole individual. The historical necessity to defend themselves from outside threats (natural and from enemies) and feudal power abuses led people to develop and maintain a system where the integrity, wealthy and good functioning of the community was considered paramount. Consequently, the form of the built environment was strongly dependent form social and economic needs of their inhabitants. This strictly relationships between urban and architectural forms and people needs conferred great pragmatism to the whole building system which primarily goal can be seen as to achieve maximum efficiency with minimum costs.

Decision making and control

In order to respond to daily needs of individuals, that pragmatic process required a clear, simple, and fast decision making system. Most of the building decisions used to take place at housing and neighbourhood level between individuals who recognized as having a compact community would have allowed finding solutions in common agreement, eventually under the advice of local masters. A peer-to-peer logic of distributed responsibilities among all the inhabitants is recognisable as, apart from special, big size constructions, the building process was in the hands of citizens and local masters, custodians and mediums of a knowledge transmitted orally through the generations.

Overall, the decision-making process was a dynamic one, allowing high flexibility at micro level but within the umbrella of environmental and regulatory constrains that guarantee a macro level framework of operation.

Constraints: Regulatory factors

Day by day, local master masons meet the needs of people by recurring to architectonic solutions respectful of local meta-principles and inspired by already existing models present in the town.

The study of traditional building rules and codes shows as they originated from the need to solve specific issues between citizens, or are about specific functional purposes. In fact, codes allow flexibility and their interpretation at the local level result in various urban and architectonic solutions. Rules were also also socio-generative as they push people to interact with each other in order to address and solve issues, resulting in the creation and maintenance of good, neighbourly relations. Because those rules were understandable and enforceable by everyone, formed a fundamental tool for people to peer-to-peer build the place they were inhabiting.

The regulatory factors was relatively dynamic in the long run, mainly because of changes in the state government, although most of the foreigner feudal rulers recognized local customs and legislation already in use, evident in the statutes of the city showing a mimic practice, among cities, in their drafting. Yet meta-principles that have an ethical nature shown a strong presistence through centuries even if under different formulations that reflects the culture which adopted them.

Constraints: site and environmental factors

On the contrary of most of the regulations, the landscape and its natural agents were generally constant constraints. They influenced the building techniques since the foundation of any settlements, and drove the developing of most of the architectonic solutions which led to the definition of a local design language.

Design language

The innovation of local architectonic models happened gradually, as an adaptation to changed circumstances – cultural, regulatory and the geographical site, eventually – and under the influence of new contributions coming from foreigner cultures that settled in the area. Overall, the local design languages have seen small variations in building forms which was also due to the slow incremental growth of the urban system.

Urban physical system

The result of the traditional building process is a complex built environment that achieved a harmonious equilibrium between the physical, social, and economic city. The study of the traditional urbanism unveiled a fundamental aspect that is that urban transformation process ensured the occurring of minimum damage to pre-existing structures and their owners. That goal was achieved through a fairness regime in urban governance that envisaged a balance in the distribution of rights and responsibilities among public and private parties, and particularly between privates who were proximate to each other. This ultimately ensured an equitable equilibrium of the urban system (built and natural environment, a society that includes control and management and economic system) during the process of change and growth, and the achievement and maintenance of harmony between the rights of neighbours.

4.3.2 – Generative elements

The means of specification

(in red colour in the figure 4.32) – It corresponds to the decision making system to choose which type of building/urban structure and architectural solution to use. In traditional urbanism that role is mostly in the hands of local master masons, and architects for what concerns special buildings such as churches. They listen and interpret the needs of the client but also paying attention to respect the general constrains, including the paramount wellbeing of the community as a whole.

The implementation components

(in green colour in the figure 4.32) – Simply, they are the available building materials and, eventually, the land morphology that can be caved such as for troglodyte dwellings and low ground floors. While most of those materials were locally available and of a various qualitative range, it was not rate to import particular types of stones or artefact, especially for relevant buildings such as churches, or aristocratic residences.

The configuration knowledge

(in blue colour in the figure 4.32) – It is constituted by the set of principles, law rules, customs, and design language, including patterns, from the already existent built environment. It specifies:
  - the illegal combinations of system features (e.g. you cannot build on a public street in a way that impede the passage);
  - the default settings (e.g. the basic housing module, the housing orientation);
  - the default dependencies (e.g. a fireplace requires a chimney,
  - optimizations (achieving maximum performance, e.g. a small room for domestic animals is obtained from the space under a entrance landing with staircase);
  - construction techniques (e.g. housing corners are made of big squared cornerstones, internal walls are built of wooden structures and earth)

4.3.3 – Deriving principles for contemporary uses in Calabria

The Mediterranean urbanism was characterised by recognisable building and urban design principles traceable in several cultures that overlooked the Mediterranean Sea for centuries. The major of those cultures – Islamic, Greek, Roman, and Byzantine – had specific building systems which, however, had in common several principles (Hakim, 2014). These principles are at the base of the urban form of the Mediterranean historical settlements and are recognizable in the ancient local customs that over time have become legislative and institutionalized in legal texts and architectural treatises, allowing today for their derivation and reuse.

Principles and intentions underlying the Mediterranean traditional building systems can be read hierarchically by importance. Initial positions are occupied by principles common to most of the cultures such as the "right to act freely within an own property" as long as outcomes of actions do not harm another person or property. As we proceed through principles, those gradually differentiate reflecting high responsiveness to local contexts (geography, culture and society organisation, including religious prescriptions, climate, building materials etc.). For example, the "respect of pre-existing neighbouring conditions" takes the local form of "not preventing a neighbour of its view of the sea" in towns located on a maritime coast.

This chapter highlights the principles and intentions underlying the traditional building system in Calabria as an intermediate step toward the development of a Generic Generative Program Model for purposes of contemporary urban regeneration in Calabria. An initial operative list of principles to analyse the Calabrian sources was formed from those identified in precedent studies (Hakim, 2007, 2008a, pp. 19-22, 2014, pp. 96-98), then, principles were revised on the base of information derived from local text sources an analysis of the urban form of historical Calabrian towns. The following is the description of eleven principles and intentions in vogue in Calabria before the end of the XIX century, listed from those underlying urban-scale and community matters to those related to specific situation and architectonic elements. The list is kept short to facilitate the interpretation of sources and the verification of principles in the built environment, also for the purpose of generalisation.

- *Freedom to act within its property*: the basis for action is the freedom to act within one's property;

- *Prevention of Harm*: acts shall not generate harm to others and their related properties;

- *Interdependence*: the freedom to act within its property is constrained by the rights of immediate neighbours and the community;

- *Rights of original (or earlier) usage*: recognisance and respect the rights of pre-existing conditions of neighbouring properties, neighbours' rights of servitude, and other rights associated with ownership for a specific period of time such as the right of views of the sea;

- *Respect for the property of others*: respect the property of others by not debasing their social and economic integrity, such as with acts, nuisance, and other harmful behaviours;

- *Privacy*: respect the privacy of others[6];

- *Compensation*: the debase of another property due to irresponsible actions or a burden on it from natural circumstances shall be proportionally compensated;

- *Respect of the public realm*: preserving the built environment clean and in good condition, including safeguarding the right of way by not obstructing or occupying public thoroughfares in a way impeding the passage;

- *Shared responsibilities on the maintenance of the public built environment*: private responsibilities for keeping clean and maintenance of the public urban environment directly in contact with ones property;

- *Pre-emption*: Right of having the first option to purchase a property when offered for sale by a family member, a partner or someone from the same community (town).

  – *Servitudes can derogate rights*: servitudes is an accepted way to regulate derogation of rights and principles on special cases; Servitudes are outcomes of the principle of interdependence.

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[6] Family privacy in old Calabria was a small problem since most of the inhabitants were linked to each other by family relationships, thus forming a strong community. Therefore, cases like overlooking within the private domain were frequent and even considered positively as increasing the chances of being rescued in case of need. Similarly, the entrances were left open or allowing to be opened from outside.

4.4 – Presenting a Generic Generative Program for urban regeneration of historical settlements

4.4.1 – The Generic Generative Program for urban regeneration of historical settlements in the Calabria region

This chapter will present a prototype of Generic Generative Program for urban regeneration in historical Calabrian settlements and heritage districts. The program is intended "to deal with change in the built environment by ensuring that minimum damage occurs to pre-existing structures and their owners" (Hakim 2014, p. 97). This ultimately ensured an equitable equilibrium of the urban system (built and natural environment, a society that includes control and management and economic system) during the process of change and growth, and the achievement and maintenance of harmony between the rights of neighbours. The establishing of a urban transformation system and process able to ensure again this equitable equilibrium is the main goal of any type of Generative Program for urban transformation in general, and regeneration initiatives in particular.

Knowing the Calabrian regional building system it is now possible to outline the Program that can be further developed later accordingly with local circumstances. The Program is articulated through the five components already introduced in the theoretical background of the research (Part. 2) and ascribable to Hakim (2007) which developed them referring in general to the generative systems in vogue in the Mediterranean area. Their contents are customised on the base of the findings of the research and on the consideration of the peculiar aspects of the Calabria and the Italian society and administrative framework.

Meta-principles

Meta-principles, including ethical, will inspire the urban governance and any building norms, working as an umbrella for any decision-making activity (Fig. 2.6). Those principles are derived from the history, thus, the list is a revised version the principles derived from the traditional building system (Part 4.3). Those have been integrated and selected in order to find coherence with the contemporary Italian and Calabrian society and legislative system where to be applied.

Most of the European countries present some fundamental principles as part of their constitution, such as Italy which has 12 principles under the form of articles of its constitution. As primary legislative source currently in vogue in Calabria, the Italian constitution was consulted. The article 9 of resulted relevant for this study as says that the Republic "protects the landscape and the historical and artistic heritage of the nation" (Costituzione Italiana, art. 9). The article 9 inspired the introduction in the list of meta-principles the one named "Heritage has to be protected". The author considered necessary that introduction in addition to the historical principles as it not only is already present in the legislative framework, that must be respected by any building activity, but also, reflects a contemporary necessity that was not present in the past and it is ascribable to a different culture and consideration of the local assets.

1. ***Community wellbeing has to be safeguarded:*** good intentions are the basis for maintaining the integrity of the community;

2. ***Heritage has to be protected:*** the authenticity of the built environment must be safeguarded by following the ethical norm of "Beauty without Arrogance"[7];

3. ***Freedom to act within its property***: the basis for action is the freedom to act within one's property constrained by the rights of immediate neighbours and the community;

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[7] That principle is primarily derived from the in vogue Italian Constitution. It is very coherent with the past traditional building system that paid attention to aesthetics and safeguard of the whole built environment considered a community asset.

4. ***Prevention of Harm***: acts shall not generate harm to others and their related properties; respect the property of others by not debasing their social and economic integrity, such as with acts, nuisance, and other harmful behaviours; if more than one damage should occur then accept the lesser, if no other option is practicable;

5. ***Prevention from natural calamities***: building acts shall pay attention to local environmental conditions and safeguard from natural hazards in order to minimize risks for themselves and the community[8];

6. ***Rights of original (or earlier) usage***: recognisance and respect the rights of pre-existing conditions of neighbouring properties, neighbours' rights of servitude, and other rights associated with ownership for a specific period of time such as the right of views of the sea and landscape;

7. ***Privacy***: respect the privacy of others[9];

8. ***Compensation***: the debase of another property due to irresponsible actions or a burden on it from natural circumstances shall be proportionally compensated[10];

9. ***Respect of the public realm***: preserving the built environment clean and in good condition, including safeguarding the right of way by not obstructing or occupying public thoroughfares in a way impeding the passage;

10. ***Shared responsibilities on the maintenance of the public built environment***: privates and public responsibilities shall be equally allocated for achieving maximum benefit and minimum effort on public realm management;

11. ***Servitudes can derogate rights***: servitudes is an accepted way to regulate derogation of rights and principles on special cases;

Private and public rights are fairly and equitably exercised

In ancient Italian communities, most of the decisions affecting the built environment were made by the inhabitants at level of neighbourhood. This allowed the functioning of generative bottom-up decision-making mechanisms. Today, the society, and the public sector especially, is organised more hierarchically, and the private sector is made not only of individuals but also of profit and non profit organisations (investment groups, various size firms, formal and informal associations, etc.). That difference from the past makes even more necessary to avoid confusions about the public and private roles in order to prevent conflicts and distortion of the rules. Therefore, the following indications aims at establishing simple but clear rights about the management and transformation of the built environment in a way that is understandable by all the stakeholders.

Private rights

– The right of fully utilize of one's property, including the right to increase useable areas 1) horizontally, also over the public domain without hindering the existing right of way and obstructing the traffic; 2) vertically, within stipulated local restrictions. Any expansion must respect antiseismic norms and not debase the structural stability of the building;

– Right to build in adherence to the walls of other properties, implying the establishment of a servitude. This also implies the right of those who own a building to decide, at the time of construction of this, on which façade of the building allow the construction in adherence by someone else. Building in adherence

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[8] That principle is introduced due to the sensible exposure to natural hazards of the Calabrian region

[9] Although in historical Calabria that principle was little applyed (Part 3.3), privacy is today a widespread necessity, therefore it is heare considered.

[10] Compensation is defined through agreements between privates. It may concern products, servitudes or other exceptions relating to their private properties.

must safeguard the structural stability of all buildings interested by the new construction and respect antiseismic norms;

- Rights of original and earlier usage. Any building acts have to take into account existing conditions. The local ecological system has to be also taken into account assuring to not debase its functionality;
- Subject to the existing conditions, privacy rights must be protected and maintained;
- Right for using a part or all of one's property for generating income, provided such use does not create damage to the neighbourhood;
- Right for technologically improving its own property by adding new systems and devices, including adaptation of the built forms if necessary;
- Civic uses: rights of using natural resources from specific areas established by the public authority;
- Rights of participating and contributing to decisions concerning the community and its built environment.

Public rights
- Right to establish a circulatory order for vehicular traffic, including its prevention;
- Right of building and change public infrastructures, including their update with new technologies;
- Rights of decision about aspects regarding public facilities;
- Right of establishing minimum performance to be achieved by building activities;
- Right of establishing restrictions on uses causing harm;
- Right of establishing, in agreement with the community, control and management systems and procedures;
- Right of acquiring the abandoned private properties and reintroduce them in the socio-economic system.

Private and public responsibilities are properly allocated and implemented

This aspect is even more relevant today because, in Italy, local governance authorities are seen as the only one appointed to intervene on the public environment. Despite the legislation clearly establishes the duty of private subjects regarding the maintenance of a decorous urban environment, their behaviour is not always in line with it. Moreover, from the side of the public it encounters significant difficulties in managing properly the today vast built environment. The establishing of ethical principles and norms concerning the sharing of responsibilities between public and private is therefore very relevant for achieving effective and efficient urban governance.

Responsibilities of private citizens and institutions
- Individual and families are responsible to maintain peace and tranquillity with their surrounding neighbours.
- Responsibilities for keeping clean and conduct ordinary maintenance of the public urban environment directly in contact with ones property against the benefit of its utilisation for a space that is the *Fina* related to that building[11].
- Informing the public authorities of any issues concerning the public realm. Technologic support can be implemented[12].
- Responsibility of constituting and electing a body of representativeness of the local community;
- Responsibility of proposing and promoting initiatives and project for the improvement of their inhabiting urban system;

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[11] The Fina is a longitudinal space along the exterior wall of buildings about one meter wide (Part 4.2.2.2)

[12] On that aspect, there are already developed several initiatives taking advantage of ICT. As an example the Italian App "Decorourbano" (www.decorourbano.org) and the Boston's government "BOS:311" App. (www.boston.gov/departments/new-urban-mechanics/bos311-app). Both empower citizens to help take of their communities.

Responsibilities of public authorities
- Protecting the rights of the public;
- Building and maintaining public infrastructures in a good state, insuring that the public realm is always kept safe;
- Protecting the integrity of local customs, that are related to change and growth in the built environment, by establishing an handy, clear and transparent regulatory framework based on performances, addressing eventual restrictions, and providing a local design language database;
- Establishing a participatory, clear decision-making mechanism for control and management able to resolving problems and disputes that may arise between property owners;
- Allowing the creation and providing regulation for civil society institutions with representative functions;
- Responsibility of proposing and promoting initiatives and project for the improvement of the urban system wellbeing;

Decision-making system, Control and Management

The study of the historical background, the built environment, and old regulations showed as the traditional building system was based on a bottom-up dynamic decision making system. It allowed control and management activities relying on peer-to-peer feedbacks between citizens, community, and master builders, constrained by site, environmental, and regulatory factors (Fig. 4.32).

Today, it is advisable to reintroduce this type of control and management mechanisms that must rely and be coherent with the meta-principles and the other regulative components. Control and management activities require specific figures to which resort in case of doubts about what to do, and to resolve divergences between inhabitants. That arbitrator role might be covered by local individuals or organisations, it must have legitimacy, and be recognised by present and future citizens living in the area. That role can be covered by a public official or by a third part individual, or a group, that is identified by a participatory process. Ideally a council/committee of neighbourhood representatives and representatives from the public side together should select the Arbitrator responding to certain characteristics to be established by a specific regulation, eventually introduced in the municipal statute.

In contemporary societies this role can be take advantage of the presence of various professional organisations and institutions such as the one of architects or engineers, also universities. For the evaluation of large urban regeneration projects, it is advisable the establishment of a third parties Office with representatives of the local government, the local community, and independent figures from professional and educational institutions.

In any case, one or more technical figures should be identified to cover a permanent role of controller and arbitrator for the area interested by the generative program. The Arbitrator primary responsibility would be to liaise between neighbourhoods and the municipal authority to maintain a healthy generative process controlled by the people, i.e. keeping it a bottom-up system. The Arbitrator will also be responsible for ensuring that all parts of a generative program function properly, and that the rights and responsibilities of private and public parties are respected. Finally, a consultant activity for local inhabitants should also be in the duty of the Arbitrator.

Efforts in that direction are already existent. In 2015, in Italy, an interesting proposal that is not distant from the figure of the arbitrator was expressed by the municipality of Reggio Emilia city. It envisaged the introduction of the *architetto di quartiere* (neighbourhood architect), a public side figure with the role of strengthen the system of relations present in the neighbourhoods between the Municipality, the associations, the volunteers and the

citizens through practices of co-design[13]. The neighbourhood architect has the task of dealing with various issues concerning the care of the city and the community: from the regeneration of places to the planning of events, activities and services, to increase opportunities for people and improve urban quality.

From that view, the role of the classical architect or urban planner becomes a facilitator of community-based decision processes (Innes 1996, 1997), and negotiators to forge agreement between two or more parties (Susskind and Ozawa 1984).

– The decision-making system acts under the umbrella of meta-principles and guarantees their respect. It ensures that private and public rights are are not hindered, and that private and public responsibilities exercised.

– The decision-making system and control should be based at level of municipality with eventual articulations at level of neighbourhood if necessary, and must be legitimised by the inhabitant. On that aspect an articulate proposal is reported in Part 4.4.

– The introduction of one or more figures with the role of arbitrators. They should be selected through a public call and in agreement between representatives. The Arbitrators must demonstrate technical knowledge and capabilities about the local generative system (principles, regulations, stakeholders, decision-making system, history, and site environmental characteristics). The Arbitrator primary responsibility is to liaise between neighbourhoods and the municipal authority to maintain a healthy generative bottom-up process. It is also responsible for ensuring that all parts of a generative program function properly.

– Each neighbourhood should be represented by its own institution made of a body of representatives[14]. The Committee has a role in the local urban governance through the decision making and control system. It has multiple roles:

  – as auditor of the local community and individuals;

  – as ambassador to the public authority of requests coming from the civil society;

  – as representative of the civil society in urban governance decisions;

  – as a promoter of initiatives for the improving of the urban system wellbeing;

  – as first consultant for solving issues between inhabitants about urban transformation matters;

Rules and codes

Rules and codes are an essential component of a generative system as assures the existence of clear indications to be followed during the process urban transformation, and for resolving decision making eventual conflicts between involved parts concerning building and management activities. A number of rules and codes should be derived from the study of the historical background, the built environment, and old regulations if any. New rules can be established accordingly with ethical principles.

Rules under the form of texts can be combined with illustrative drawings that facilitate their understanding, keeping attention that drawings will not imply prescriptions for codes that are intended to be proscriptive.

Rules for the Calabria region should be defined by the following indications:

- Rules and codes must be compatible with the ethical principles;
- They have to be coherent, thus allowing the exercise of rights and responsibilities of private and public parties;
- Rules and codes have to be socially and technically viable;

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[13] Details of the proposal are available at the Reggio Emilia municipality website.
https://www.comune.re.it/retecivica/urp/retecivi.nsf/PESDocumentID/BDAAA6C4203BB895C1257DF7003941BD?opendocument

[14] In Italy, the discipline of the Committees is contained in articles 39 to 42 of the Civil Code.

- Their nature should be proscriptive as much as possible, therefore opened for interpretation to local conditions;
- They have to address the implementation of modern technologies;
- Their text should be accompanied by illustration any time it is possible and useful.
- When possible, they should be derived from history and the historical built environment following the principles of the more it is proximate the better it is. Rules and codes can be readapted to contemporary necessities.

From the analysis of the case study (history, documents, and the built environment of historical centres) the following list of subjects should be applied. For each subject specific rules has to be established at level of town.
- Land Use
- Public space and accesses
- Houses
- Private Property
- Light & Views
- Overlooking
- Walls, stairs, beams, and roofs
- Drainage & hygiene
- Planting

Here, the author preferred not to give in to the temptation of entering in the specificity of each subject because the Calabrian region is too various between the south and the north, and the eastern and western side, even more between internal and coastal areas (d'Orsi Villani and Rossi-Doria 1984; Appendix 1). Accordingly, historical towns varied so much so that by establishing a rule at level of region would have been simply useless as might result coherent for towns in a specific area but totally unfitting towns from other areas. Therefore, this work has to be done at level of town.

However, the Appendix 2 and its rules analysis in Appendix 3 provide examples of rules and codes in vogue in Calabria for specific towns corresponding to their relative sources. They can be redeveloped for application to a specific town after a study of local town history, built environment, and eventual documents if existing.

4.4.2 – Critical aspects on how to foster today a Generative Program for Urban Regeneration.

A generative program for urban regeneration is in relationship with the urban governance system in vogue in the targeted place. The today way of building and transforming cities is distant from a model of urban governance allowing the existence of a generative process, yet there are situation where an attempt to reintroduce generative elements in the building system is more likely to have success. Here, it is proposed a gradual reintroduction of generative aspects in urban governance regulations by starting with pilot projects in small targeted areas.

Following are presented four key aspects to be considered for fostering generative programs for urban regeneration:
- Innovation of local administrative institutions;
- Revision of urban planning tools;
- Social innovation as a drive to encourage the adoption of generative programs for urban regeneration in historical centres;
- Locally developing research and education to understand, preserve, and reuse local knowledge.

4.4.2.1 – Innovation of local administrative institutions[15]

The adoption of a generative program would benefit from a revision of the local urban governance system that should embrace generative aspects (Part 2.2). The first innovation to be introduced is a change in the structure of local public institution allowing the functioning of new mechanism of decision-making, control and management, more responsive of bottom-up initiatives and request from the civil society.

The local public authority will be enhanced from the establishing of an Innovation Office appointed of dealing with various issues concerning the care of the city and the community, including overseeing urban transformations. The structure of the Office, its organisation and relationship with the public and private sector can take inspiration from the Boston model known as New Urban Mechanics (Part 2.1.3.1) of which it is outlined here its internal organisation.

The characteristic of the MONUM that here is relevant for introducing and fostering generative programs for urban regeneration is represented by the organizational change in the public sector structure as the MONUM agency is hierarchically directly dependent from the Mayor, and has a horizontal collaborative approach ensuring legitimacy and authority to the agency (Fig. 4.33).

The peculiarity of the Office is its hybrid nature, made of public responsiveness toward the civil society but operating through methods and techniques usually ascribable to private sector organizations. The Office of New Urban Mechanics has a traditional hierarchical organization only internally, where the team reports to two Co-Chairs which are in direct contact with the Mayor's staff and the Mayor itself who see them weekly. On the contrary, the approach to work, and members' duties within the Office are more flexible: people are free to pursue whatever they consider relevant for the cause of producing evidences for public policies, be creative, and meet other people, always within the law and the typical parameters of a public agency. Although people do not have strong directives, first and foremost, they have to meet the mayoral priorities, yet they are free to do that in the way they prefer. Failing, that implies using economic and material resources, is also allowed as part of the learning process and knowledge building; this is one of the major differences from a traditional agency that usually operates on a safe ground, and that allows for experimentation such as the testing of a generative program prototype.

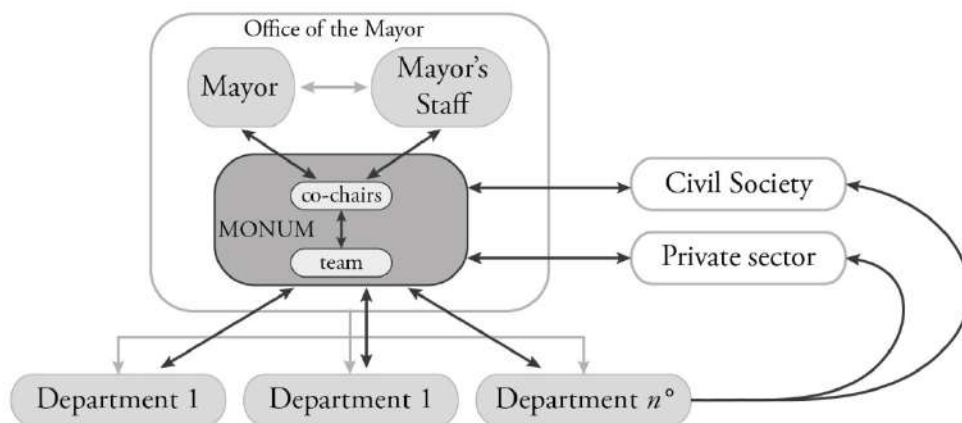Fig. 4.33 – The city of Boston's administrative organization after the establishment of the MONUM agency. Drawing by Guglielmo Minervino.

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[15] That essay is based on research conduct by the author, Guglielmo Minervino, during his one year PhD visiting at the Northeastern University of Boston in 2017.

Overall, the Office will operate at the boundaries between the public sector, the private sector and the civil society in order to get more opportunity to find cooperation and agreements around relevant urban governance topics (Murray et al. 2010; Nicholls & Murdock 2012; Nicholls et al. 2015). In this tripartite relationship the Office would be a central actor guarantor of the respect of ethical values under the form of meta-principles which presence increases the responsiveness from the public side toward the civil society (Vigoda-Gadot, Shoham, Schwabsky, Ruvio 2008). The presence of such ethical values in the Boston model represents an important coincidence with the ethical principles that underlined the old urban governance in vogue between the XII and the XIX century in Italy. On those ethical values, a fundamental aspect of innovations in the public sector refers to the "logic of appropriateness", meaning the consideration of local specificities of the context in which the governments operates (March & Olsen 1989). The main value this type of innovation has to take into account is the responsiveness, which can be guaranteed if: i) the innovation is legitimate and politically sustainable (Moore 1995); ii) refers to democratic values considered important from citizens, such as accessibility, participation, empowerment, transparency, accountability and equality (Bason 2010); iii) its results addressing citizens needs (Vigoda-Gadot, Shoham, Schwabsky, Ruvio 2008).

Local Innovation Office

On the base of the Boston case, for the Italian society it is proposed the introduction of a local innovation office (Fig. 4.34) as following:

The public authority has to establish an Innovation Office or restructuring an existing one with role of dealing with various issues concerning the care of the city and the community, including overseeing urban transformations. It should acts:

– as a promoter in case of complex initiatives such as projects largely interesting the urban system and of not immediately application;

– as a consultant and arbitrator under request of private individuals or institution for solving specific issues;

– other roles can be the planning of events, activities and services, to increase opportunities for people and improve urban quality.

The Office should be made of components from the public institutional body (not politicians), representatives of the civil society (from neighbourhood committees if present) and one or more arbitrators to be selected through a public call and in agreement between representatives.

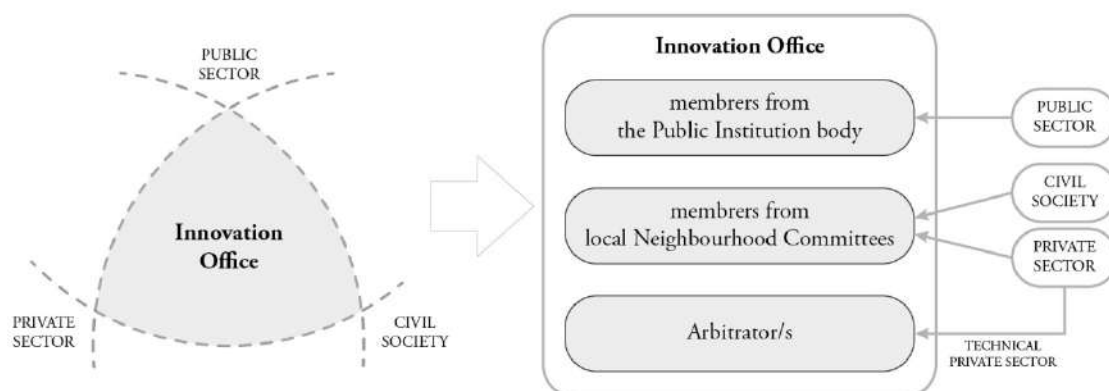Fig. 4.34 – A possible structure of the Innovation Office, based on the Boston's Mayor Office of New Urban Mechanics (Part 2.1.3.1). Drawing by Guglielmo Minervino

4.4.2.2 – Revision of urban planning tools

Once a generative program is ready, it has to be integrated with the in vogue urban planning tools that can be just revised, by integrating mechanisms of the program and its components, or substantially reformed if very

distant from generative aspects. A generative program can also be adopted as it is and constitute a separate urban governance tool, however it has not to be in contrast with other in vogue panning tools. Whichever is the case, a general screening of in vogue urban regulations, tools, and process has to be carried out for understanding what needs to be changed.

About the Italian context, three are the main regulatory tools that shall be modified as consequence of the adoption of a generative program for urban regeneration.

- **The Municipality statute** – In the case of structural change in the municipality organization required for the functioning of generative program mechanisms, this must be indicated in the norm regulating the office of municipal agencies and services. Similarly, the norms about municipal public goods (real estate and public spaces) shall open to the possibility of allocating shared responsibilities between the public and the private on the management of the built environment. Finally, the statute's chapter about relations with the local community has to be checked to verify if all the mechanisms envisaged by the generative program are compatible with the in vogue regulations. In the case of negative result, necessary measures have to be taken to modify the statute[16].

- **The urban planning Municipal Structural Plan (Piano Strutturale Comunale) and sub-plans** – Regarding the ways of intervention within the heritage districts, those are defined by technical norms that couples with the Plan. As the generative program is meant for heritage districts only, it is not necessary to modify the zoning map that in Italy already accounts for the identification of historical areas and sole buildings, even if they are not continuous each other. Special plans and programs corresponding to specific areas can also be envisaged, such as for the Recovery Plan of the Historic Center: this is where to intervene by including norms that allows for the functioning of a generative program.

- **Built environment regulations** – In Italy the regulation that is more in continuity with the past building system is the Regolamento dell'ornato (ornate regulation document). If the ornate regulation is not present (not even as part of the technical norms of the Municipal Structural Plan), it shall be developed as main referencing document for the aesthetic of the built environment. It describes the local design language, including urban and architectonic patterns. It would work as the "library" to which any citizen and building firm must refer for decision making building activity within a heritage district. Sometime, the ornate regulation has been substituted with the *Piano del colore* (plan of color) or the *Piano del decoro urbano* "plan of urban decorum" that address similar aspects. All of these planning tools are not mandatory and left to the will of local government. This can be seen as an advantage for the introduction of a generative program because part of its components (particularly rules and codes) can be embedded in these documents that become drivers already envisaged by the State law framework.

4.4.2.3 – Social innovation as a drive to encourage the adoption of generative programs for urban regeneration in historical centres

The beginning of the 21st century has seen an increasing number of people committed to investing themselves and their resources in the effort of activating innovative processes of development based on networks of people operating on common agendas, mainly improving the well-being of society by addressing people needs (OECD 2011; Nicholls, Simon, & Gabriel 2015). Those processes originated firstly from grassroots initiatives of social innovation. These initiatives are usually led by organizations of the civil society which produce solutions in unconventional settings through atypical combinations of people, ideas and tools, mobilizing resources and knowledge around local issues (Gupta et al. 2003; Seyfang & Smith 2007; Smith et al. 2017). Members of those

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[16] In the knowledge of the author, aspects about the relations of the Italian Municipality with the local community are already coherent with the necessity of adopting a generative program.

initiatives use their creativity to find new solutions by relying on local assets, including natural resources (ISTAT 2012). Fressoli and others (2014) argued that the encounter of grassroots innovative organizations (civil society) with mainstream institutions, both public, and private, can lead to the development of new models of inclusion and knowledge production based on innovation that modern science, technology and innovation institutions actually struggle to recognize.

Such a new tripartite regime in the urban governance rely mostly on social innovation that is referred to as the participation process and relative outcomes that support social progress, leading to systemic improvements in the dynamic of the urban system (MacCallum et al. 2009; Moulaert et al. 2005). Outcomes of the process are products, services, procedures, policies, designs and models that simultaneously meet social needs and create new collaborative relationships (Westley, Zimmerman & Patton 2006; Mulgan et al. 2007; European Commission 2010; Murray, Calulier-Grice & Mulgan 2010; Terstriep & Totterdill 2014). In fact, the main characteristic of social innovation is an horizontal relationship-based approach at problem-solving, producing solutions that reveal to be better than existing ones regarding effectiveness, efficiency, and sustainability for which the value created impacts the society systemically (Phills, Deiglmeier, & Miller 2008). Social innovation practices recognize the importance of building relationships, and they do that through a strong ICT-supported networking activity that is seen crucial to produce and spread information and knowledge across members and groups (Caperna, Giangrande & Mortola 2005; Bazurli et. al 2014; De Rosa 2017; Ogawa, Yuhashi & Nishigaki 2017).

In Italy, social innovation has roots in a long-time tradition of active citizenship. This term refers to the set of self-organization forms that involve the exercise of powers and responsibilities in public policy to make effective rights, protect common goods, and support vulnerable people (Moro 2015). The principle underlying active citizenship is contained in the Italian Constitution, which declares that "The state, regions, provinces, and metropolitan cities promote the autonomous initiatives of citizens, individually and associated, in performing activities of general interest, by subsidiarity" (Costituzione Italiana, art. 118). Also, "the Republic recognizes the social function of cooperation of a mutual nature and without the purpose of private speculation [...]" (Costituzione Italiana, art. 45)

The dimension of the Italian active citizenship can be appreciated by looking at the third sector, as most of these citizens decide to self-organize into the form of nonprofit associations. The last Italian census reported that in 2011 there were 301,191 active nonprofit institutions, included the associations, a growth of 28% in 10 years. The nonprofit sector represents 6.4% of all Italian economic activities with 4.7 million voluntary workers, which is 83.3% of the total of human resources involved the sector. In Italy, the third sector is the first productive reality in the industries of social assistance, cultural activities, sport, entertainment, and leisure (ISTAT 2012).

A large number of social innovation initiatives aim to revitalize the historical centers, or at least make an impact that will benefit those heritage neighborhoods and their communities. This purpose can be found in manifestoes, statutes, or just documents of intention of a number of initiatives.

For example, in Calabria, the mission statement of *Belmonte in Rete* is "we work for the sustainable development of the historical center of Belmonte Calabro" (Belmonte in Rete). Furthermore, they see "the citizen as an active agent, a creator of processes, physical, and digital places, and networks. The only one who is capable of fostering the transition from a development model based on pure economic growth toward one based on sustainability. The ambition is to build an urban organism more adaptive to local conditions, thus able to achieve more resilient performance and better life prospects for its inhabitants" (Fig. 4.35) (www.belmonteinrete.flazio.com). *Belmonte In Rete* was born with the first goal of building a shared Vision of Belmonte Calabro that images the town over the next 20 years, capable of inspiring all its inhabitants and all those who want to contribute to the development of Belmonte (Belmonte In Rete).

Fig. 4.35 – Examples of activities organised by *Belmonte In Rete*. From the left: recovery of the sole survived room of the castle (Photo by Michela Cannizzaro); a moment from an initiative for building a perceptive map of the historical centre with citizens; young students visiting an ancient watermill at the outskirt of the historical centre. Photos by Guglielmo Minervino

In Jacurso, a less than 630 inhabitant's historical village in Calabria, the initiative *Jacurso da Vivere e Imparare* (Jacurso to live and learn) seeks to record and safeguard aspects of the traditional life in reaction to the globalization effects that could erase them. They aim to restart the life of the small community through sustainable tourism based on participation, offering a full immersion through workshops, Italian language classes, guided tours with an anthropologist and contact with the local community daily life (www.jacursodavivereeimparare.it).

Another example from the South of Italy is the case of Pisticci town, a historical hill-town in the Basilicata region, headquarter of the *Imbianchini di Bellezza* (beauty painters). It is an initiative from 2014 when, in reaction to the state of abandon of their historical center, young citizens decided to paint the houses facades with whitewash (Fig. 4.36). The group grew fast and started to make a variety of actions under the topic of urban regeneration. They now organize activities direct to "propose a model of territorial development that can combine the listening of the citizen by the public administration and the needs of the community" (Imbianchini di Bellezza).

Fig. 4.36 – People painting old houses with whitewash in Pisticci. Photos from https://www.facebook.com/imbianchinidibellezza

In Sicily, the *Farm Cultural Park* is an independent cultural center with a strong focus on contemporary art and innovation. Located in the heart of the old town of Favara, it has acquired some of the abandoned houses and

transformed them into contemporary art exhibitions, meeting spaces, open kitchens for workshops and lunches, cocktail bars, and vintage shops (Consiglio and Riitano 2015, www.farmculturalpark.com).

An example from central Italy is the case of the village of Artena, close to Rome. The inhabitants of the half-abandoned historical centre occasionally take care of the maintenance and refurbishment of many small public spaces, they collect money to buy street furniture and to repair public fountains (Fig 4.37). They also organize open events on a range of topics related to their town characteristics. The activities are organized by a local neighbourhood committee born in 2014 with the purpose of promoting projects and initiatives aimed at improving the quality of life of the residents of the historical centre of Artena (Comitato Centro Storico Artena).

Fig. 4.37 – Inhabitants of the historical centre of Artena doing the refurbishment of some blighted area. Photos by Guglielmo Minervino

That type of initiatives testifies the urgency of modify the actual model of urban planning. Civil society is responding with alternative regenerative practices of revival of heritage areas. People challenge social and environmental issues by dealing with their surrounding abandoned assets, taking care of them and bringing them into a new economic and social dynamic, often by empowering local communities (Smith et al. 2015)

For urban governance purposes, social innovation offers a way to a model of management that is based on subsidiary and cooperation principles. At least, a part of the public and private heritage could be maintained by local citizens and put into an economically sustainable dynamic of asset management, without the necessity to recur to external funds (Consiglio and Riitano 2015). The new approaches to enhance public assets by supporting grassroots participation have achieved success under certain conditions, such as "the presence of a community capable of self-organized processes, the location of the buildings in urban centres, specific building characteristics in terms of type and state of preservation, the presence of a party — other than the public administration — with the ability to independently assume a managerial role in the activities promoted, and a flexible legal relationship between the administration and private parties" (Mangialardo and Micelli 2017).

Finally, the way people act and decide what to do presents generative aspects very similar to those underlying the traditional building system that gave origin to their towns. These observations suggest that the introduction of a generative program in these environments would likely encounter few difficulties respect a place where social networks and cooperation dynamics have to be built from zero. However, any experimentation shall be conducted along with an informative and educative program that aims at explain the overall topic and benefits of adopting a generative process and program. In conclusion, it is advisable that a generative program takes in account to develop mechanisms able to engage with local grassroots initiatives, if any. Moreover, it is also desirable the study and implementation by local and regional level governments of any strategy and action fostering the social innovation phenomena, especially if ties with the built heritage.

4.4.2.4 – Locally developing research and education to understand, preserve, and reuse local knowledge

The first problem hindering a return of a generative program is about citizen education, and labour force technical preparation. They should at least have a basic awareness of the context where they operate, meaning the local design language and history. Traditional building rules and customs are still present in the knowledge of elders, yet it is rapidly destined to disappear along with their passing away. It is needed a sincere operation of collection and safeguarding of such knowledge that is also at the base of the developing of a generative program. The question to who shall conduct such an educative-training activity has to be clarified.

The role of public school in educating new generation is a crucial aspect in Italy where in 2014/2015 the school system consisted of 88.6% of state schools, with a catchment area of almost 7 million students (95% of the total number of students) (ISTAT 2017). The large catchment area of the public school in Italy offers an interesting possibility to introduce complementary educative projects on the discovery of the local heritage, accordingly with the Italian legislative framework that allows for proposal of special formative projects to be done during the school year. Another audience that shall be engaged is the one made of technicians, public sector employees, and third sector organization leaders. In Italy there are several bodies that operate in the field of training and education. Valuable ones are the architecture and engineering associations, formally recognized by the Italian state, and that are capillary present in each Italian province. Others interesting operators in the field of training and education are the *Enti di Formazione* (Training Institutions or Agency), and simple nonprofit association that mostly activate short time courses on subjects pertinent with their statutory scopes.

An example of case of education and training regarding urbanism is here briefly described.

The case saw the collaboration among a private nonprofit association named International Society of Biourbanism (the promoter), the local administration of the city of Artena (Rome), and the Ordine degli Architetti di Roma (the Architecture Institute of Rome). That case is even more relevant for that research as its formative offer contained a class on generative process and programs for heritage preservation and transformation. The author took part as a student to two of the three summer schools occurred in 2012, 2013 and 2014[17].

The summer schools were held in the historical centre of Artena, a little town dating back to the 13th century and placed on a hill top at 40 km South of Rome. For three years, the summer school hosted roughly 25 participants per year and from various countries and work field (architects, designers, engineers, psychologists, social scientists, and policy makers). The program offered seven full days of lectures, practical workshops, and design studios with international experts for exploring how to design urban environments able to revive, support, nourish, and enhance sociality and human relationships (Fig. 4.38). The choose of an historical town as place for education allowed the experience and testing on-site of theories about Biourbanism, complex systems, generative systems and traditional building rules, pattern language, and sociogenesis[18].

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[17] A video storytelling of the second summer school is available in english at https://www.youtube.com/watch?v=A8Mss8mNiXk

[18] A full description of the summer schools can be found at www.biourbanism.org/summer-school-in-neuroergonomics-and-urban-design/

Figure 4.38 – Collage of photos from the ISB summer school in 2013. Photos by Guglielmo Minervino

The summer school initiative fostered a spin-off project around which a small group of citizen and technicians gathered together. It was a five years participative strategic design project for the revival of the historical centre of Artena (Rome), under the guide of the Society of Biourbanism. The project named Progetto Artena was at the same time a research aiming to prototype a model of development process for similar historical towns (www.progettoartena.com). After more than 80 initiatives carried out within the project, during the third year it happened a breakthrough event, also the most relevant result achieved: a Neighbourhood Committee ("Comitato Centro Storico Artena") arose from a proposal of few citizens (Fig 4.39). Now, the Committee promotes projects and initiatives in order to improve the quality of life of the residents of the Artena's historic centre. For example: social events, recovery of neglected areas, restoring of buildings, a mediation role between citizens and the Municipality, promotion of local products, fundraising for initiatives. Today, the Committee involves around 250 among residents and supporters of which roughly 40 are highly active, and carry on an increasing number of initiatives catalyzing different players such as local business owner, makers, professionals, the local administration, food producers, schools, associations, and many others (Minervino, G 2016).

What is worth to note from that example is the high level of outcomes originated from just a limited in time educative initiative. Although other factors resulted crucial for the ideation and development of the Progetto Artena, such as the presence of motivated and skilled people, it is indubitable that the summer schools worked as a trigger of social innovation in a local distressed context[19] that was the historical centre of Artena, a one that is

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[19] Here are indicated three articles describing the Progetto Artena process, motivation and outcomes.
- https://www.casilinanews.it/78935/attualita/artena-intervista-stefano-serafini-societa-internazionale-biourbanistica.html
- http://www.ediliziaeterritorio.ilsole24ore.com/art/progetti-e-concorsi/2014-10-31/riqualificazione-partecipata-borgo-porte-173117.php?uuid=AbmGDdZK
- http://progettoartena.com/en/blog/2014/11/12/il-progetto-artena-sul-sole-24-ore/#

similar to other thousand of Mediterranean historical towns. The Neighborhood Committee of the Historical Centre represents a valuable outcome for the functioning of generative programs. It is suitable for covering a role of control and management mechanisms regarding the decision making process. For example, decisions on macro-urban transformation can be discussed by the public administration with representatives of civil society, which in the case of Artena may be the Neighborhood Committee representatives.

In conclusion, educational and training activities are necessary complementary actions to be planned and undertaken along with the development and introduction of a generative program. Education can become a suitable way for stimulating the rediscovery of local history and traditional customs related to the built environment. Moreover, when conducted through practical activities, it can help the creation and reinforce of social relationship between citizens.

Figure 4.39 – A photo with citizens members of the Neighborhood Committee of the Historical Centre of Artena. Photo by Guglielmo Minervino

4.4.3 – Practical implications for local policy decisions: a vademecum for fostering today a Generative Program for Urban Regeneration in historical settlements

The following is a synthetic step-by-step list of indication that can help the process of developing and applying today a generative program for urban regeneration in historical settlements. This vademecum is developed with in mind the idea of working in the Italian context, particularly in small towns that usually lacks of sophisticate tools, resources, and strategies for urban governance. Therefore, the following steps are based on the experience and understanding of the author about the context of application that for this research is the Calabrian region. However, the vademecum is a suitable base for the other Italian regions, and about its general steps for the other European countries.

Step 1 – A local government that intends to undertake the process must establish a clear policy outlining intentions, motivation, and strategy underlying the adoption of a generative program. Indication on how to develop this policy are:

1. To commission an expert to draw up a guideline document outlining the strategy to be followed for the development of the generative program, the necessary resources, the timing, and the methods suggested to implement the program. The strategy should include the following elements:
   o The identification of a well defined area as target of the program. That can be the historical centre as a whole or a part of it where to conduct an initial testing phase. The second option is advisable for large settlements. In that case, the strategy shall define how and when the process will continue after the testing phase. Whichever is the case, attention should be placed in identifying an area that also corresponds to an identifiable community. The testing of the

program to only a part of an area inhabited by a sole community shall be avoided in order to evade social conflicts that would hinder the overall process;

- o A participatory process aiming at involving the targeted community, including all the society sectors stakeholders operating in the area. That process should also be well defined by indicating the engagement strategy, timing, and mechanisms allowing feedback generation and reception from the targeted community;
- o A monitoring activity of the overall process of development, testing and application of the generative program. This would help in case of modifications of the program because only a practical test will verify the functioning of program mechanisms;

2. Eventual observations and changes, and adoption of the final document by the local administration, possibly with an act of the city council in order to have a larger consensus[20];

3. The allocation of necessary economic resources should be put in the annual budget law of the local government. This will avoid interruptions of the process and the overcoming of unexpected issues.

Step 2 – On the base of the policy contained in the guideline document, the local government has to establish a team appointed of applying the policy.

1. It is advisable that the team is made of both, members of the local administration and external experts on matters of generative process, local history, participatory process, and social aspects. It is also advisable to have at least one of the experts belonging to a University or another relevant institution as it provides more credentials to the eyes of the civil society. Other experts can be necessary on specific topics and work as consultants (for instance, translations activity or assistance about law matters);

2. The position of the team and its role within the administrative structure should well be defined and clear to the civil society that will interacts with it. Inspirations on how to do so can be taken from the Boston MONUM's case outlined above. Conflicts of interests must be avoided as diminishing the legitimacy of the team to the eyes of the civil society.

Step 3 – Developing the generative program.

1. The research activity should include the involvement of local inhabitants as it is frequent that among them there are key persons detaining valuable knowledge necessary for the unveiling of the traditional building system. That aspect can be included in the participatory process strategy;

2. Communication of achieved milestones to the local community is a well action to include in the general strategy. This is relevant as the developing of the generative program is not a short-term activity and for its success it is necessary its fully understanding by local inhabitants.

Step 4 – Once the generative program is ready, it is necessary to harmonize it with the in vogue urban legislation. About the Italian context, three are the main regulatory tools that has to be considered, verified in their compatibility with the program, and eventually modified: The Municipality statute, the urban planning Municipal Structural Plan (Piano Strutturale Comunale) and sub-plans, and the ornate regulation document (*Regolamento dell'ornato*) or other similar plans such as the *Piano del colore* (plan of color) or the *Piano del decoro urbano* "plan of urban decorum".

Step 5 – Once all the precedent activities are concluded, the generative program is ready to be tested on the field. This is a very delicate phase which shall be carefully planned.

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[20] In the Italian local administration legislative framework, two options are allowed: acts by the solely government administration (Giunta comunale), and acts from the whole city council that included members from the opposition (Consiglio municipale).

1. A permanent link between the local government and the community must be present. For that scope it is advisable to use the same team, or at least some of their members, that implemented the policy so far;
2. Selected representatives of the community shall be identified in order to facilitate the report of feedback and questions that in the first months of the program are expected to be numerous.
3. A program of regular meeting with the community would ensure the monitoring of the program and avoid the sense of abandonment that is typical after the adoption of a new policy;
4. A revision activity of the generative program has to be planned in order to embrace feedback;
5. In the case of the target area is not coincident with the whole historical district, necessary steps must be planned for progressively enlarge the area of application;

It will took some years before that the mechanisms of the generative program take roots in a community and daily life of people. During this period, the assistance from the municipal government can be gradually reduced until minimal interventions will be required.

Some special expedients shall be put in practice during the steps to facilitate the whole process. They can be seen as complementary activities for a more successfully result. They are:

Use of technology
It is advisable to use ICT tools during the whole process. For example, the ornate regulation, the generative program components (principles, rules etc...), and a system of question & answer can by digitally developed and make available through a Smartphone app. The digital ornate regulation can be designed as a dictionary, accompanied by illustration and pictures of the town, immediately consultable everywhere and at any time by citizens and construction firms operating within the heritage district. Similarly, it should always be possible to promptly formulate a question by the use of a smart phone, maybe also allowing taking and sending pictures in real time regarding the issue.
Overall, the principle is to facilitate the mechanisms of decision making and consulting in order to make preferable and convenient to follow the right way of acting.

Culture to support the process
It is advisable to envisage program of cultural and educational activities for local inhabitants about the targeted heritage district. As an example, local schools can be involved in the participatory process through activities dedicated to the young students such as guided tours of the heritage district, photo contests, sensorial map drawings, family activities and so on.
The guiding principle is that any action that fosters and strengths the relationship between the community and the living place would benefit any future intervention on that, including changes in the regulatory framework such as the introduction of a generative program for urban management and regeneration.

Social innovation strategy
Cultural activities can be developed by local grassroots organizations, or in partnership with them. They can also be involved as facilitators between the public government and the civil society during the whole process. They can also cover the role of representatives of the community. They can receive in concession some area or building to be managed, this will empower them and reinforce their sense of place. The underlying principle is that cooperation allows for achieving better result in a more effective and efficient way.

In conclusion, this vademecum would represent an operative base from which any local administration, grassroots organisation, or even individuals can begin to foster the development and adoption of a generative program for urban regeneration and management.

Part 5 – Conclusions

The research focused on urban regeneration as an approach and tool for urban transformation that embraces the worldwide diffusion of an ecological and systemic perspective for urban planning. This new paradigm led urbanism to become a full cross-disciplinary practice which main goal is a human-oriented design to achieve sustainable and prosperous development. The absorption in urbanism of concepts from the field of biology, sociology, mathematics and computer science has opened new possibilities to develop integrated tools for urban governance and transformation as an alternative to the rigid, hierarchical model of land use regulation characterising the XX century planning that revealed to be not enough responsive the contemporary dynamic society.

Within this systemic worldview and from the necessity to innovate contemporary planning tools for a more effective urban governance, the research moved from the studies of Besim Hakim who unveiled as the growth of historical Mediterranean and Near-East towns happened through a building process relying on generative aspects that are common to those of living organism. The quality and the efficiency of historical urban forms provide an evidence-based proof that validates the positive effects of generative aspects in urbanism. This motivated the decision of a research investigation about the development of a method that supports the adoption of generative programs in urban regeneration processes. The research question is investigated for historical centres and heritage districts but provides the basis for its extension to modern urban fabrics to be studied by further researches.

The method adopting generative aspects focuses on "Generative Programs" that in urbanism can be considered a new tool for urban regenerative practices. More specifically, the underlying goal of adopting a Generative Program for urban regeneration is to ensure the equitable equilibrium of the built environment during the process of change and growth. This can be achieved by stipulating fairness in the distribution of rights and responsibilities among various stakeholders through a set of ethical principles, rules and a decision-making system responsive of civil society needs.

To conduct the research, it was adopted the learning by analysis approach applied to a case study, the Calabrian region in south of Italy of which its past traditional building system was studied in order to 1) verify the presence of generative aspects in that past way of building, 2) deriving valuable lessons to be applied in contemporary urban regeneration practices and urban governance policies. The study took advantage of written documental sources, on field survey of 54 historical centres, and in-person interviews.

Key findings are:
- The unveiling of the traditional building system in vogue in the Calabria region until the early XX century. The system was compared, and resulted coherent, with the theoretical model of a generative system having as components a *mean of specifying family members* corresponding to the building decision making and control system, the *implementation components* corresponding to the local site and environmental constrains, and the *configuration knowledge* corresponding to the old regulatory factors and design language (Fig. 2.7).

This last component is the most relevant for the aim of developing a generative program for urban regeneration. In particular, the analysis of the case study allowed for the recognisance of local ancient rules, codes and mechanisms that were reorganised under the components of the Generic Generative Program Model already developed by Hakim. (Part 2.2) (Meta principles; Private and public rights are fairly and equitably exercised; Private and public responsibilities are properly allocated and implemented; Control and Management; Rules and codes).

- That operation allowed achieving the second key point of the research: the development of a Generic Generative Program for urban regeneration of historical settlements in the Calabria region.

  This constitutes the base for the development of a similar program for other Italian region and a solid base for conducting that type of study for others areas sharing a similar historical environment, such as countries around the Mediterranean basin. Moreover, the Generic Program Model is a suitable starting point for developing future research on the possibility to develop and apply generative programs in modern urban environments. On that aspect, a practical vademecum is presented to facilitate the process of adoption of a Generative Program by public institutions, and professionals operating in the sector.

  Complementary, a series of indications and critical point concerning the adoption of Generative Programs were provided:

  - The revision of local administrative structure and procedures resulting in a better adaptability of urban governance toward local dynamics;

  - The rethinking of in vogue planning tools and practices resulting in more compelling urban transformation interventions;

  - The involvement of citizens in the decision-making process determining future urban policies. This would result in more effective interventions toward citizens needs;

  - G generative program should be accompanied by research and education activities directed to civil society, in particular students, aiming to discover and preserve local knowledge. These types of activities would result useful to foster local entrepreneurial spirit in the direction of recognising and exploiting local assets, safeguarding the local community identity and continuity

For the specific case of the Calabria region, the research found some limits respects the initial aims and goals:

- Respect the aim of translating the Generic Model in a fully operative tool as Generative Program for the Calabria region, the author preferred to limit that operation because Calabrian towns resulted too various from areas to areas (especially between the north and the south) that establishing rules at level of region would have resulted misleading in local applications as a rule could result well fitting towns in a specific area but totally unfitting towns from other areas. Therefore, at level of region, the research presented a Generative Program for the Calabria region only for the first four components. It is in the opinion of the author that for what concern Calabria, a generative program completed in all of its components shall be only developed at level of individual town. However, it is reasonable to consider the Calabria as a special case due to its intrinsic characteristics, while other Italian and Mediterranean areas might present sufficient similitude between towns even on large geographical surfaces. From these observations it is advisable that future studies should not define in advance a specific target area on the base of administrative boundaries, but that it should be identified after a first screening of the history, geographical, and town's main characteristics by starting from a small area to be eventually expanded later.

- Another limits encountered during the research process has been the unexpected lack of building information (rules, customs, practices...) contained in old town statutes. About Calabria, this showed as the transmission and continuity of building knowledge after the X century (date of the *Prochiron Legum* source) was mostly held by local master masons and architects, for what concerned big size buildings. This was confirmed from interviews that highlighted as masonry was orally transmitted from masters to apprentices without relying on written documents. However, town statutes allowed understanding the decision making system at level of urban governance and principles related to the use of public and private domains, as well as their management.

  Given that findings, the research had to concentrate more on the analysis of built environment forms in order to derive underlying rules, and compare them with those contained in written sources such as the *Prochiron Legum* and others from other Mediterranean countries. That operation was indeed satisfying as

it was possible to identify and collect several evidence of covered issues addressed by law codes in the Calabrian built environment.

From that, a useful indication for future studies is to dedicate more efforts and resources on the analysis of historical built environment for identifying characterising urban and architectonic patters; then comparing them with the written documents that are closer in terms of geographical distance and time. Finally, interviews to old master masons could be very supportive to unveil reasons behind the patterns. For instance, see the case of "abutting walls" in Part. 4.2.2.5.

- Regarding the research sources, certain written documents, or parts of them, are in Latin language which slowed down the research due to translation need and understanding of contents. Because limits of the author in the comprehension of the language not all the available documents were properly examined, and that leaves space for further and deeper studies. A note, the archives of Calabrian, and southern Italy municipalities, libraries, religious institution, and private families have a significant number of documents which study has never done under the lent of urban studies. This is still a wide path of research for the understanding of our historical urban system in order to derive lessons for contemporary uses.

- Finally, the proposed Generative Program has not been implemented in the historical sites of the Calabria region, therefore it is necessary to highlight the need to verify its feasibility.

Indications on future lines of research, the main one is to apply the presented methodology in real contexts and verify its ability to support "generative programs". This will require a strong motivation of a local town administration supported by a group of professionals and researches.

A second and wider research path is to replicate the study for other areas, both in Italy and other Mediterranean countries. Similarly, it would result interesting the study of some Near East towns.

Regarding the transfer of Generative Programs form historical built environment to modern ones, this would need an exploration on the type of context that a GP is appropriate. On that aspect, a general suggestion is to proceed with modern towns that share a historical continuity with their old districts, therefore towns around the Mediterranean basin. Eventual researches on completely new towns should be conducted on XVII-XVII century's colonial towns as founded by European cultures still relying on building systems still strongly influenced by their old traditions. For instance, the author had the chance to live in Boston (USA), during its doctorate program, of which noted a good preservation of an original old district, the North End, presenting significant characteristics recognisable in the historical Italian towns.

Concluding, the future of urbanism is a clear path toward the integration of various disciplines concurrent on the understanding and development of the urban system. Ways of transformation of the built environment are focused more and more on well defined projects interesting small portions of an urban system, such as for distressed and neglected areas where its revitalisation cannot preclude from the ideation and development of comprehensive intervention and long term programs. Distressed urban environments are suitable candidates for experimenting generative concepts under the form of regenerative programs, especially for heritage environments, exactly those historical towns that were originated from a generative building process. In these contexts, it would be reasonable and not difficult to motivate communities in participating to pilot projects.

Whereas the re-establishment of a fully operative generative process would require a strong motivation and serious intention from the public government side, generative concepts and mechanisms can be easier adopted and introduced in various aspects of urban governance.

In the current awareness of a compelling need to follow a path towards a more sustainable development model, including a rediscovered centrality of the human being as the first beneficiary of the urban environment, we find inspiration and clear lessons to follow from the experience of the traditional Mediterranean cities and in countries that have historically followed a similar model of development.

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Appendices

1. – Formation and evolution of Calabrian historical settlements

2. – Sources

3. – Covered Issues related to the built environment in Calabria

4. – Derived principles and rules for contemporary uses in Calabria

5. – Dynamic System model

6. – Two examples of urban regeneration

7. – Map of the analysed historical centres

8. – Examples of generative programs

Appendix 1

Formation and evolution of Calabrian settlements. From the VI to the XIX century

This appendix outlines the Calabrian history by looking at the urban development starting from the Byzantine period (VI-X centuries), at the beginning of which the Calabria moved from the Greek-Roman sphere of influence to a new socio-political and cultural dimension that is at the base of the medieval era. The X century is also when the *Prochiron Legum* was written on the base of precedent laws. After the Byzantines, the region experienced several dominations that alternated for eight centuries until the 1861, year of birth of the Italian State.

The first chapter outlines the geography of the Calabrian region of which landscape characteristics have always played a determinant role in the process of urbanisation and shaping of urban forms. Following chapters will shortly go through all the Calabrian historical periods (Fig. A1.1) highlighting the aspect related to urbanism and the elements that influenced the traditional building system. Overall, this appendix provides the necessary background for identify and frame the documents and towns analysed in (Part 3).

Fig. A1.1 – Southern Italy administrative geography from the VI to the XIX century. Maps by Guglielmo Minervino.

1.1 – Geography

Being the tip of the Italian boot, at the centre of the Mediterranean Sea that washes it for 780 kilometres, the Calabria region (Fig. A1.2), along with Sicily, has always hold a strategic position for the commercial routes crossing the whole Mediterranean basin (Fig. A1.3). That fortunate location assured to the region significant influences from European, Nord-African, and Near-East cultures, reflecting their characteristics on the urban and architectonic forms of the Calabrian settlements.

The majestic massifs of Pollino and Aspromonte, the long roughly coastal ranges, and the huge Sila plateau, confers to the Calabria a mainly hilly and mountainous surface, rich in variety of stones, sands, clay and other

materials extensively used in building activities until the early nineties. Such availability of materials reflects the local geographies in the colours of the traditional settlements and their forms influenced by a combination of different building techniques that alternated through history (Fig. A1.4).
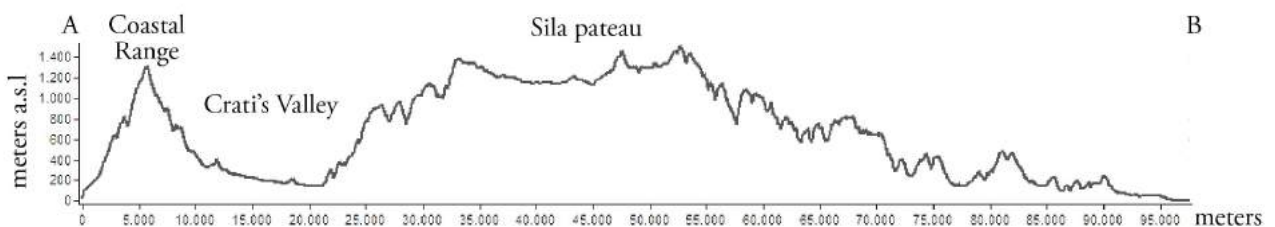
Fig. A1.2 – The Calabrian physical geography. Map by Guglielmo Minervino

Fig. A1.3 – Mediterranean commercial routes. From Mansson, M. J. (2018). Medieval trade networks v.4. https://imgur.com/MsXaOdV

Fig. A1.4 – The variety of building materials and techniques evident in some Calabrian masonry. From the left, in the towns of Paola, Gallicianò, Belmonte Calabro, Cerchiara di Calabria. Photos by Guglielmo Minervino.

The Calabrian climate is generally of a Mediterranean type where it varies widely moving from the coast to the inner mountains. Such a clime favours the growth of extensive forests made of different arboreal species which large reserve of timber was extensively used to make beams for roofs and floors, and lintels for doors and windows until the XX century (Fig. A1.5).

Fig. A1.5 – An example of a wooden roof and window lintels in a XVIII century house, in Paola. Photos by Guglielmo Minervino.

In the Augustan era of the Roman Empire, the Calabria region was known as Bruttium, from the population that lived there. The name Calabria originally designated the Augustan region *Regio II Apulia et Calabria*, the current Puglia, while the today's Calabria, together with the current Basilicata region, was known as *Regio III Lucania et Bruttii*. But once the Byzantines unified the two peninsulas of southern Italy, the name Calabria was used to also identify the region of the Bruzio; subsequently, with the loss of Byzantine possessions in Puglia, in favour of the Longobards, the name was used to designate only the current Calabrian peninsula, which still retains its name.

1.2 – The Byzantine period and Arabs (VI-XI)

At the mid of the VI century the Byzantine emperor Justinian I had eliminated the Ostrogoth presence in Italy, but his efforts to keep the Italian peninsula united went vanished due to the invasion of the Longobards in 568. That opened the way for a net distinction between the Longobard regnum and the Byzantine Empire (Eastern Roman Empire) (Fig. A1.1a). Most of the Calabrian territories belonged to this last one, and since the VI century they took the name of *Duchy of Calabria*, although with unstable boundaries (Fig. A1.1a-d). For a short period of time, the emperor Basil I (867-886) made Reggio Calabria the capital of the Byzantine possessions of southern Italy, producing new economic well-being that reflected in the growth of the city and its agricultural surrounding.

1.2.1 – Urban settlements

Between the V and VI century, the Calabrian territory was lightly urbanised by a number of nodal points, mostly Episcopal seats, and last still active Roman centres. The regional road network was simple[1], connecting the inner agricultural centres with the coast. For the whole south of Italy, the Via Popilia (the roman *Popilia-Annia*), linking Capua to Reggio Calabria, was the main connection along the west coast for several centuries to come (Zinzi 1998). Few cities were relevant, such as the seaports of Reggio Calabria and Crotone, and Cosenza in the inland for its strategic location controlling the Popilia road.

With the growth of the latifundium, several minor agricultural agglomerations become residential centres, also controlling the access to inner areas and the productive hinterland (Zinzi 1999), building the foundations for a still visible today regional urban system following the relationship between coasts, roads, and the agricultural use of the territory (Fig. A1.6).

The V-VI century has seen a growth in the number of settlements that can be deduced from the organisation of dioceses which had to be coincident with some consistent civic and demographic presence. In fact, as original Roman cities become bishop centres, the Church acquired great relevance in the structuring of the Calabrian urbanism, especially when Reggio Calabria got the role of capital in the IX century, becoming the main point of reference of the Greek Church, thus a privileged destination for a continuous influx of Basilian monks. They favoured the massive presence of convents and places of worship in the whole Calabria, among which the Byzantine *Cattolica di Stilo* is the most representative and popular (Fig. A1.7, A1.8) (Cilento 2001). Those monastic settlements constituted an opening for the appearance of several future towns that grew around them in the centuries to come.

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[1] Information about the road network in the Roman period are mosty derived from the *Tabula Peutingeriana,* an illustrated Roman road map showing the layout of the public road network of the Roman Empire. The two coasts of Calabria were linked by a transversal road originating at the height of Vibo Valentia. A description and a copy of the map is in, Levi, A., & Levi, M. (1978). *La Tabula Peutingeriana*. Bologna: Edizioni Edison.
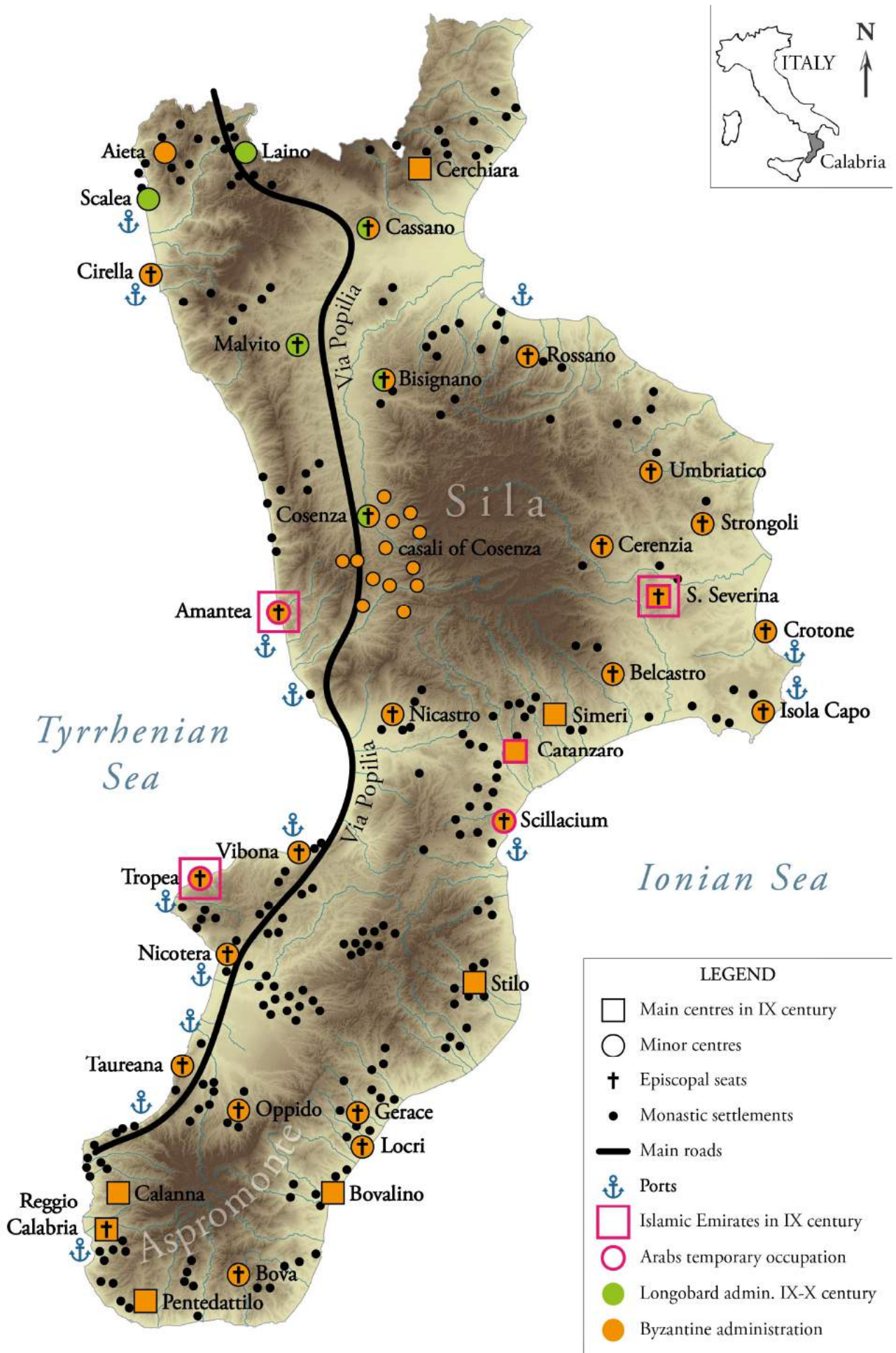
N

ITALY

Calabria

Aieta

Laino

Scalea

⚓

Cirella ✝

⚓

Cerchiara

Cassano ✝

Malvito ✝

Via Popilia

Rossano ✝

Bisignano ✝

S i l a

Umbriatico ✝

Cosenza ✝

casali of Cosenza

Strongoli ✝

Cerenzia ✝

S. Severina ✝

Amantea ✝

⚓

Crotone ✝

⚓

Belcastro ✝

⚓

Nicastro ✝

Simeri

Isola Capo ✝

⚓

Tyrrhenian Sea

Catanzaro

Via Popilia

Scillacium ✝

⚓

Ionian Sea

Vibona ✝

⚓

Tropea ✝

⚓

Nicotera ✝

⚓

Stilo

Taureana ✝

⚓

Oppido ✝

Gerace ✝

Locri ✝

Aspromonte

Reggio Calabria ✝

Calanna

Bovalino

⚓

Bova ✝

Pentedattilo

LEGEND

☐ Main centres in IX century

○ Minor centres

✝ Episcopal seats

• Monastic settlements

— Main roads

⚓ Ports

▢ (pink) Islamic Emirates in IX century

◯ (pink) Arabs temporary occupation

● (green) Longobard admin. IX-X century

● (orange) Byzantine administration

Fig. A1.6 – The Calabrian urban system in the early Middle Ages. Map by Guglielmo Minervino based on the one in Zinzi, E. (1998), p. 285.

Fig. A1.7 – The Cattolica di Stilo. A Byzantine church built in the IX century in the town of Stilo. Photo by Guglielmo Minervino.

Fig. A1.8 – The historical centre of Stilo. Photo by Guglielmo Minervino.

1.2.2 – Elements influencing the urban structure

Landscape morphology and defensive necessities

From the VII to half of the XI century the calabrian population moved from coastal to inner areas as consequence of a coastline shift, formation of swamps, and defensive reasons, especially (Placanica 1999).

Settlements of that period were founded on naturally defended rocky spurs, bordering canyons and close to strategic points favourable for the control of the territory (Zinzi 1998). The countryside was still characterised by scattered small, not walled agricultural nucleolus while the number of maritime settlements reduced drastically during the IX century, years of most frequent Muslim incursions.

When the Byzantine general Niceforo Foca, of Armenian origin, conducted his campaign to get free the south of Italy from Longobards in the IX century, he invited local people to settle in *kastellion* (castle, in Greek), fortified villages located on hills more easily defensible thanks to the natural configuration of the land, according to the motto "Ascendant ad montes" (settle in the mountains) (Nisticò 1999) (Fig. A1.9, A1.10a). In fact, in the calabrian Middle Ages, the typical urban layout of Byzantine settlements, compact and perched on top of a mountain, was kicked off by the *castrum* (Fig. A1.10b), a word referred to defensive purpose structures, including civil ones (Le Bohec 1992). Romans used that word to indicate their typical military settlement intended to host an army and control the territory. There are two essential elements of a *castrum*: the walls, for defensive purposes, and the *mastio,* a fortified tower further developed during the following Norman, and Spanish periods. City walls in Calabrian settlements were not always built on the entire perimeter if this was already inaccessible thanks to morphologic natural elements, yet perimetral houses were built neighbouring to each other (Fig. A1.10b).
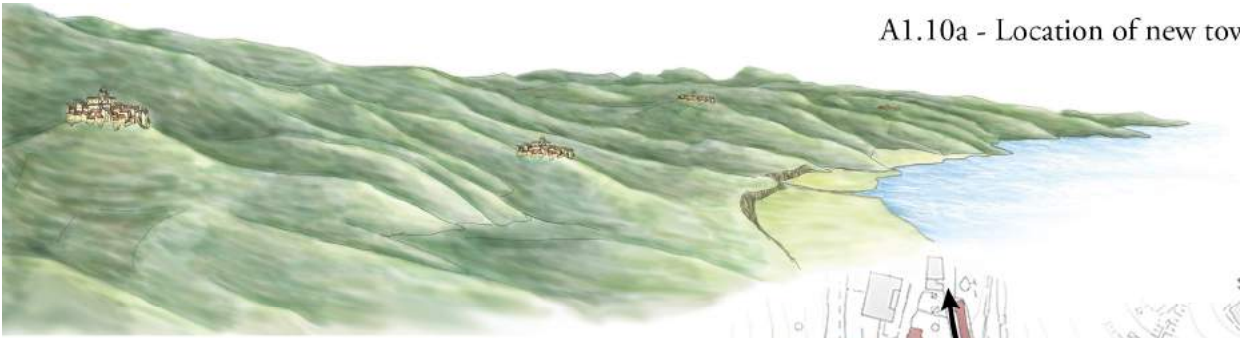

Fig. A1.9 – Examples of hill-top, naturally defended centres. From the left: Fiumefreddo Bruzio, Cerchiara di Calabria. Photos by Guglielmo Minervino.

The geomorphology of the foundation's place conditioned the plant and growth of calabrian settlements which usually had two or more opposite located city gates, linked by a main road running on the hill ridge or following the natural contour levels (Fig. A1.10c). Most relevant towns had a seat of the civil power while those being an Episcopal seat had a cathedral. Cave dwellings were present within or at the borders of towns as well as urban monasteries. Public baths are documented such as in Reggio Calabria and Stilo.

The *castrum* of the Romans entered in the languages of many populations until today (Greek: *kàstro*; Arabic: *qasr*, from which originates the *alcazar*; Italian: *castro*; English: *Chester*). The same is for the word *castellum* that indicated a fortification (Greek: *kastellion*; Italian: *castello*; English: *castle*; German: *kastell*; French *château*)[2].
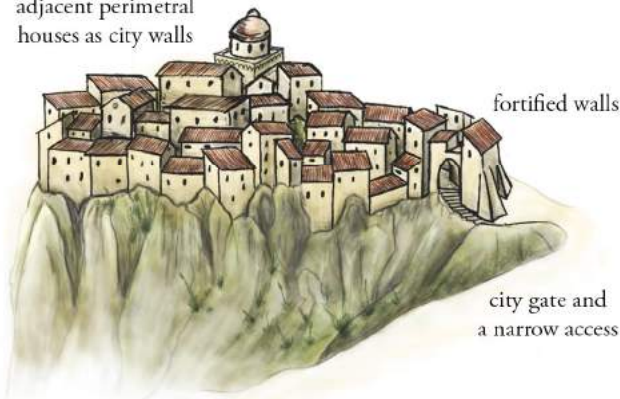
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[2] Rumpf, Andreas. "Castrum." In *Enciclopedia dell' Arte Antica Classica e Orientale*, 1959.

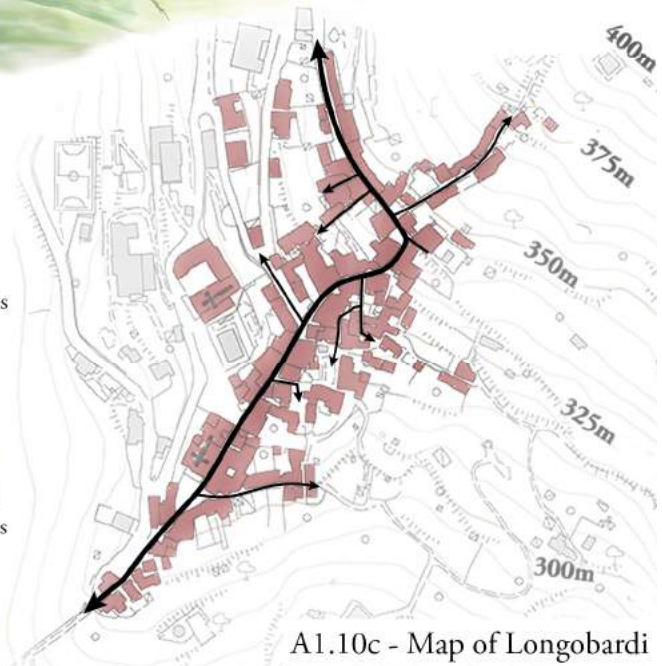Fig. A1.10 – a) The hill-top location of new towns. b) the new urban form of *castrum*. c) map of Longobardi town with streets hierarchy, typical of the Islamic tradition: the main road runs on the ridge, and secondary roads culminate in cul-de-sacs connecting housing aggregations. Most of the cul-de-sacs have been opened but it is still possible to recognise them. Drawings by Guglielmo Minervino

The regain of the whole Calabria by Byzantine over Longobards in the X-XI centuries reinforced the regional urban system, transforming several small villages in administrative centres, also giving them ecclesiastic functions. Settlements concentrated mostly in central and southern Calabria, while the north, previously under the Longobards, was less dense. At this point, the Calabrian urban system is mostly oriented toward the inner territories, and the line of hill-towns forms a barrier against Muslims and a strong watching system, also useful to assist refugees (Fig. A1.9 left, A1.10a).

Cultural influences

To the detriment of Byzantines, in 827 the Arabic populations arrived in Sicily, turning it in a Muslim province within a half-century. Since then, the Arabs (generically called Saracens) conducted several tentative to conquer the southern Italian settlements, resulting in short-term occupations of towns of Taranto, Bari in Puglia region, while in Calabria, Tropea, Santa Severina, and Amantea which was an Emirate in the 846-886 (Tonghini 1997; Turchi 2004). Until 1020, the Arabs sacked the towns of Gerace, Cosenza, and Bisignano, while only Rossano resisted to the invaders (Ravegnani 2004, 180--181). Located within the Byzantine influence, the city of Cosenza was largely contended by Longobards and Muslims which almost destroyed it in 988 causing people to move away in the surrounding where they gave birth to a number of hamlets, called *casali*, today districts of the city or administratively separated towns. Whit the Sicily completely in the hands of Muslims, the Byzantine territories unified in what was called the *Catepanato d'Italia* (Cilento and Bulgarello 2006) (Fig. A1.1d).

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The at that time calabrian population was composed of several ethnicities and cultures that have been determinant in changing the urbanism of the region, its landscape, and the shape of towns. Oriental influences on the calabrian urban system and architecture were strong and from various areas of the Near East, at that time Byzantine Empire. Beside the predominant Latin and Greek cultures, other minority groups were present in the region, such as Africans, Syrians, Palestinians, Armenians, Slavs, and Bulgarians (Zinzi 1998). The Calabria has always seen foreigner influx of people, bringing with them their building knowledge, as happened when the Byzantine general Niceforo Foca, before to leave the region, granted the freedom and the faculty to remain in Calabria to all the slaves and soldiers, mostly Armenians, favouring the imperial policy of repopulating the desolate provinces of southern Italy (Amari 1854, 440--442; Placanica, 1999). An evidence of the Oriental influence on local architecture is in wall decorations (Fig. A1.11).

Fig. A1.11 – A reversed two-barried cross of Greek origins and associated with the bishop power used as decoration of a palace facade in the historical centre of Gallicianò. Photos by Guglielmo Minervino

Contemporary, from the Mediterranean coasts an intense monastic migration to the South of Italy moved a significant number of people looking for a new living place due to the Muslims occupation and the Byzantine iconoclasm, such as for a consistent number of Basilian monks that found refugee in the rugged folds of the Calabrian Apennine (Musolino 2002). Their influence is confirmed in the one hundred houses rock settlement known as of the "Sbariati", in the actual calabrian town of Zungri (Manna 2009). Basilian monks arrived here in the XII where remained for two centuries but recent hypothesis anticipate the birth of the settlement to the IX century. Monks' building activities followed the Rule of S. Basil that prescribes to them to live close to towns and share with the close communities their artisan, agricultural and architectural abilities. Archaeological studies of the Zungri's settlement revealed as some architectural aspects and the conveying of rain and spring waters have similar characteristics (excavation methodology, used tools, and the interception of superficial water veins through horizontal wells) to those that can be observed in semi-desert environments of the Middle East and North Africa[3]. The urban layout of the settlement is still clearly legible and the road network is divided into pathways that lead up to the various underground housing cells from upstream to the valley (Fig. A1.12).

Fig. A1.12 – Carved houses carved in the Sbariati rock settlement, in Zungri. Photos by Guglielmo Minervino

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[3] Water infrastructures in urban area, ascribable to the oriental knowledge and techniques, are still visible in several southern Italian towns, especially in Puglia, such as in Matera of which historical rock settlement is well preserved and still inhabited. An extensive study on that matter is by Pietro, Laureano. 2013. *Water conservation techniques in traditional human settlements.* New Delhi: Copal Pub. Group.

Specific urban and architectonic forms in Calabria, as well as in the whole south of Italy, can be ascribable to the building knowledge preserved in the traditions of various populations, imported in Calabria and here reshaped by the encounter with local customs, functional necessities, and the use of available local building materials.

After the Roman civilization, Northern Calabria was mostly under the Longobards that, having not an own architectural tradition, nor pictorial, nor sculptural, used the workforce existing on site. This is one of the reasons why the Longobard artistic language in Italy is extremely composite and reveals specific characteristics in different parts of the peninsula. Therefore, the Longobard architectonic language of the various areas was different but certain architectonic patterns took roots and were replicated in all the Italian towns. This is the case of the *gafio*, a word referring to a cantilevered wooden balcony embedded in the wall (De Blasi 2009). In Calabria, the word *gafio* usually indicates a masonry landing under the form of a small terrace with an external staircase serving to give access to housings (Part 3.2 towns).

Beside Longobards and other minorities, the Arabs populations are those that have impacted the most on the urban environment. Significant is the year 952 when the Byzantine troops lost a crucial battle creating the condition for the stipule of a peace treaty establishing for the first time the construction of a mosque in Reggio Calabria, then destroyed few years later. Despite emirates in South of Italy lasted for a short period, the Islamic influence is still readable today and comparable for importance with the one in the Iberian peninsula (Guidoni 1979). Muslims legacy is still recognisable in the toponymy and urban spatial aggregation that in Sicily, Calabria, and Puglia regions are most evident and preserved. The Islamic tradition in the south of Italy showed continuity until the industrial age under the form of territorial uses and ways of aggregation of living spaces, still readable in some characteristics of the urban fabric, such as the territorial organisation of settlements in urban areas (*madina*, "city") and rural suburbs (*rabadh*), the hierarchy of streets, and the distinction between residential and fortified areas (Guidoni 1979). In the calabrian historical towns, the street hierarchy is still preserved, made of a main road running on a ridge and several ramifications ending in cul-de-sacs (Part 3.2 towns) or inner courtyards. Those have been opened for the majority or altered by following urban transformations, resulting in a curvilinear road grid (A1.10b).

This intense influence on the urban structure, produced in a short time, is understandable as Muslims also introduced a new model of society and management of workforces based on family units and relative network, an aspect still strong in the calabrian culture and readable in the use of minor public spaces and streets common to the immediate inhabitants. Cul-de-sacs and courtyards where shared by several residential units and ascribable to customs belonging to small groups tightened by family or ethnic relationships (Guidoni 1978). The distribution of land ownership, and family spheres of influence determined the territorial and urban subdivision throughout the late Middle Ages and beyond through real systems of socio-political equilibrium having the objective of maintaining the status quo (Guidoni 1979; Minicucci 1983). In the successive centuries, family-houses aggregations are replicated at the city scale with entire neighbourhoods that recognise around a parish which the relative church functions as an ordering element of the urban space, producing in certain cases a symbolic, geometrical superstructure of the city (Guidoni 1974).

If most of the original spatial aggregations of houses have been altered by hundreds of years of urban transformations, the evidence of that powerful Islamic influence can be found in urban and architectonic forms such as cul-de-sacs, courtyards, and window and balcony grilles (Fig. A1.13).

Fig. A1.13 – *from left*) A long cul-de-sac in Cerisano, and in Aieta; enclosed, and partially opened courtyards in Santa Severina. Photos by Guglielmo Minervino

Particularly, two urban elements ascribable to the Islamic city experienced a secular continuity in Calabria, the spatial *Fina* and the physical *Sabat* (Part 3.2 towns).

The *fina* is an Arabic tem indicating a semi-public space running alongside all exterior walls of a building, and extending vertically (Hakim 2007, 2009b). In Calabria, the *fina* is recognisable in all the road network of historical centres where it is occupied both by permanent and temporary uses (Minervino and Canturi 2017).

The *sabat* is another Arabic term that indicates a room bridging a walkway, therefore occupying the whole street space, including the *fina,* but without creating obstructions to traffic (Hakim 2007). More *sabat* built side by side can origin covered corridors that in the northern Calabrian towns are very common.

The *gafio*, *cul-de-sacs, fina*, and *sabat* are all interrelated architectonic elements solving basic necessities of accessibility and expansion of housing by recurring to a decision making system based on social relationships, ethical principles of respect for the others and the community as a whole, local building customs, and technical possibilities depending of available building materials (Part 3.2 towns).

Legislation and local customs

The X century is also the period when a law text named *Prochiron Legum* was written (Appendix 2). It is a manuscript in Greek language containing laws for the administration of a town in central Calabria that Freshfield (1931) hypothesised to be Soverato, today, a roughly nine thousand inhabitant's municipality by the Jonian Sea, entirely rebuilt in a closer location after the earthquake of 1783. The *Prochiron* was written on the base of laws already in vogue during previous centuries and for the practical purpose of town management that had to be easily understandable by the inhabitants (Brandileone & Puntoni, 1895; Brandileone, 1985). The chapter 33 of the text proves as local customs and legislations addressed urban topics from long time (Hakim 2014) and people followed them during building activities, resulting in their preservation, despite the intense cultural contaminations and alternation of rulers through centuries. Principles underlying the law codes in the *Prochiron* (Part 3.3) continued to live for centuries and inspiring successive law texts and the practical incremental building of towns. Still today it is possible to read some of these principles in the urban and architectonic forms of Calabrian historical towns.

1.3 – The Norman-Swabian period (XI-XIII)

At the turn of the millennia, Byzantines troops were insufficient to guarantee control over their territories, and the imperial government was unfair toward the Italian population which economy was seen only as a support of the Empire, resulting in a passive behaviour of people to the arriving of any kind of foreign invaders (Tramontana 2003). This was the case for Normans which were recruited by local barons as a military force against the Byzantine in exchange of lands and political power. Since their first settlement, Aversa (Campania), more of them came to the south including the Altavilla family (from Houterville, in Normandy) that, under the leadership of Robert Guiscard, settled in Melfi (Basilicata). At this point, the Pope, aimed to submit southern Italy under the Catholicism, and finally eliminate the Byzantine presence, appointed the Normans to liberate the South in exchange of such lands (Givigliano 2003). In 1056, Robert and his brother Roger I begin a fast conquer of the Calabria region. On the contrary, as Sicilians were strongly interrelated with the Islamic administrative structures, the conquest of the island by Roger II took thirty years, given birth to the Kingdom of Sicily by unifying the whole south of Italy (Fig A1.1e) in 1130.

The Norman dynasty merged with the Swabian under Frederick II (1194-1250). Under his rule, the kingdom was divided into eleven territorial justiciarships (*giustizierati*) supervised by officials named *giustizieri* with administrative, penal, and religious duties, and direct representative of the emperor. The Calabria was administratively divided in two *giustizierati,* the justiciarship of "Calabria", and justiciarship of "Val di Crati", then become "Calabria Ultra" (the south) and "Calabria Citra" (the north) during the Spanish domination. That partition lasted until the second half of the XIX century.

1.3.1 – Urban settlements

The period between the X and the XIII centuries is when most of the Calabrian urban system has been structured. Several towns were funded or largely renovated (Fig. A1.14) such as for existing various size strongholds (*castrum*). Under the Norman governance, Italy experienced the typical Medieval process of "encastellation" that changed the aspect and the nature of settlements all around the Europe (Hubert 2002) (Fig. A1.15). Normans conducted an intense building activity of infrastructures around central residential nucleolus that were surrounded by a landscape organised in the way that Toubert (1981) recognised and explained in a specific model for the southern Italy, made of concentric belts of decreasing productivity. In Calabria this landscape organisation saw vegetable gardens occupying the areas immediate closer to towns, followed by arboreal plantations, mostly vineyard and olives, then cereal fields bordered by forests which constituted a significant source of woods for building activities until the XX century (Rotundo, 2003). The XI century also saw a widespread phenomenon that is the increase of land defined *proasteia* (territories that remain uninhabited) following the slow but constant absorption of hamlets by monasteries due to the strong expansion of the ecclesiastical property (Di Gangi & Lebole, 1997).
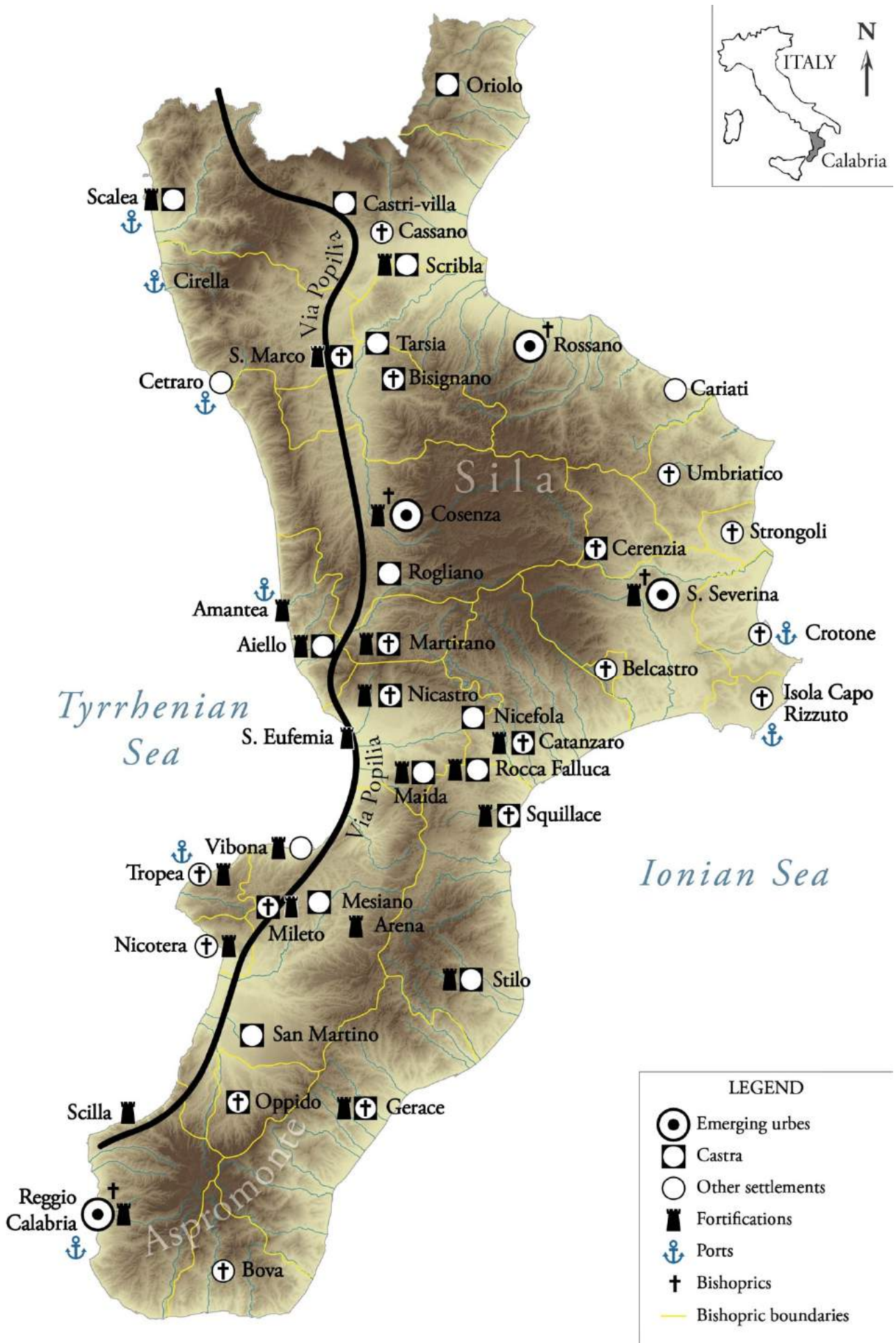
N

ITALY

Calabria

Oriolo

Scalea

Cirella

Castri-villa

Cassano

Scribla

Via Popilia

S. Marco

Tarsia

Rossano

Bisignano

Cariati

Cetraro

S i l a

Umbriatico

Cosenza

Strongoli

Rogliano

Cerenzia

Amantea

S. Severina

Aiello

Martirano

Belcastro

Crotone

Nicastro

Isola Capo
Rizzuto

Tyrrhenian
Sea

Nicefola

S. Eufemia

Catanzaro

Via Popilia

Rocca Falluca

Maida

Squillace

Vibona

Ionian Sea

Tropea

Mesiano

Mileto

Arena

Nicotera

Stilo

San Martino

Scilla

Oppido

Gerace

Aspromonte

LEGEND

⊙ Emerging urbes

☐ Castra

○ Other settlements

♜ Fortifications

⚓ Ports

✝ Bishoprics

— Bishopric boundaries

Reggio
Calabria

Bova

Fig. A1.14 – The Calabria in the Norman period. Map by Guglielmo Minervino based on the one in Zinzi, E. (1998), p. 291, and Pensabene, P. (2003), p. 77

Fig. A1.15 – Port of a fresco from the XVII cent. in the Vatican City representing the territory around the town of San Marco Argentano. From the fresco it is clear the hill-top location of settlements and their fortification with city walls and towers. Photo by Paolo Chiaselotti.

The Norman King Roger II (1095-1154) was a man of culture who always preferred diplomacy instead of war to solve political conflicts. Under his rule, Sicily and the Kingdom increased their prosperity under an unusual coexistence, for that time, of all the present cultures that merged one another in the artistic fields, making Sicily the central point for trading and culture of the whole Mediterranean. In Palermo, Roger II attracted around him the best men of all ethnicities, like the Arabian geographer al-Idrisi (Ahmad 2008) who wrote, in the 1154, *Il libro di Ruggero* (The book of Roger)[4], a compendium of geographical information of the world at his time (al-Idrisi, 1883, 2008). Idrisi depicted in his book a Calabria made of ancient and beautiful cities, small, densely populated, but rich in trade with seaports and river ports visited by big and small size ships (Zinzi, 1998, 2001) (Fig. A1.16).

The al- Idrisi's work is the second of two main sources of the Norman period that described the geography and cultures of the Mediterranean basin, also providing general information on the urban settlements of Calabria (Zinzi, 1999). The first source, written half a century before the *Il libro di Ruggero,* is the *De rebus gestis Rogerii calabriae et siciliae comitis et Roberti Guiscardi ducis fratris euis*, a chronicle narrating the Norman ventures in the Mediterranean basin written by Goffredo Malaterra, a Benedictine Norman monk (Zinzi, 1998; Malaterra, 1928, 2002).

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[4] The original arabic title is *Nuzhat al-   -* (the book of pleasant journeys into faraway lands).

Fig. A1.16 – The *Tabula Rogeriana* of al - Idrisi, a detail from Italy. The Calabria Region is within the white circle. Picture from Mazzetti E, (ed.) *Cartografia generale del Mezzogiorno e della Sicilia.* ESI, Napoli, 1972, tav. XVII. The figure shows the "Principato Citra" by Mario Cartaro (coll. C. A. Stelliola), 1613 (delineazione 1590- 1594), cm. 36 x 51.

A characteristic of the Norman age urbanism concerns the creation of several fortifications built in strategically relevant positions to protect and control the conquered Byzantine territories (Di Gangi and Lebole 1998). Settlements under the Norman domination were of different types that can be classified in cities (*urbes*), small fortified settlements (*castra*), and agricultural settlements (*casalia*) (Fig. A1.17) (Zinzi 1998, 2001).

Urbes or *civitas* were settlements emerging as cities, differentiating from *castra* by size, population density, importance or legal status. The critical difference between *urbes* and the other settlements is the presence of a consolidated community. Since the XI-XII century, inhabitant of *urbes* organised in a complex society given rise of city communes. In the northern Italy that was a phenomenon due to a weakening of the monarchy, while in the south cities were still subject to the king which had the ultimate word on the degree of independence of town from the crown. In both cases, the formation process of a local community identity, corresponding to the physical city, was favoured by the retrospectively confirmation of ancient customs (*consuetudines*) (Coleman 2004). In Calabria, during the XIV centuries, *consuetudines*, usually transmitted orally, started to be written in city law books (*statutes*) intended to provide a clear and transparent corpus for the management of a city.

The minor and simpler organised settlement typology is the *castrum*. Characterised by defensive purpose structures it was present both in urban or rural area: it is the analogous of the Byzantine *kastellion* and frequently part of a city. There are two essential elements of the *castrum*: perimeter walls, and a keep (French: *donjon*; Italian: *dongione/mastio/maschio*), the major fortified tower. During the Swabian and Spanish dynasties, several *castra* were enlarged becoming *castella* (castles), the emblematic Medieval fortification that in Calabria constituted a significant new element.

To assure a comprehensive control of the realm, Normans introduced in Calabria a small type of rural fortification called *motta* such as Scribla in northern Calabria, a strategic crossroad of all Normans directions to the south (Pesez & Noyé, 1989). A *motta* was a small artificial hill raised above ground, surrounded by a moat, and surmounted by a wooden towered structure (*donjon*) enclosed by a fence made of wood and soil (Fig. A1.17). In Calabria, this type of fortification frequently took advantage of natural rocky spurs, and, with time, wooden structures were substituted by stonework such as it is probably the case of the Tower of S. Marco Argentano, (Fig. A1.18) (Cuteri, 2003). In a number of Calabrian towns, the term *motta* become a common toponym associated with neighbourhoods next to the castle.

For necessity of the agrarian colonisation, Normans introduced a new type of settlements named *casalia,* small hamlets of farmhouses not fortified, and documented since the end of the XI century (Zinzi, 1999; Martin, 2002). This typology of rural residence continued to be used until the XX century, and they are numerous, of

different size and style in the whole Italian peninsula. In general, the term *casalia* refers to very small settlements or sole buildings (Italian: *casale*) in rural areas for agricultural purposes.

All that settlement typologies potentially constituted points of aggregation for people, therefore the basis for the emergence of proper towns in the centuries following the Norman period: this is the case of the "Casali del Manco", fourteen *casali* at the periphery of Cosenza, and considered for centuries part of the city (Fig. A1.19). In 1786, around Cosenza there were 366 casali, couted by Giovanni Enrico Bartels during a trip in Calabria after the earthquake of 1783 (Scafoglio 1984).
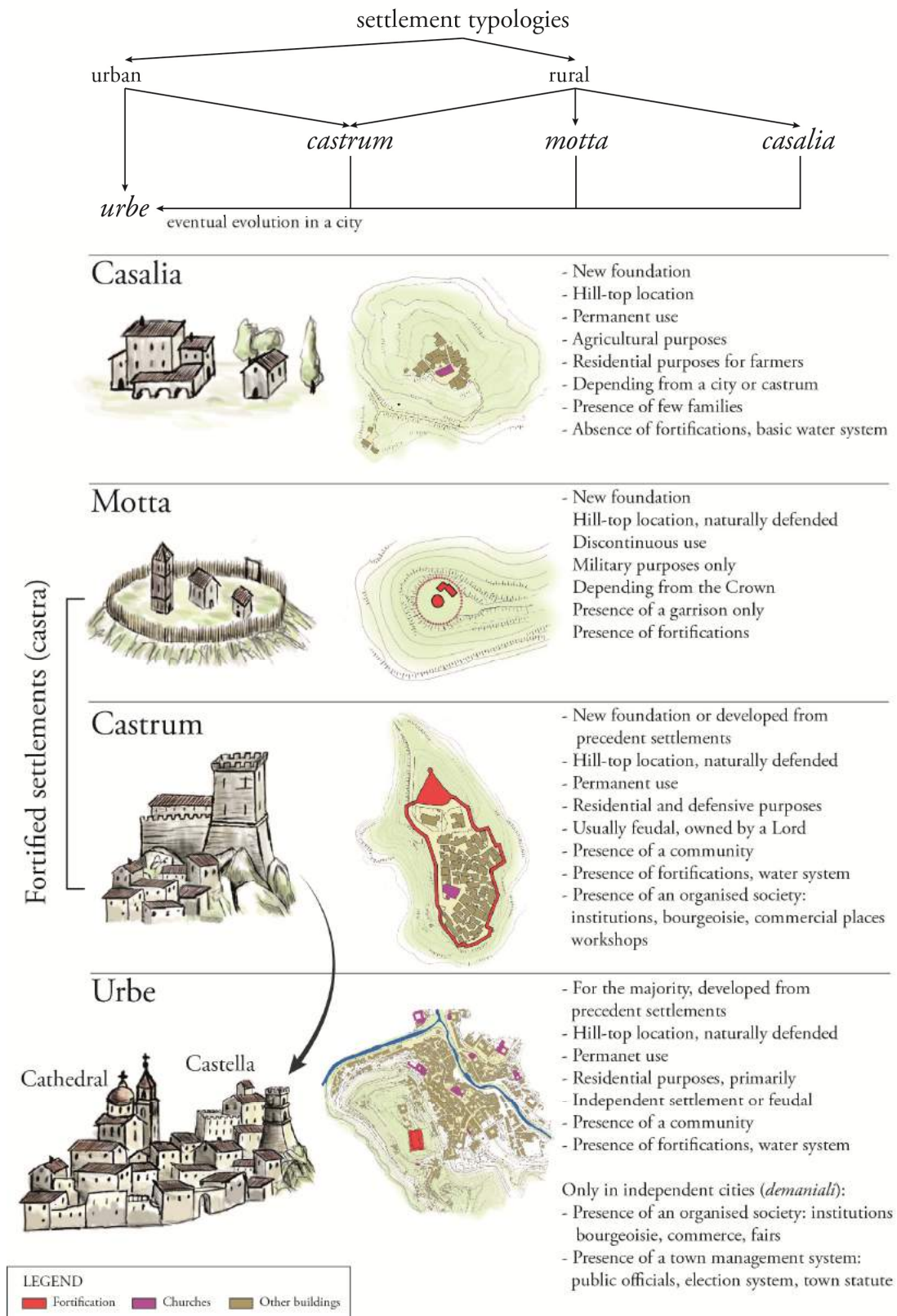
Fig. A1.17 – Urbes, castra, castellia, and casalia. Drawings by Guglielmo Minervino

Fig. A1.18 – Stone tower (*donjon*) examples. From the left in S. Marco Argentano, Paola, and Zagarise. Photos by Guglielmo Minervino
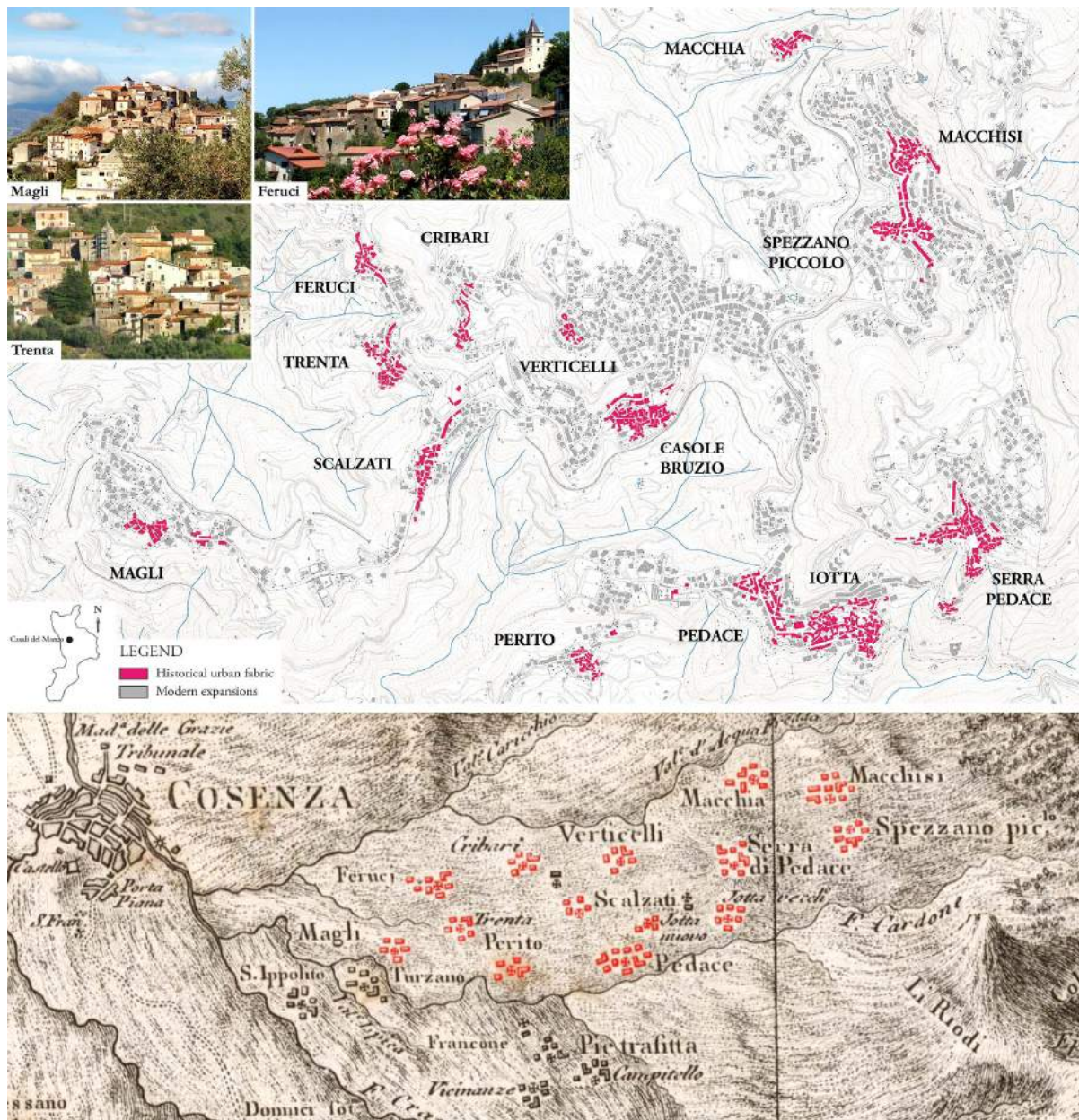
Fig. A1.19 – The Casali del Manco municipality is composed by 14 *casali* from the X century: Spezzano Piccolo, Macchia, Macchisi; Serra Pedace, Pedace, Iotta, Perito, Trenta, Magli, Feruci, Scalzati, Cribari, Casole Bruzio, Verticelli. They were founded by groups of people from Cosenza who took refuge on the hills in order to escape from the invasions of the Saracen Abitul Casim in 986. Until the early 1800s

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in the *casali* were held regular public assemblies, and acts of ancient notaries recorded the minutes with numerous deliberations, interventions and decisions testifying, even today, the liveliness of life participation of the various communities. That case is an example of new settlements quickly originated by necessity. Although their origin differs from proper Norman *casali*, intentionally funded for agricultural purposes, they shared the same evolution of proper towns which expansion and aggregation still continues today. Drawings and photos by Guglielmo Minervino. The map below is from Rizzi Zannoni, Giovanni Antonio. 1808. *Atlante geografico del Regno di Napoli*. Naples: Giuseppe Guerra

In civil settlements (*urbes* or *civitas*) the coexistence of the political and the Episcopal powers was evident in the architecture and the urban plan that is dominated by the presence of a castle, seat of the feudal power and located on a raised favourable spot to overlook the urban area, and a Latin cathedral that arises autonomously and isolated, sometimes in a privileged relationship with the castle. The cathedral has usually an elevated and central location to testimony its unifying function (Di Gangi & Lebole, 1998; Zinzi, 1999, 2001) (Fig. A1.20). An exemplary case is the cathedral of Gerace (RC)) that records an impressive leap in scale without any relationship with the previous urban structure (Fig. A1.20), apart from the ancient sacredness of the place, here renewing its relationship with the city and becoming a symbolic figure, ideally addressing the residential area (Bozzoni, 1999).
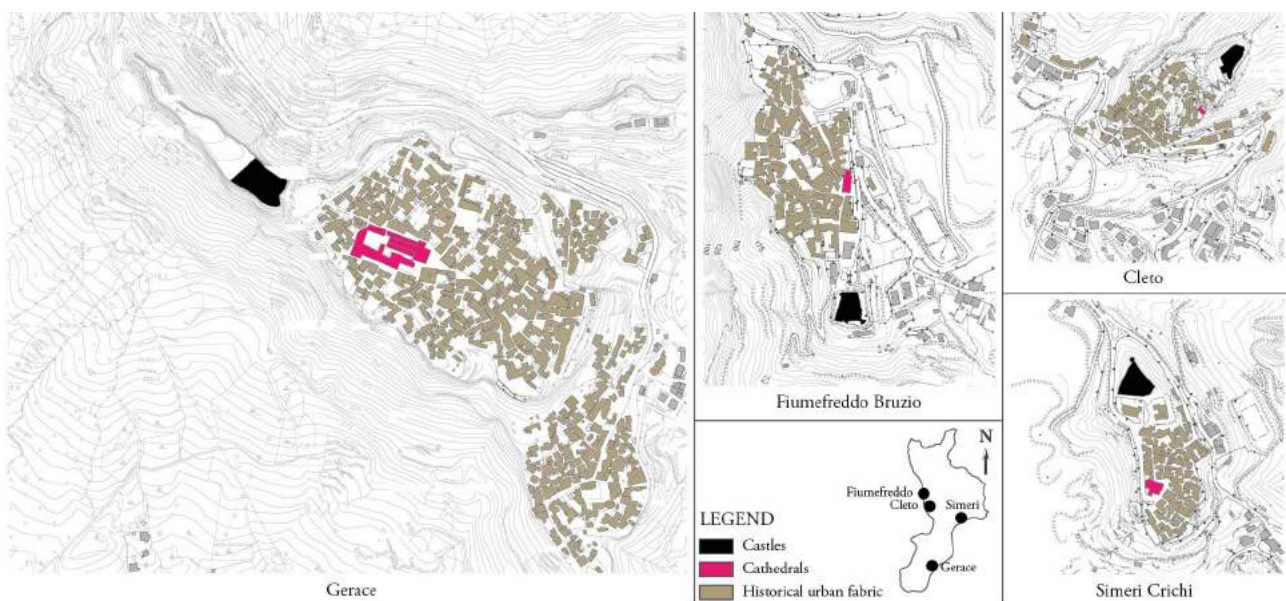

Fig. A1.20 – The relationships of the castle and the main church within the urban fabric. Drawings by Guglielmo Minervino

About residences and civil buildings there are few archaeological pieces of evidence and documents. In general, houses were made of bricks or raw clay, covered by timber roofs with shingles, atriums with shared access, *solaria* (part of the house open to the sun and the air), *apothecae* (small warehouses), open air elements for the collecting of water (Zinzi, 1999), and cisterns for its storage such as documented for military buildings (Cuteri, 2003).

Common building technique, also in vogue during the Byzantine period, was the constructive system with bands where thick layers of stones and mortar alternate thinner layers of stabilisation and levelling purpose made of bricks or stone slab (Cuteri, 2003). This technique shows a continuity since recent time as it is still readable in the XIX century calabrian buildings (Fig. A1.21). It has been hypothesised that such masonry bands of different thickness could correspond to work days, therefore used to estimate the chronology of a work. However, this was a time of presence of wide different building techniques ascribable to all the already mentioned ethnicities and cultures co-habiting the southern Italy at that time.

Building materials were mostly of local origin such as limestone for mortars and aggregate materials, stones, river pebbles, and bricks. There are evidences of some better quality material imported for particular architectonic elements such as door and window arches (Cuteri, 2003). Lastly, there are registered particular additions and decorations used in monumental buildings ascribable to the diffused medieval phenomena of spoliation and reuse of Roman architectonic elements such as columns, and capitals (Pensabene, 2003).

Fig. A1.21 – Examples of walls built with the techniques of alternate bands. From the left in Gallicianò, Cerzeto, Cerchiara di Calabria, San Donato di Ninea. Photos by Guglielmo Minervino

1.3.2 – Elements influencing the urban structure

Urban Governance

During the Swabian period, under Frederick II (1198-1250), there is a clear separation between the private property, such as those of the feudal barons, and the public property of the State known as *demanio* (Zinzi, 1999). Centres of new population are now called *terrae* (lands) while Italian municipalities were called *comuni* (municipalities). That term was changed by Charles I of Anjou (1226-1285) in *Università* (University), from *universi cives* (union of all citizens), surviving until the abolition of feudalism in 1806, by Joseph Bonaparte.

Depending on the property, *unveristates* could be *feudali* if subjected to a local baron or *demaniali* owned by the Crown. The two different statuses meant sensible differences in the local administration and treatment of the population, reflecting wide disparities among cities. The *universitates demaniali* where a minority and directly dependent from the monarchy from which benefitted of various privileges and concessions, in change of fidelity, useful for increase the town prosperity. On the contrary, in *universitates feudali*, local lords exercised their power on the civil population as they wished, frequently resulting in a deprivation of the society. During the Angevine rule, many feudal lords acquired great power and expanded their properties, they rebuilt the mighty castles and fortresses that Frederick II had demolished, becoming states in the State, with unlimited powers also towards the people who lived in their fiefs (Brasacchio, 1977a). Similarly, under the Spanish dynasty, the communities did everything to become *universitates demaniali* subject to the royal authorities, in order to avoid being subjected to a baron who was an even more oppressive lord of the king. Finally, a *università* could have a number of *casali* depending from it such as in the case of Cosenza.

The typical organization of a state-owned *università* (Fig. A1.22) had at its base an assembly that annually elected a *Consiglio* (council) composed of a number of members that varied according to the population. A *syndicus* (Italian: *Sindaco,* English: *Mayor*) was appointed among the members of the council to represent the city in both civil and criminal judgments. *Universitates demaniali* were administered by a *baiulo/baiouolo/baglivo,* a person administrating civil and criminal justice, and responsible of the tax system, assisted by local judges. It was under the supervision of a *Giustiziere* (Proviancial Justice Officer) that envisaged an external control in representation of the royal authority for all the cities located within a justiciarship (Gregorio 1805; Martin 1994, 180; Romualdo

Salernitano 1866, 423)). A *baiulo* remained in charge in its office for a year and was a popular judge as it was chosen among the most distinguished citizen, excluded clerics. Operating in a *università* there were also numerous other offices managed by different elected magistrates or judges such as for the determination of weights and measures, for the administration of justice, for the safety of citizens, for the maintenance of roads, walls and gates (Alianelli 1873). Judges could not be ecclesiastical, servants or subject to feudal jurisdiction. They had to have knowledge of the *ius commune* (the Imperial Roman law conceived as an element of an organized system of co-existing legal sources in which it was coordinated according to certain local rules and rights) of the *ius regium* (the law of the Crown) and of the *consuetudines* (local customs).

The organization of feudal *Universitates* was simpler as the administration of the justice was entrusted to judges appointed by the feudal, yet they took the oath of the provincial *Giustiziere*.
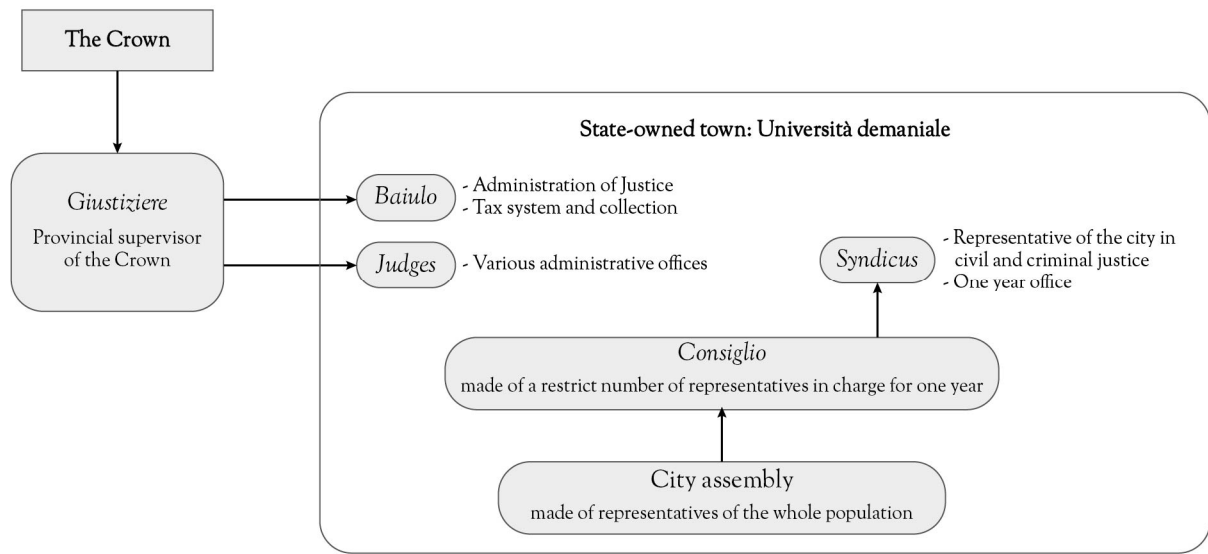

Fig. A1.22 – The typical organization of a state-owned city: *Università demaniale*. Drawings by Guglielmo Minervino

Specialised workforce and corporations

There is no evidence of proper Norman city in Calabria, but rather interventions on pre-existing Byzantine settlements, still following the oriental tradition. The Norman building activity could count on a wide range of experience: the wide Byzantine, and Islamic knowledge is now combined with a northern European tradition based on wooden construction, and the expertise on masonry hold by European monks, architects, and workforces trained in the Longobard area. This was a time of significant movement of people among which architects, master masons, and artisans arrived in Italy from several areas such as the case of Syrian architects and masters moved in Calabria and Sicily for the purpose of building churches as documented in the Vatican Greek code 1591 of the 964 (Cuteri, 2003). However, a significant influence was still exercised by the Islamic workforce already present in Calabria or coming from the Sicily and other areas of the Mediterranean, recognisable in the architectonic techniques, static solutions, and decoration, especially applied for sacred buildings (Castellano 1987; Di Gangi, 2003; Zinzi, 2003).

Since the Norman-Swabian period it is possible to identify the specialised figures operating in relevant construction sits, hierarchically organised in *protomagister*, master masons, and *magistri* (Fig. A1.23).

A *protomagister* (Italian: *protomaestro/capomastro*) is a term used during the Federician period (1198-1250) to identify the responsible for the construction of a building (Castellano 1987; Occhiato 1981). Like the Roman *rector fabricae*, it usually was an architect appointed by a relevant client such as the king, a bishop or abbot, a feudal lord. Under Frederick II, it was launched a royal defensive building program managed by a new office named *praepositus aedificiorum,* an architect in charge of the supervision of every work of the imperial property

(*demanio*), from the castles to the hydraulic infrastructures (Cuteri 2000; Carbonetti Venditelli 2002). There are no evidences of a role of the *praepositus aedificiorum* on civil building activities. The most famous representative of that office was Riccardo da Lentini at the dependence of Frederick II. Since the Swabian period the figure of the *protomagister* continued to be relevant on building sites where operated relevant specialists such as Nicolaus Sacerdos, in Puglia, and Pierre d'Angicourt in the whole south of Italy, both in the XIII century under the French Angevin domination. Other Italian master masons recorded in history are Atanasio di Ricardo Primario (Naples, XIV cent.), Bartolomeo da Foggia (architect, Puglia, XIII cent.), (Giorgio di Matteo from Zara (Northern Italy, XV cent.), Andriolo de Santi (Stone cutter, sculptor and architect, Northern Italy, XIV cent.), Calendario Filippo "Tajapiera" (Venice, XIV cent.).

A *protomagister* manages and supervises a work through a number of master builders (Italian: *capomastro*; Franch: *maitre-mason*, English: *foreman/master mason/superintendent*). A master builder is the one who, being for skill, emerged from the ranks of the workers after having been a worker himself. It is able to provide for the execution of the complexes drawings of the architect, the organization of building sites, and eventually to design the work to be carried out in not too important cases. In the Middle ages, masters were at the head of corporations called guilds (*Arti* in Italy) aiming at keeping and transmitting the tradition in a regime of secrecy. The status of master was achieved after having been an apprentice, for one or more years, and a journeyman through a process of apprenticeship which length varied from one to even twelve years, different for every trades and crafts (Renard 1918). In the north of Italy, the "Maestri Comacini" was corporation of builders continually active since the VII century until the XIX century, well known for sending its masters wherever they were requested (Merzario 1893). The last figure is the *magister*, skilled workforces in various arts such as masonry, stonecutting, carpentry, and organized in team belonging to the respective corporation. For instance, the *caementarii* were those experts working with the cement.

That type of organization regards big size construction projects such as churches, castles, palaces, or aqueducts and bridges. Civil residences were usually built by the owner of the property, eventually recurring to local specialized workforces.
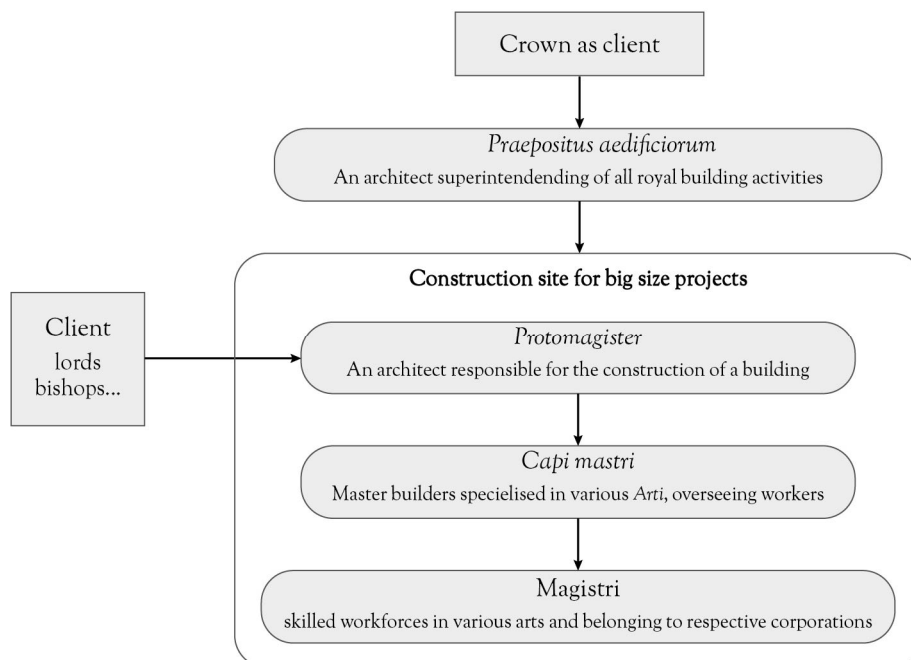

Fig. A1.23 – The building site organisation in the Italian Middle Ages. Drawings by Guglielmo Minervino

A significant role in the training and spreading of skilled fork forces was due to the monastic orders such as the Benedictine from the abbey of Saint-Evroul-sur-Ouche in Normandy, that were experts in the use of well-shaped ashlars. In Calabria, relevant was a branch of the Cistercians monks under the guide of Joachim of Fiore (1135–1202), from San Giovanni in Fiore, a calabrian town in the Sila plateau. They largely influenced the Calabrian

society and economy by hosting groups of workers in their numerous settlements, 38 only in Calabria, and others in Campania, Lazio, Puglia, and Tuscany (Passalacqua, 2002). As established in the Rule of the Benedictine monastic order, artisan monks were allowed to work in their respective arts (St. Benedict, 1947; Benito & Doyle, 2001), and several of them were expert architects and builders among which Robert de Grandmesnil was a popular *protomagister*, abbot and architect working in the South of Italy in the XI century (Basile 1975; Occhiato 1981; Zinzi 2003).

State legislation and jurisprudence

Among all the Normans rulers, king Roger II was the one that maintained the most tolerance in the kingdom for all faiths, races and languages. This is well evident from his *Assizes of Ariano* (Appendix 2), a juridical corpus that formed the new constitution of the Kingdom of Sicily, promulgated in the summer of 1140 at Ariano Irpino (Campania) (Brandileone and Capasso 1884; Zecchino 1984). The *Assizes* were the attempt to establish centralised government by a bureaucracy seeking to maintain the feudal system under the strict royal control. The juridical text contained forty-four clauses concerning the private property, the public property, the church, civil law, royal finances, the military. The work derived its precepts not only from the Norman and French legislation, but also from Muslim and Byzantine legal theories, especially from the Justinian code. In particular, the *Assizes* established two important principles: 1) that for all that was not in direct contradiction with the *Assizes*, each of the subjects would continue to live according to the previous laws and customs, distinctly for each community (Zecchino, 2005); 2) that the Law was of direct and exclusive royal emanation and therefore only the king could be considered above it (D'Onofrio 1994, 183--187).

Few years after the promulgation of the *Assizes*, Roger II commissioned the drawing of the *Catalogus Baronum*, a list of all Norman vassals and related possessions with the purpose of controlling the periphery and ensures stability for the kingdom (Cuozzo, 1984). The work was done by the *duana baronum*, an office of which staff was mainly formed by Arabs, and probably based on the model of the *dîwân al-majlis*, introduced in Sicily by the previous Fatimid rulers for the control of the transfer of land ownership (Kiesewetter 2004; Matthew 2004).

In 1230-1231, as part of a reorganisation of the administration of the royal castles, Frederick II introduced the *provisore castrorum*, a public figure with the office of supervise royal castles and verify the obligations of the communities to the maintenance of them according to custom (Houben, 2005a). At the conclusion of the job, those officials compiled the *statutum de reparatione castrorum* which listed 225 *castra* and *domus* (family residences*)*. Areas of operation of the *provisores* were 5 districts: Abruzzo; Campania and Molise; Puglia and Basilicata; Calabria and eastern Sicily; Western Sicily (Houben, 2005a). Unfortunately, the part relating to Calabria and Sicily is lost. The number of the communities in charge of the maintenance of castles varied considerably, from two to more than twenty, and there were not those located in the immediate surroundings. This might followed a political strategy that is the will, on the part of Frederick II, to prevent castles from linking too closely with the immediate communities which could result in a threat for the stability of the Imperial power (Houben, 2005b).

The drafting of the *statutum de reparatione castrorum* is part of the wider Federician project of a collection and codification of the laws and customs of the Norman age that resulted, in 1231, in the issue of the *Liber Augustalis,* also known as the famous Constitutions of Melfi (*Constitutiones Regni Utriusque Siciliae* or *Constitutionum Regni Siciliarum*) (Appendix 2) (Tardioli, 1985). The Constitutions represent a body of rules and laws that regulated the common life in the kingdom of Sicily. Starting from the *Corpus Juris Civilis* of Justinian and integrating the Norman legislations and customs, they have been adapted to the new imperial system, and to give to the State a unitary imprint under the centralised power of the emperor flanked by the *Magna Curia*, the council of the main imperial officials. For the first time, the Constitutions dealt with the hygienic problem by regulating the cleaning activities of cities and tanning artisan workshops.

1.4 – French and Spanish (XIII-XVIII)

In 1266, the French Charles I of Anjou succeeded to the Swabian dynasty in ruling over the southern Italian peninsula. Soon, French lost the Sicily that become a Spanish province of the realm of Aragon after the Sicilian Vespers, a civil insurrection that divided the previous Norman-Swabian Kingdom in two, the Kingdom of Sicily ruled by Spanish, and the Kingdom of Naples under the French (Fig. A1.1f).

Under the Angevin, the south of Italy and particularly the Calabria, went through a long period of struggles and instability, with negative consequences on productions, limiting any possible forms of social and urban development (Zinzi, 1999). The administrative system during the Angevin domination was very lacking, characterised by abuses and excesses perpetrated by local public officials of which operate remained unknown to the central government (Dito, 1979). The civil population was even required to take care of the maintenance of castles, therefore, residential settlements around those military structures had to cover the expanses of restoration both in terms of workforce and economic funds. Furthermore, most of the economic and financial activities were in the hands of foreigners, especially Florentine merchants that took advantage of the few local productions, limited to raw products such as silk, wheat, and wool coming from the huge latifundiums, property of barons and clericals (Salerno, 2013). In the XVII century, that situation further exacerbated due of epidemics, earthquakes, floods, pestilences and famines.

The French monarchy lasted for almost two centuries, until the 1442 when Alfonso V of Aragon conquered Naples, the capital, assuming the crown (Alfonso I of Naples) and reuniting the whole southern Italy (Fig. A1.1g). During the Aragonese, the vexations from local barons increased, causing a strong popular resentment that resulted in several revolts, such as the one organized by Antonio Centelles in 1459, viceroy of Calabria, against King Ferrante, tamed in the blood by the royal army (Fodale, 2001). However, despite the oppressive taxation and the growth of baronial power, at that time town statutes shows a population loyal to the sovereign, seen as the supreme defender of the poor against the abuses of the local powerful men. Under the Aragonese, the Calabrian economy was predominantly agricultural and pastoral, but with a certain animation from the artisan and commercial point of view. This can be deduced from the numerous fairs held in different cities such as in Catanzaro that had even six fairs in a year (Grohmann, 1969).

With the end of the Aragonese domain, at the turn of the 1500, the kingdom of Naples fell under the control of the royals of Spain that ruled it through viceroys. The administrative structure, although strongly centralized, was still based on the ancient feudal system which, however, did not prevent several cities from obtaining the desired public status (*demanial*), key of access to the independence allowing more development possibilities.

With Naples being a prosperous capital, the south of Italy remained a direct possession of the Iberian dynasties for more than two centuries, deeply influencing the culture and customs of southern Italy until the end of the Spanish succession war in 1713.

1.4.1 – Urban settlements

Between the XIII-XVI centuries, none of the Calabrian settlements had a big size, reflecting a tragic phenomenon of abandonment and decreasing in population in all the urban centres due to the Franch-Spanish wartime and economic crisis. The 1276 Angevine registers recorded 374 residential settlements, while in 1505 only 245 are reported in the *Levamentum foculariorum Regni*, a register with the census of the all inhabited places of the kingdom (Zinzi, 1999). Northern Calabria had only ten centres of 5.000-8.000 inhabitants, and only four settlements of 5.000-6.000 inhabitants were recorded in the southern part of the region. Cosenza recorded only 2.901 people and Reggio less than 5.000 (Zinzi, 1999). During the Aragonese domain, Calabrian towns experienced a rising politic, economic, and social vitality, although they were still small centres. In 1443 only the 6,97% of the population lived in 21 centres with a number of people between 2000 and 5980, while the remaining 94,03% inhabited 280 settlements of less than 2000 persons each (Cozzetto, 1986).

In this prosperity-adverse climate, due to the feudal system, some city did better than others taking advantage of their administrative status, such as for the city of Cosenza which, during the sixteenth century, experienced an impressive artistic and humanistic flowering so much so that under the Aragonese ruling it was called the "Athens of Calabria" (Caruso, 1970). Cosenza clearing benefitted from its *demanial* status and the position of being the administrative capital of the Calabria Citeriore (North). Capital of the Calabria Ulteriore (South) was instead Reggio Calabria which held the role for 12 years until the 1594 when, because the Turkish incursions, left the seat of the administrative offices of the governorate to Catanzaro for the next 220 years. Those three towns are still today the most developed and large in size of Calabria. Among them, however, only in Cosenza and partially in Catanzaro it is still possible to observe the mature complex urban fabric that in the XVI-XVII centuries had a crucial phase of development. About Reggio Calabria, the 1783 and 1908 huge earthquakes totally destroyed the city, leaving no traces of the old town of which we can have a general idea from the view in fig. A1.24. A similar fate hit most of the other Southern Calabrian settlements (Vivenzio 1788; Principe 2001).

Looking at the monastic places, they coincided with the most wealthy and populous centres, confirming a continuity of the significant influence of the Church on process of urban development. Monastic orders had their own reference on how to build ecclesiastic structures such as the treatise of the Archbishop Charles Borromeo (1538-1584) named *Instructionum Fabricae et Supellectilis ecclesiasticae* (instructions concerning the construction and the ecclesiastical furnishings). The work become a reference for other monastic orders such as the Capuchin for which the architect, father Antonio da Pordenone wrote the *Memoriale su come fabricare un nostro picciol e ordinato monasterio* (Memorial on how to make our small and orderly monastery) (Spanò 2009).

Fig. A1.24 – Reggio Calabria, engraving from the 1761. Giambattista Albrizi, *Storia moderna di tutti i popoli del mondo. Il Regno di Napoli* (Tom. XXIII, plate 50). Venice

Significant indication on the urban fabric of XVI-XVII centuries came from the city of Cosenza, at that time the most important centre of Calabria. Two representations of the city, from 1584 and 1703 (Fig. A1.25) show a much smaller and less dense city in the most recent picture. This is possible if one takes in account the earthquake of 1638 that caused severe damages to the city. The first half of the XVI century saw the employment of specialist from Tuscany in military and religious building sites which architectures showed forms of the Renaissance stile. Cosenza prevailed over the other Calabrian cities for being the stage of workforces from central Italy employed also in civil architecture works both of private and public commission. However, contemporarily to the use of stiles from the western architectural tendency, local workforces continued to elaborate forms derived

24

from the byzantine tradition, never interrupted during the Middle age and still alive, especially evident in the domes (Bozzoni, 1999).
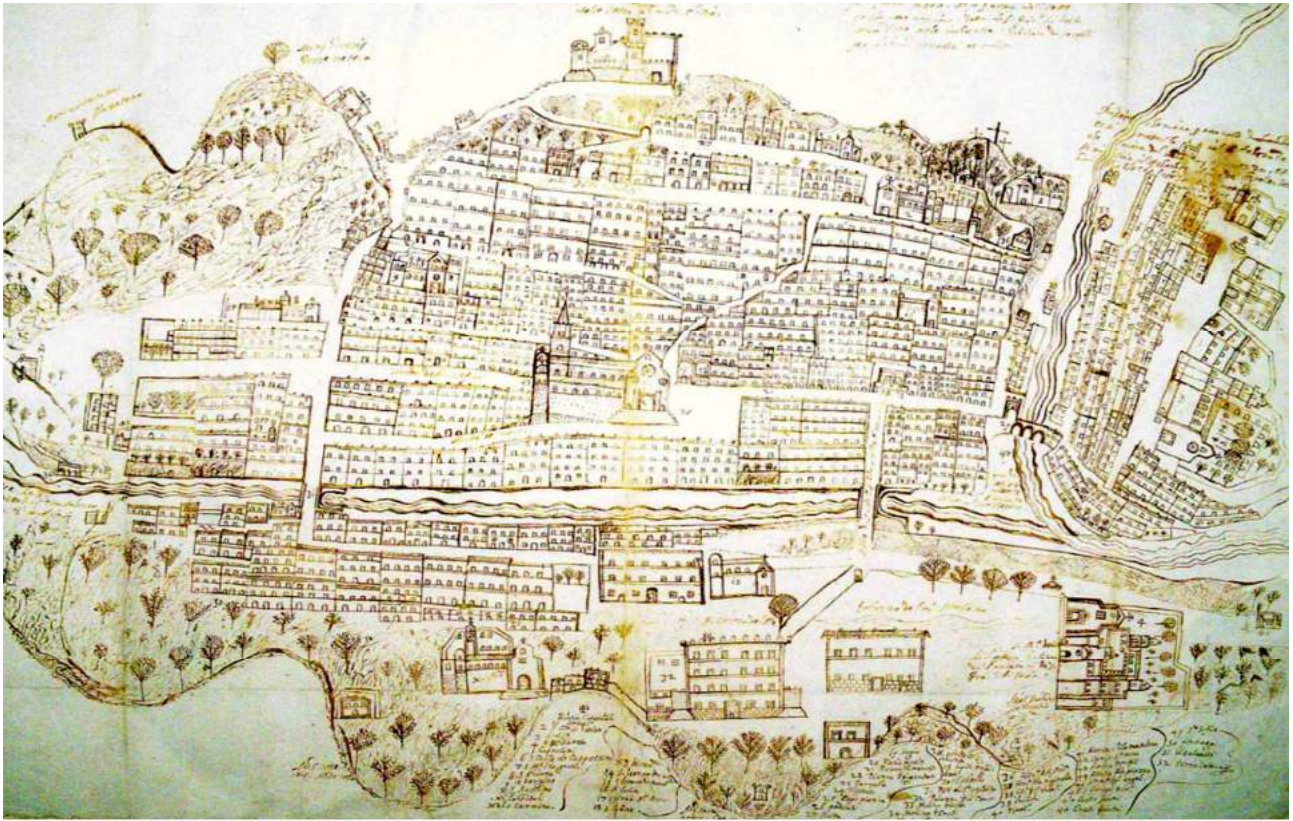

Fig. A1.25 – *Above*) Cosenza in 1584. Drawing by anonymous, located in the Biblioteca Angelica, Rome. *Below*) Cosenza in 1703. Drawing by G.B. Pacichelli. In *Il regno di Napoli in prospettiva diviso in dodici provincie*. Napoli: Stamperia di Don Antonio Perrino

The urban fabric adapts to the morphology of the hill, in continuity with the common practice to all the other settlements introduced since the Byzantine period. The hill-top is for fortified structures, the Swabian castle in this case, and the centre of the city is occupied by the cathedral that embraces the surrounding residences. The ancient town presents a consolidated and stratified urban fabric characterized of 3-4 stories buildings adjoined

one each other. Most common housing typologies, still in place today, were *case palaziate*, *case locanda*, *case profferlo*, *casaleni* and *habili*, towers, rural houses, buildings dedicated to the milling art, and convent complexes.

The *case palaziate* (palace houses) (Fig. A1.26) are the complex result of a long time incremental building process made of various constructive moments such as additions, merging and separation of different housings, several changes of property with buying and selling activities documented in notarial deeds. Therefore, the house looks like a palace but its genesis was not planned in advance. The typical casa *palaziata*, has a low ground entrance leading to a inner quadrangular court of shared property between the various housings reachable by a common staircase. In the most ancient types, the staircase leads to a gallery running around the courtyard (Fig. A1.26). The low ground facing on the street usually hosted a number of shops and artisanal workshops.

The *case locanda* (inn houses) are instead the most typical Medieval typology of housing made of a sole room on the low ground for commercial purposes, an upper level space for residential purposes and eventually an attic for storage and treatment of food.

The *casa a profferlo* is a building having an external staircase leading to a terrace landing on which opens the entrance at the upper level. Under the staircase there is usually a small room for commercial or artisanal purposes. The whole architectonic element made of the room, staircase and landing is called *profferlo* from the latin *profenŭlum*, derived from the Greek ροφερής, «front place». The *profferlo* is the equivalent of the Longobard *gafio*.

Casaleni and *habili* are simple small buildings serving the main house and fully dependent of it.

In conclusion, the Cosenza example provides significant insights on the generative formation process of Calabrian towns. Even in a weak socio-economic equilibrium due to conflicts between local feudatories, and oppressive taxation from the viceroys, the city showed a significant cultural autonomy. This is reflected in the transformation of housing that seems to be completely determined by private dynamics as a result of the purchase and sale of properties that may have been merged or separated in the free will of the owner. Transactions were than formally recorded by notaries.

| ground floor | first floor | second floor | third floor |

Fig. A1.26 –Plans of a case palizziata in Paola. It is evident the difference in floors perimeter as result of the merging of multiple properties and expantions. Drawing elaboration by Guglielmo Minervino

1.4.2 – Elements influencing the urban structure

Local legislation: the city's statutes

During the second half of the XV century, Calabrian municipalities experienced a remarkable flourishing. The consolidated agrarian landownership was now accompanied by a slow growth of the bourgeoisie class, made up of artisans, merchants, clerics and professionals. They found a fertile context in public cities that gradually took advantage of their autonomy by a process of reorganisation of public apparatus. The most significant aspect of that new city governance has been the formation of city statutes, a set of local shared law codes regulating the organization and functioning of the municipality, also allowing transparency and clarity in the decision-making process concerning all the aspect of the society. Town statutes addressed issues concerning the relationship between people and the public administration. Contents of the statutes varied among towns, yet, they took inspiration from one each other, resulting in a general organization common to all of them concerning public offices, elections, inheritance, workplaces, civil, commercial and criminal matters, also including the local customs (*consuetudines*) until then orally transmitted. The application of such rules had an impact on the management and transformation of the built environment, on which matter statutes contain some specific articles (Fig. A1.27).

Although statutes were a transparent source helping the city governance, life took place under the contrasts between nobility and people and often even among neighbouring communities, both where the people predominate, as in Catanzaro, or the nobility, as in Cosenza, and even where there was a precarious balance of forces such as in Crotone and Reggio (Brasacchio, 1977b).
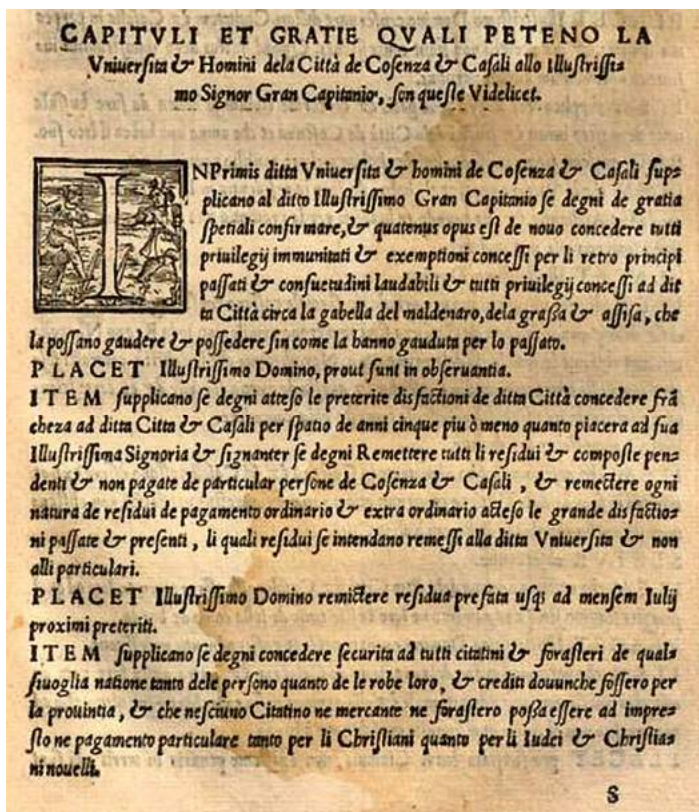
Contemporary to the advent of statutes, traditions and customs continued to be transmitted orally thanks to the bourgeoisie, a new social class that allowed merchants and crafters to rule cities without being on the dependence of local lords. Most of the bourgeois people were members of guilds that increased their power by establishing monopolies for each represented profession. Guilds also adopted their own statutes as main source for the internal management of the corporation and to establish rules to keep the tradition secret (Davy 1999). This is the case of the art of silk for which, in Calabria, the *Capitoli Ordinazioni et Statuti dell'Arte della Seta* (the articles, orders, and statutes of the art of silk) was written in the XVI century.

Fig. A1.27 – Part of the page 69 of the Statutes of Cosenza from a copy from 1557

New immigrations and minority groups

The Calabria region has always been a place of immigration for population from all the Mediterranean basin and more. Along with the mayor flows of Greek, Longobards, Near east populations, Normans, French and Spanish, a number of minority groups established in Calabria since the XIII century such as the Arbëreshë and the

Waldensians. Jewish people arrived in Calabria in the II century and remained until half of the XVI century, significantly contributing to the economy of the region.

The largest community is that of the Albanians. The first phase of settlement took place in 1448 following the Arab conquest of the Balkan Peninsula. The other phases that followed were due to Turkish raids. The first allocations of the Albanians were in the province of Cosenza, and then extended to the territory of Catanzaro (Fig. A1.28).
In 1458 the Albanian fighter Giorgio Castriota Scanderbeg arrived in southern Italy to support the king Don Ferrante against the revolt of the barons. The Albanian condottiere obtained in Italy a series of noble titles, and the annexed feudal possessions, which were shelter for the first communities. After 1478 the sovereign allowed these refugees who escaped from the Turkish advance in Albania to occupy entire desolate or abandoned Calabrian villages in order to repopulate them, granting them also numerous privileges and royal exemptions. Albanians were so numerous that in the 1543 they had already repopulated 45 *casali*. (Zinzi 1999).
The Arbëreshë communities likely imported their own customs that flowed into the local statutes. The notice of a statute of the village of Cerzeto reports that there were norms addressing building matters such as the colour of housing facades.

A group of Waldensian reached the Calabria in the XIII and XIV century establishing in a *casale* of Fuscaldo, then became a proper town named Guardia Piemontese (Fig.A1.29) that is the only one fully founded by them. Other groups found place in the already existent towns of Montalto Uffugo, San Vincenzo la Costa, Rose, San Sisto dei Valdesi. Waldensian were persecuted religion people hailing from Western Alps to which some Calabrian landowners offered lands to be cultivated in exchange for an annual fee, with the right to constitute communities free from feudal obligations (Gilles 1644).

Since the II century, it is documented the presence of many and numerous groups of Jews residing in Calabria in their neighbourhoods called *judaiche* or *Giudecche* of which only the memory remains in some local toponyms.
The ancient *Giudecche* occupied central sectors of the city. This indicates a certain degree of integration of the Jewish group in city life but, many other *Giudecche* consisted of a section of the road bordering city walls, and this indicates rather a social marginality. The suburban location of Jewish housing compared to the centrality the of social and political life could simply be due to the fact that the Jews were in these cases the last have come to the city, therefore physically added to the city nucleus (Vivacqua 1996). The construction and repair of synagogues is also documented in the Angevin policy of support to the Jewish communities as they were deemed to be laborious and with financial resources necessary for the royal court (Zinzi 1999). The Aragonese domination was one of the happiest for the history of southern Italian Judaism. The relevant datum of the Jewish presence in Calabria is the widespread diffusion of the settlements, even in the smallest and remote centres of the region (Vivacqua 1996). The most numerous communities in the late XIII century were in Cosenza, Rossano, Crotone, Monteleone, Reggio, Castrovillari and Catanzaro. After the XVI century, they represented the only efficient source of financial and commercial activities managing important sectors such as the silk. They also benefitted of the exclusive privilege, granted by local governments, to lend money (Gianolio 1999).
The Jewish presence terminated in the 1541 when the Viceroy Pedro of Toledo issued the deportation order for Jews from the Kingdom of Naples. The last communities that had already settled between Brindisi and Rome disappeared from the towns in which they had found shelter.
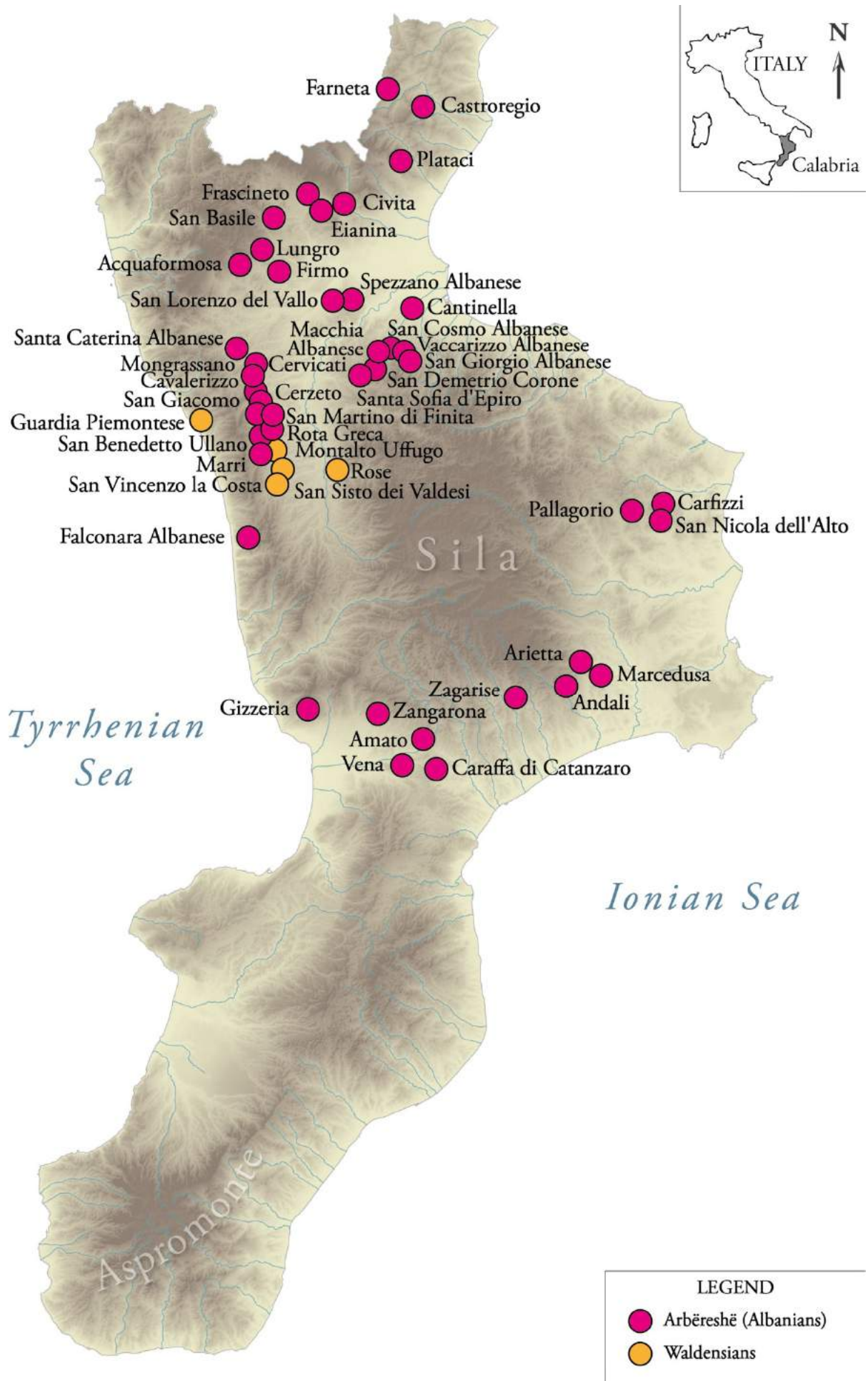
Fig. A1.28 – Minorities settlements in Calabria. Map by Guglielmo Minervino

Fig. A1.29 – The Waldensian town of Guardia Piemontese. Photo by Guglielmo Minervino

1.5 – The Bourbon dynasty (XVIII-XIX)

In the 1713 the Spanish domination over the Italian peninsula finished, leaving space to the Austrian brief period under the Habsburg family that, however, lost the Kingdom of Naples in 1734 when the House of Bourbons ascended to the Crown. The Kingdom of Naples and the Kingdom of Sicily were unified in the 1816 under the name Kingdom of Two Sicilies that persisted until the 1861 (Fig. A1.1h). The Bourbon dynasty was shortly interrupted between 1808 and 1815 by Napoleon who appointed Joachim Murat at the head of the Kingdom until he was executed in Calabria in the town of Pizzo Calabro.

During the Bourbons period, the abolition of feudalism was the point of arrival of a process aimed at facing latifundium practices, the main obstacle to agricultural progress in the rural south, predominant sector now fostered by the reclamation of swamp areas. In 1792 a law on state-owned reform (reform of the *demanio*) foresaw the reduction of the latifundium by creating a class of small and medium-sized landowners, which would have transformed the peasants into small direct farmers. That process, repeatedly taken up, did not work completely, effecting negatively on the economic conditions of local agricultural workers. The industrial sector was instead a developing field, supported by the Bourbon government through a policy aiming at reaching the economic independence of the realm. Main symbol of that policy was the Ferdinandea Foundry and the ironworks both in Mongiana, Calabria. There, the iron extracted from the numerous mines in the area was processed for the entire kingdom.

In 1783 the Kingdom had to face one of the biggest earthquakes that ever hit the entire Italian peninsula. Five consecutive earthquakes interested the central and southern Calabria. With magnitudes between 5.9 and 7.1, it caused roughly 30.000 victims and extensive destructions that interested almost all the Calabrian centres. That dramatic episode moved the royal authority to undertake a state program of reform concerning the in vogue building practices that since then moved away from the traditional model toward a modern urban planning, in that case coordinated by state technicians sent in Calabria for the reconstruction works (Principe 2001). For Calabria, the earthquake of 1783 was an opportunity

to launch a series of extraordinary measures that include not only the reconstruction of destroyed centres but also a reorganization of the entire welfare system.

After the earthquake, the Calabria region, until then mostly unknown to the Europeans, become more attractive from a scientific point of view. The XVIII-XIX centuries were in fact the time of European travellers undertaking what was called the *Grand Tour*. This was a long trip to the most interesting countries in Europe among which Italy was a must. So it became a journey not only for education, but above all for pleasure and desire for adventure that, in the eyes of time travellers, could be found in Southern Italy. In Calabria only a few of the 450 travellers decided to set foot in it, among which there were Edward Lear, Arthur Strutt, Bartels, and Swinburne that produced valuable descriptive sources of the at that time settlements an society (Praino 2016).

Finally, at the end of the eighteenth century the kingdom had to cope with the scarcity of terrestrial communication routes. The Bourbons were particularly interested in the construction of new public works coordinated by several technicians formed in the oldest Italian civil engineering school named "Scuola di Ponti e Strade" (School of Bridges and Roads), founded in Naples at the behest of Joachim Murat in 1811. On October 1839, the inauguration of the first Italian railway that connected Naples with Portici guided the South of Italy in the modern age with decades in advance respect to other European countries.

1.5.1 – Urban settlements

The aspiration for an overall reform of the realm takes shape in the formation of a select group of professionals committed to designing and managing an articulated plan of architectural and urban development, with the opening of cities to the vast surrounding territory and the radical renewal of aesthetic canons and civil customs, updated to the taste and needs of the emerging bourgeoisie (Malangone 2006). Architects and various technicians working in the kingdom were educated by studying Renaissance architectural treatises, which influence was still strong after centuries.

If this scenario was applicable to the major and wealthy cities, the general situation of the enormous realm is described by the historian Raffaele de Cesare, in 1895, as strongly disadvantaged, as at the end of the Kingdom of the Two Sicilies there were neglected public hygiene conditions, especially in smaller municipalities. He highlighted the absence of sewers, house toilets, and a scarce use of water. Referring to public space, he noticed that only few were paved or cobbled, and with numerous puddles and sludge in the others. Domestic animals were also free walking in the streets. That was due to the fact that farmers were living in the old part of the cities along with animals in the low ground. The general picture is a realm where the municipalities had no means to cope effectively with the management of the city, resulting in a situation where the poor people were abandoned to themselves, while the gentleman had their houses on the main road that made paved for their personal use.

Images of the XVIII century Calabria come from the descriptions and drawings (Fig. A1.30) made by several European travellers that decided to make a stop in Italy during the *Grand Tour*. Southern regions where generally avoided due to a bad reputation and the Calabria region was visited by only few and most adventurous of the travellers in the XVIII and XIX century. However, most of the descriptions were made after the tremendous 1783 earthquake, which effects remained evident for years, filling the notebooks of adventurers with pictures of distressed settlements.
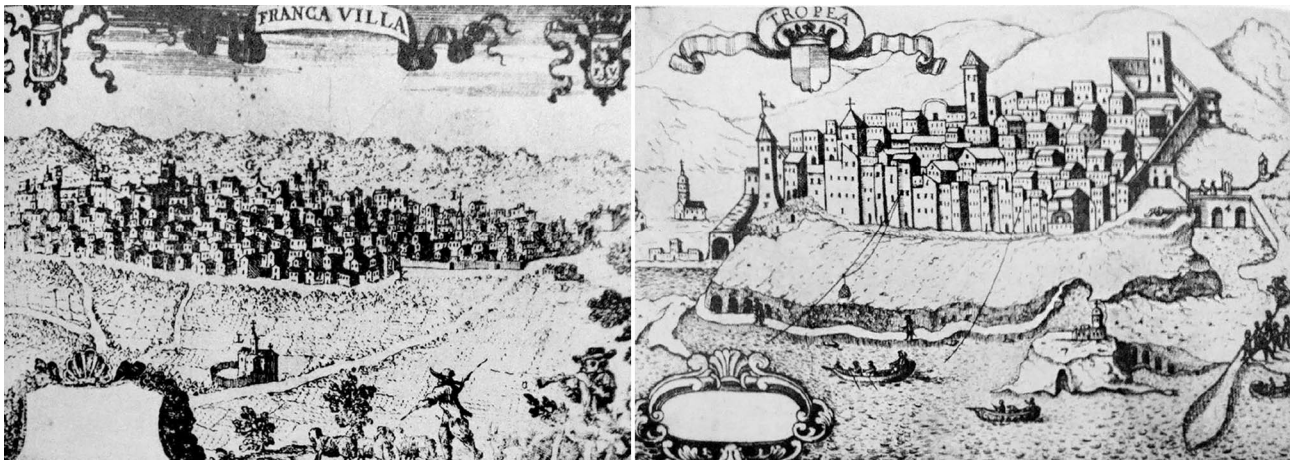
Fig. A1.30 – The cities of Francavilla and Tropea in early XVIII century drawing by G.B. Pacichelli. In Il regno di Napoli in prospettiva diviso in dodici provincie. Napoli: Stamperia di Don Antonio Perrino

Nevertheless, the Bourbons period was one of the most progressive in Europe. An innovation concerning the city governance was promoted by the Italian Enlightenment reformers that have developed a new conception of property requiring the introduction of the cadastre. The aim was to introduce a tool of land registry for implementing more equitable taxation system. Through the "Catasto Onciario" of Napoles, initiated in 1756, it is possible to trace a detailed, albeit incomplete, physical, economic and social description of the entire kingdom.

Rural areas result productive and dotted by farmhouses, while urban centres like Cosenza are relatively poor and scarcely populated. The real estate is largely owned by the ecclesiastical institutions that rented the houses to the lower classes of a quite various society (Fig. A1.31). Overall, the city was divided into areas of varying size and population density, composed of neighbourhoods often coinciding with a single street. In the suburbs, the last arrivals from the surrounding towns reside in simple houses. Moving towards the city centre, the more affluent classes reside in palaces. Commercial streets were located in the urban districts where they generated more rental income (Teti 2000).

The urban fabric was mostly made up of *case locanda*, located in the suburbs and mostly owned by the ecclesiastical institutions that rented them, of common houses having more rooms, and of *case palaziate*, larger multi-storey buildings usually divided into a number of apartments (Teti 2000).

Similarly to previous centuries, the *case locanda* were widespread minimal housing, consisting of one or two overlapping rooms where the ground floor was eventually used as work spaces. Externally they could have a wooden or masonry staircase with a small landing called *mignano* (from Latin. *maenianum*, in Rome, the outer balconies of the houses, especially those facing the courtyard). The *casa palaziata* (palatial house) was now an indicator of a more wealthy property, resulting from the aggregation of more minimal units characterized by a *basso* ("low", ground floor with commercial activities) and a *alto* ("high", residences and attics). In the suburban districts of Cosenza and in the oldest ones, the presence in origin of minimum unit types, often autonomous among them, favoured the leasing and sale of single real estate units within a single palatial house that resulted from the merging of such original buildings. The apartments were minimal, often even formed by one or two rooms, and separated by simple wooden partitions.

Finally, rural areas saw the new XVIII century bourgeois class that, inspired by the Enlightenment ideas, promoted the practice of building suburban villas as temporary residences for leisure time, connected to the surrounding territory also as farms. Examples of that practice are present even in the extreme peripheries of the realm such as in Stigliano, near Reggio Calabria (Valtieri 2000).
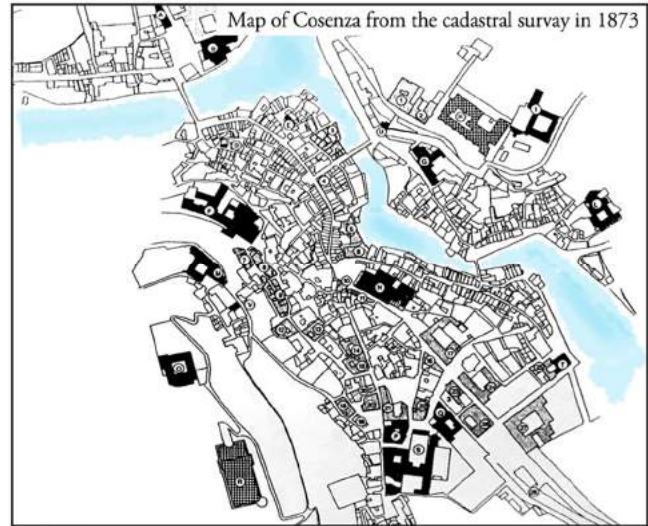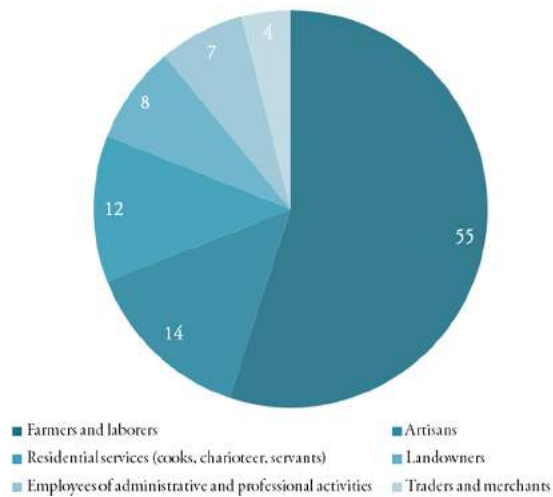
Fig. A1.31 – The Social fabric of Cosenza and its urban structure in the late XVIII century based on the cadastre, from Teti, 2000. Urbanesimo e assetto insediativo a Cosenza nel XVIII sec. Alcuni dati di lettura el catesto onciario. In Rosa Maria Cagliostro (ed.) 1734-1861. I Borbone e la Calabria. Roma: De Luca. Graphic elaboration by Guglielmo Minervino

1.5.2 – Elements influencing the urban structure

Natural calamities motivated new building techniques and planning

On February 5, 1783, in Calabria began one of the longest and most disastrous seismic periods that have ever occurred in Italy. There occurred 5 tremendous shocks whose overall effects devastated most of the Calabrian territory and the north-eastern Sicily. The numerous and violent earthquakes caused impressive effects on the natural environment to the point that large areas of central and southern Calabria were overturned in their landscape. The seismic sequence lasted for more than three years, causing, according to official estimates, the death of 30,000 people only in Calabria, and thousands more died in the following years due to famine, disease and hardship. Referring to the 391 Calabrian settlements, a synthetic list of the damages is reported by Vivenzio: 33 totally destroyed, to be refunded in a different place, 150 totally destroyed, to be rebuilt in the original place, 91 partially destroyed and partially uninhabitable, 44 partially destroyed and partially cracked, 14 totally cracked and uninhabitable, 26 only damaged, 14 where few houses were damaged and other cracked, 5 partially destroyed, 7 almost totally destroyed, 4 where only few buildings were cracked, 3 remained undamaged (Principe 2001) (Fig. A1.32). Earthquake victims made up for the lack of housing by built emergency homes in the form of huts (*barracchè*) near the original village, as in the case of Catanzaro, Pizzo and S. Lucido where the houses were small and made of wood and bricks, generally more resistant to earthquakes (Hamilton 1783; Stolberg 1794).
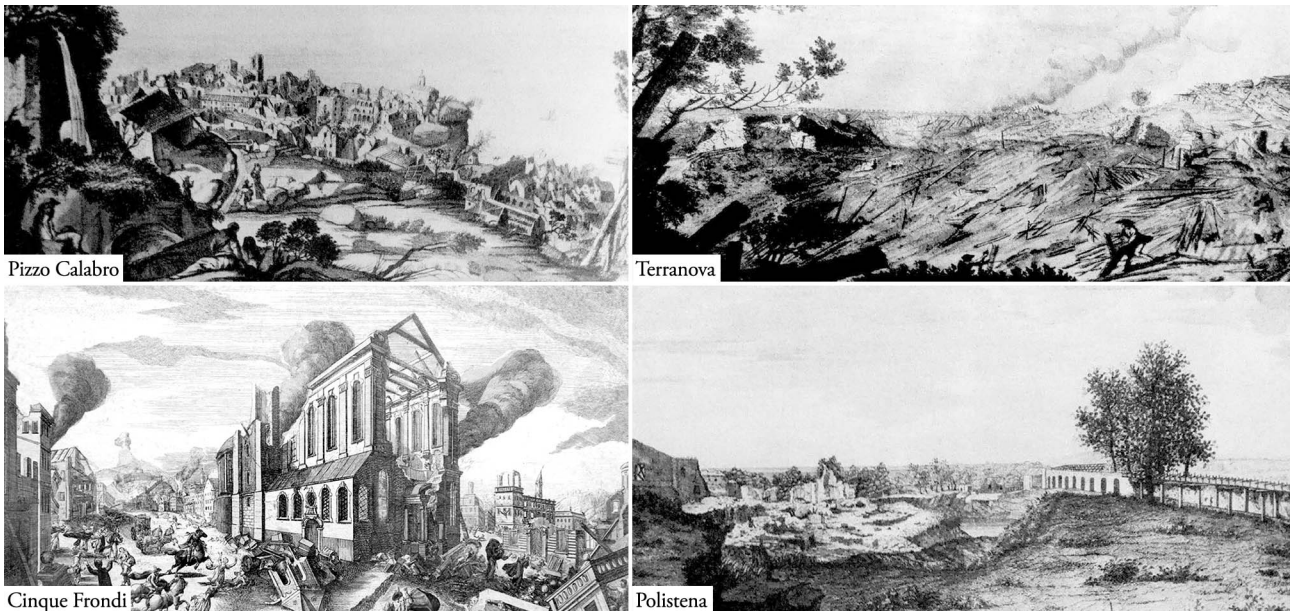
Fig. A1.32 – Pictures of ruined Calabrian towns after the earthquake of 1783.

The king of Naples, Ferdinand IV of Bourbon, decided to quickly intervene by appointing as Vicar General of the Calabria the Count Francesco Pignatelli, with the task of organizing the first aid and following the long phase of reconstruction. The size of the catastrophe pushed the whole Neapolitan and Calabrian leadership class of the time to become aware of the need for an extensive and radical reform of the economic and housing system of Calabria (Principe 2001). Dozens of towns were abandoned and rebuilt on different sites. The reconstruction projects developed by the Bourbon government raised the problem of the new location of the settlements to be rebuilt, examining in depth the relationship between the nature of the soil and populated centres, between villages and the territory, between the effects of the earthquake and the type of construction.

The proposals for transferring entire populations provoked a cultural conflict between the popular classes, that did not want to move, and the management groups (Scafoglio 1984). For example, as can be seen from the report by Dolomieu, a French geologist visiting Calabria earthquake in 1783, the inhabitants of Oppido saw the impositions to the transfer to the new centres as deportations. Among their motivations to remain in the destroyed settlements there were those that their towns have already been tested by numerous other earthquakes, that they would have reused the stones and timber of the houses to rebuild them, that the air was much better, and their landholdings closer. All these advantages together compensated the inconvenience of having to get water at the bottom of the valley, a task that did not represent a burden for them (De Dolomieu 1784).

Grimaldi (1963) lists as many as thirty-nine engineers and architects called to work in Calabria for post-earthquake reconstruction. Their work made clear the beginning of a new model of urban organization that goes beyond the ancient one characterizing the medieval villages. The reconstruction was conducted under new criteria regulated by the spatial planning practice, concerning also the location of certain functions of primary importance such as first aid. For the first time health principles are introduced such as the recommendation for an extra-urban localization of hospitals and cemeteries. Hospitals have always to be in one of the extremes of the country and turned to the dominant winds that will remove the exhalations.

In drawings of new urban plans, it is evident the intent of rectifying the road network by an orthogonal grid with at the centre a main square where public buildings open (Cagliostro 2000). Not all the projects seen light but the influence from the Renaissance style and a new conception of the city was in the education of technicians operating in Calabria at the end of the XVIII century, laying the groundwork for the modern urbanism (Fig. A1.33).

Fig. A1.33 – New plans for Calabrian cities compared with the previous urban structures. Pictures from   Valenise, Francesca. 2003. Dall'edilizia all'urbanistica. La ricostruzione in Calabria alla fine del Settecento. Roma, Gangemi

Specific *Istruzioni*[5] (instructions), issued by the Bourbon government on March 20, 1784, were written for use by the technicians responsible for planning and reconstruction (Ruggieri 2016a) (Appendix 2). The Royal *Istruzioni* is an anti-seismic code providing indications on the shape of the cities, the regularity of the dislocations of the buildings, the width of the streets, and gave precise rules for the structure of the buildings (Ruggieri 2016b). Concerning the urban structure, a straight main road 8 meters wide was indicated for smaller cities, while for the most important cities it should have been from 10 to 13 meters. The prescription for secondary roads was from 6 to 8 meters wide, straight and orthogonal to each other. A large square for the main market had to be proportionate to the population served also by smaller squares with parish churches and other public buildings. Furthermore, the *Istruzioni* prescribed that every city must have its underground canals, thus sewers for the drainage of garbage and dirty water (Barucci 2000).

The reconstruction of entire cities and towns, such as Reggio Calabria, Messina, Mileto, Palmi, Taurianova, was designed according to totally new urban planning rules, which can rightly be seen as one of the first European attempts to introduce anti-seismic legislation aimed at reducing the seismic

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[5] *Istruzioni per gli ingegneri commissionati nella Calabria Ulteriore (Instructions for Engineers commissioned in the South Calabria)* in G. Vivenzio, *Istoria de' tremuoti. Atlante*, a cura di G.E rubino, Catanzaro, Giuditta 1992 – 89-97

risk (Boschi et al., 2000). Vivenzio (1788) reports that the *Istruzioni* "…in order for the buildings to resist to earthquakes in the future it was decided that walls must have strong timbers inside and a solid masonry leaf and characterized by only one storey around them…" (Ruggieri 2016a).

The most relevant innovation regarding housings was the introduction of a new typology named *casa baraccata* (Tobriner 1983; Laner and Umberto 2000; Ruggieri 2005; Biano 2010) characterised by a masonry reinforced with a double timber framing, technique likely inspired to the "gaiola pombalina" applied in Lisbon after the earthquake of 1755 (Langenbach et al. 2006). This typology was part of a proper urban restoration program involving the construction of houses no more than two storeys high, the demolition of extra floors, the removal of balconies and other protruding elements, the chaining of beams and floors at the walls and the elimination of pushing roofs.

The *case baraccate,* many of which still visible (Fig. A1.34), gave proof of great efficiency as resisted to the violent earthquake of 1908 in Reggio Calabria and Messina which caused roughly 120.000 victims (Baratta 1910). Today, the historical seismic system proposed during the Bourbon period is totally forgotten, and modern Italian codes reflect little interest for wooden structure by the scientific community.
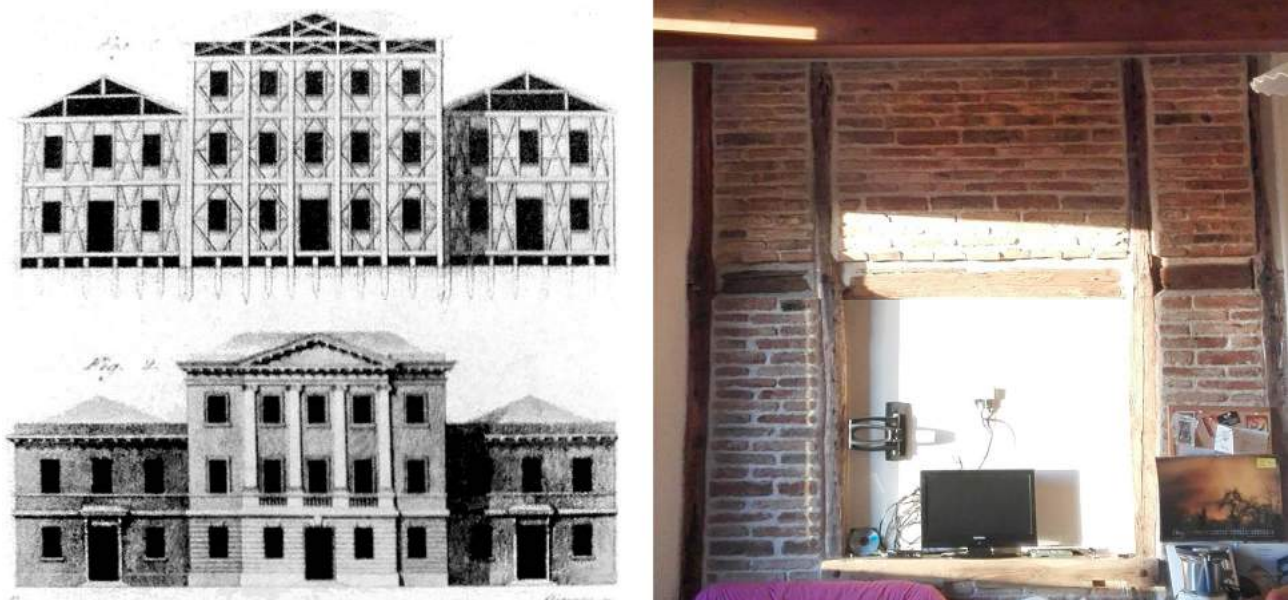

Fig. A1.34 – Fom the left: *Case formate di legno*, tables from Vivenzio, 1783; The interior wall from a *baraccata* house in Reggio Calabria still inhabited today. Photo by Guglielmo Minervino

In 2013 The technology of the *baraccate* houses has been subjected to a test carried out in the laboratories of the Institute for the enhancement of wood and tree species (IVALSA) of the Italian National Research Council, in collaboration with the University of Calabria (Ruggieri et al. 2015). The experiment has clearly shown that the Bourbon's building system conceived at the end of the VIII is able to resist to seismic events of significant intensity, and that this technology, once completed the necessary investigations and adopting innovative connection systems, could be favourably applied to modern buildings, guaranteeing stability and giving safety for the people who live there. The experiment was carried out by researchers that reconstructed a wall section of a Calabrian building of the late XVIII century (Fig A1.35) according to the instructions of the royal building regulations imposed after the earthquake of 1783.

Fig. A1.35 – Building activity of the housing wall section used for the experiment. Photo from

Industrial settlements

Starting in the XVIII century, Calabria housed the royal arms factories, supplied by mines of ancient tradition in Mongiana, a village founded by the workers employed in the adjacent ironworks. The industrial settlement was provided with technical infrastructures such as aqueducts and buildings for the home of workers and professionals (Brasacchio 1977b, 377). This unusual mix of industries and residences makes the case of Mongiana truly remarkable. The first plant, including deposits, housing, services and a church, was designed by the Neapolitan architect Mario Gioffredo appointed by King Ferdinand.

In new foundation settlements of Enlightenment and rational conception, cemeteries and industrial plants were built outside the urban perimeter to comply with the requests for improvement of living conditions. For Mongiana, however, the opposite occurs. The heart of the village is the Real Fabbrica d'Armi (Royal Arms Factory). Neighbouring it, the housing district is gradually structured following the land morphology, composed of two levels compact houses, adjacent each other and equal in shape and size (Fig. A1.36).

One of the peculiarities at the origins of this small settlement lies in the absence of a regulatory plan that was instead drawn up for all the other centres interested by post-earthquake reconstruction of 1783. Mongiana, therefore, is in countertendency, rebuilt by the initiative of the workers because the royal funds and the interventions of the technicians were destined to the reconstruction of the ironworks and the foundry but not of the inhabited centre (Gentile 2008).

With the Unification of Italy, initiated an irreversible process of decadence of the Calabrian steel industry and, consequently, of Mongiana. The production of metal artefacts was moved to northern Italy, causing the emigration of the many people left without work. There was, therefore, a sudden decline in population, and the inevitable structural deterioration of the whole Mongiana industrial settlement.

Fig. A1.36 – Map of the industrial settlement of Mongiana, and related satellite images from GoogleMaps.

Considering the typical urban evolution of the Calabrian settlements, from small fortified nucleolus to proper cities with administrative apparatus, Mongiana is a unique example because, although it was founded centuries later respect to the medieval centres, it was still realized through a traditional building practice, testifying a strong continuity in the transmission of constructive knowledge, definitively interrupted only in the XX century. Mongiana represents even more a singular case because other centres affected by the earthquake were reconstructed at the same time but accordingly to a blueprint decided by royal authority technicians, while where this was absent, the traditional building models are repeated by the inhabitants as testified by the case of Mongiana.

Appendix 2

Documental sources

Geographical area of interest	Text sources	Period (1st ed)
Soverato	**Prochiron Legum, ch. 33**	980-1050
Kingdom of Two Sicilies	**Assizes of Ariano**	1140
Kingdom of Two Sicilies	**Constitutions of Melfi**	1231
Cosenza & casali	**Statute of Cosenza**	1333-1557
Laino Castello	**Statute of Laino**	1470-1475-1535
Arbëreshë towns	**The Kanun of Lek Dukagjini**	XV century and earlier
Arbëreshë towns	**The Kanun of Skanderbeg**	XV century and earlier
Southern Calabria	**Istruzioni**	1784
Roman teritories	**Regulae Juris**	Roman era

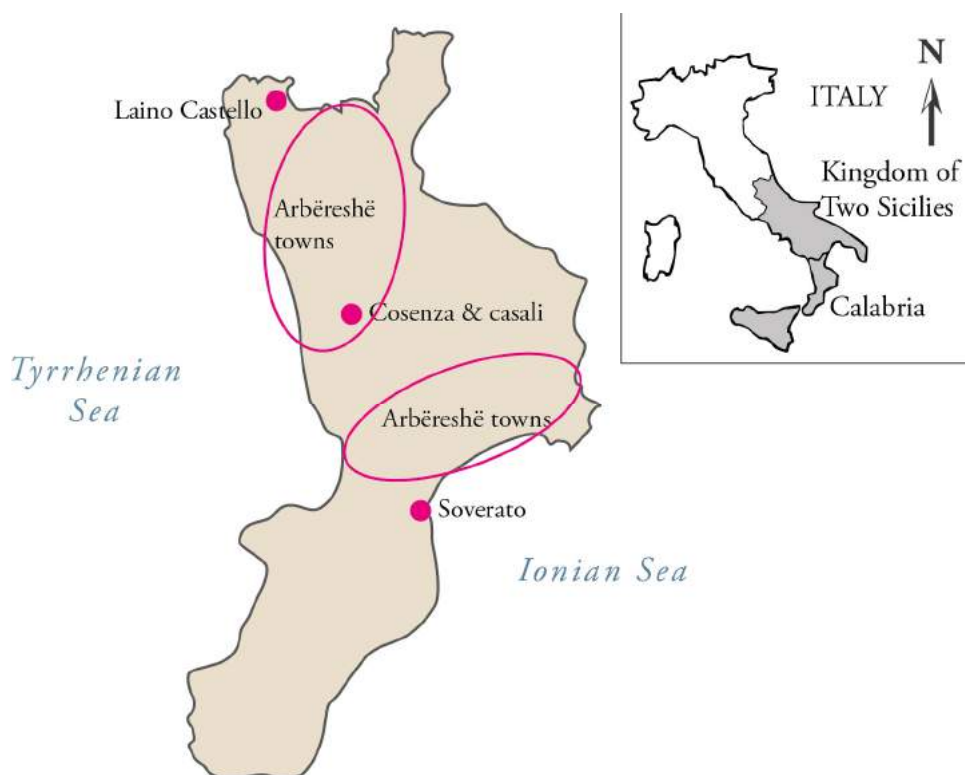Tab. A2.1 – Text sources of the research

Fig. A2.1 – Text sources and their geographical area of interest

Appendix 2.1 – Prochiron Legum (A.D. 980 – 1050)

Source reference

- Brandileone, F., and Puntoni, V. (1895). *Prochiron Legum: Pubblicato Secondo il Codice Vaticano Greco 845*. Roma, IT: Istituto Storico Italiano, Fonti per la Storia d'Italia

- Hakim, B. S. (2014). *Mediterranean urbanism*. Dordrecht, NL: Springer. Appendix 4 - Prochiron Legum: Background and Text

Background

Organisation and Contents

Many of the articles within the chapters of the Prochiron Legum clearly show the adaptation of earlier Byzantine codes to be compatible with local customary practices in Southern Italy. The editor replace technical terms with common words and simplified the sentences so that the reader could understand the meaning and purpose of each article (Brandileone 1895). The document is made of separated sheets for a total of 40 chapters, and it has been translated from the Greek to the Latin. A translation in English of the Chapter 33 of the Prochiron was published by Hakim in 2014 in the book Mediterranean Urbanism, appendix 4.

Sources of the documents

The sources for the Prochiron Legum are the *Ecloga* dated to 741 CE (Burgmann 1991), and the later *Procheiros Nomos* dated to 872 CE (Schminck 1991). The Ecloga is in the form of a synopsis of Justinian's Corpus Juris Civilis from the first half of the 500's CE. The Ecloga was issued by Leo III and Constantine V. It constituted a corpus of secular law unrivaled until the end of the 9th century (Burgmann 1991). It continued to be the official exposition of the law until the publication of the Procheiros Nomos by Basil I, the emperor whose reign is 867–886 CE and the founder of the Macedonian dynasty that dates from 867 to 1156 CE. The Ecloga was used as a precedent to the Procheiros Nomos in form and substance (Freshfield 1930). It dates to 872 CE (Schminck 1991). The first edition of the Prochiron Legum dates back most probably during the reign of Basil II (976–1025), while the date of the revised edition would be between 1130 and 1140 CE. This means that the second edition dates over a century later than the original first edition.

Referencing territory

In Calabria and Puglia people continued to be the subjects of the Byzantine empire until the Norman conquest in 1060 CE. During the reign of Basil II (976–1025) the Eastern Byzantine government attempted to restore authority in Calabria and Puglia. It is either in the reign of Basil II, or earlier, that the first edition of the Prochiron Legum was composed in Calabria. According to Freshfield it was copied at Soverato, a village near Cantanzaro in Calabria. It was compiled for use in Calabria.

Matters regarding the built environment

The chapter 33 of the Prochiron Legum addresses issues related to the build environment and provides rules for its management and transformation.

Significant articles covering issues related to the built environment

1. A person creates a new work, when he builds a wall anew or pulls it down and alters the original aspect of it.

2. If your servant is engaged in building I can legally give him a notice in regard to new building. But your servant cannot give a valid notice to another person engaged in building.

3. If the matter concerns several persons in regard to the building a notice to one of them suffices; and it will hold good and be reckoned as given to all the owners concerned in the undertaking. If after notice given one of the owners continues to build, the others will not be affected or liable; for the work done by one shall not prejudice those who took no part in it.

4. We decree that anyone who wishes to renovate an old building shall not change the old plan of the house, nor shall he be permitted to deprive his neighbors of light and view unless perchance he has either by contract or agreement a servitude which grants and permits him to change the form of the building as he may like and wish. For the person who has this right of 'servitude' may build without hindrance as he wishes even if perchance he prejudices his neighbors since the servitude was constituted by contract or agreement. When two houses stand 'over against' one another, that is to say are placed contiguously to one another, a space of 12 feet must intervene between them beginning from the foundations and be so separated from the adjoining house. And each party can raise his building as high as he wishes and open prospect windows whether he builds a new house or rebuilds an old one destroyed by fire.

5. In this blessed city the view of a neighbor who only claims (is entitled to) 12 feet cannot be taken away if he can see the sea directly standing or even sitting in his dwellings, and is not obliged to turn about and obtain a sideway view of the sea. If however there is a space of 100 feet between two dwellings one owner can build without hindrance and deprive his neighbors' view of the sea.

6. Where anyone has a view of the sea from a kitchen, bath, steps or terrace then another person can build within the 100 feet and without any impediment deprive his neighbor of a view. If however there is an agreement which concedes and permits building the agreement shall hold good even if it damages the neighbor's view of the sea, or if he who is now the owner has so agreed or the former owner did so. For a general law cannot over-ride servitudes properly created (that is by agreement).

7. One joint owner of property cannot impose a servitude on the property jointly owned without the knowledge and consent of the other joint owner.

8. A right of 'view' does not apply to a tree or to a garden.

9. Anyone building premises where an alley or lane intervenes is not permitted to appropriate the excess by which the alley or lane exceeds the width of 12 feet. For the law as to 12 feet is not prescribed to the public detriment but only to prevent less than 12 f. between two houses. When therefore the alley or lane is more than 12 feet wide the excess cannot be appropriated but must be kept for the public. Should the space between two old houses be less than 12 feet no one can raise his house beyond the original height or open windows other than those which already existed. Wherefore if the space intervening be 10 feet then the person building is not allowed to make prospect windows unless he already had them. But he can make lights at a height of 6 feet from the ground. No one is allowed to make a false floor in his house and so convert a light into a prospect window.

10. No one who is a joint owner of a party wall can pull it down and build it up again without the knowledge and consent of the other common owners: for he is not the sole owner of the wall.

11. There is no restriction on building on vacant land, that is in a place where a building can cause no damage to neighbors.

12. Anyone desiring to build or heighten a tumbled down house must not obstruct his neighbor's light or otherwise damage him: and he can be compelled to retain the former style and the plan of the original scheme of the house.

13. Anyone who can legally raise his house can do so provided he does not impose a 'burden' on his neighbor's house. Similarly he must not impose a servitude more burdensome than is appropriate thereto.

14. No one can forbid his neighbor and prevent him from opening a doorway on to the public highway. Provided he does not injure the highway.

15. If a spring from which a person draws water runs dry, and subsequently it flows again in the former course and such person again draws water as before, the servitude for him to draw water from it is reinstated as he formerly had it.

16. No one is allowed to make an oven or kindle a fire on a party wall lest the wall be injured.

17. Where anyone builds a chimney and smoke issuing from it is a nuisance to dwellers in houses above, such dwellers can effectively and legally compel the builder to prevent the smoke unless perchance a servitude or other legal right for the smoke to issue exists. But on the other hand we decree that dwellers above, who throw water or ordure down and injuriously affect those dwelling below, are forbidden to do so. Inasmuch as a person can only act in his own house so as not to injure others. And we decree likewise regarding offensive smells.

18. If your wall inclines toward my house and leans forward I can compel you to straighten it and prevent it from falling and injuring my house.

19. If a tree stands in my neighbor's yard and throws out great roots which injure the foundations of my house, then with the antecedent order of the Archon I can compel him to cut them off.

20. If anyone forcibly opens windows in derogation to another person's premises he can be compelled to restore the building to the former state at his own cost.

21. No one can deposit manure near another person's wall unless a servitude or some agreement or other right to do so exists.

22. If rain gutter tiles need renovating we order that each proprietor shall repair the pipes of the gutter beginning in his own premises and continuing till he reaches the premises of his neighbor.

23. In the same way the beds of water-courses, that is to say water conduits serving gardens, plantations and vineyards, must be cleaned and repaired, each proprietor beginning on his own premises and continuing up to that of the adjoining owner. And where the bed of the water-course passes through his garden he must dig it out, remove the mud and sodden soil and clean it and throw the refuse on his garden.

24. The following agreements are not effective. If I agree with you that I am not allowed to make a fire on my hearth in my house, or kindle a fire, or rest or wash in it. For if agreements of that sort are made they are void altogether and ineffective.

25. Agreements made contrary to law or to good custom shall, we decree, have no force. And that applies also to ambiguous law.

26. A vendor who sells a house and in general terms tells the purchaser, 'this house which I am selling to you is subject to a servitude,' is not obliged to sell the house freed from that encumbrance.

Wherefore should there even be no servitude he can impose one upon it and make it subject to the vendor's or any other strange house. But if the vendor say specifically my house is for sale and is subject to a servitude in regard to the owner of such a house and conveys the servitude to him there can be no question.

27. A species of servitude exists when a person is prevented from emitting smoke from a chimney or the furnace of a bath house on to his neighbor's premises or to throw slops or water down on to them.

28. If I am bound to you by a servitude not to build, and I do build, and a long time elapses, that is 30 years, the servitude is extinguished through the effluxion of time.

29. I can build a stair against a party wall since no damage ensues.

30. If you owe me a servitude not to heighten your building in such a way as to impede the light of my house which pertains to me because I had lights which come through windows in my house, and I obstructed them 10 or 20 years ago, that is to say closed them up, and in that state they continued for the said periods, the consequence is that my right to the servitude expires, if you raise your house and it so remained raised for 10 or 20 years. For observe that in that case I did not exercise my right to servitude since I kept my windows obstructed and closed and you rightly obtained freedom (from the servitude) to raise your house higher, which freedom you could not a quire if I had not closed my windows; and so my right to exercise the servitude ceases. If however when my windows were closed you did nothing to your house by raising it my right to exercise the servitude remains to me whole as it was at the outset. And if after 10 or 20 years I open my windows and then you wish to heighten your house I can legally prevent you from so doing.

31. If I have a servitude which entitles me to place my joists, that is my beams, and apply and support them in your wall and insert them in joist holes made in your wall, then if I remove my joists and for 10 years I do not replace them in the joist holes, leaving the holes open as they were when I took the joists away, then the prescription (against me) does not run in your favour. But if, when I removed my joists, you close up the joist holes and they remain so closed for 10 or 20 years you obtain freedom from the servitude due to me. For you have acquired the 'dominium' by usucaption by keeping the joist holes closed for that time. If however you leave them open and do nothing but leave them in that condition the servitude to me is preserved and I can replace the joists in the joist holes made aforetime.

32. Every servitude and usufruct arising there from is lost if it is not exercised for 10 years if the parties interested are present, or for 20 years if absent.

33. If a purchaser in good faith does not know that the property he acquired belonged to anyone but the vendor, he is a purchaser in good faith. If the purchaser subsequently learns that the property belonged to anyone other than the vendor, that is a stranger to the purchaser, and nevertheless proceeds to erect a building, then if later on, the true owner comes to claim the property the purchaser cannot claim expenses incurred but he can take away the building materials provided he does so without injuring the owner of the property, that is to say without injuring the property.

34. If an individual has built on or farmed the land of another that he bought in good faith and then the land is (re) claimed by the previous owner, a fair judge will evaluate the case according to the people and circumstances. Suppose, for example that the previous owner would have made the same improvements to the land as the current owner. If he wants to get his land back, he must at least match the increased value that occurred in the land. If the current owner has spent more than the land itself was worth it suffices that the applicant (previous

owner) matches its actual value. If, for example, the current owner was so poor that to make these expenditures he was deprived of his home and the tomb of his ancestors, then the judge would consider it sufficient if the previous owner (the applicant) be allowed to remove what he can, provided that the land does not suffer and not be of less value than it was before any new construction. It can also be decided that, if the previous owner is ready to go to the current occupant and offer all the amount he could get, including what he has added to the field, then the previous owner shall be allowed to do so. In such a case, we should not encourage abuse, such as an occupant who wants, for example, to remove paintings that adorned the walls out of spite or a sense of revenge. But if it is deemed that the first owner is willing to (re) sell his assets immediately upon recovery, he must meet all costs. If he refuses, the current occupant will be ordered to restore the assets only after such costs have been deducted.

35. If anyone obtains property in bad faith and alienates it, that is parts with, sells, donates, exchanges or in any other way disposes of it, and the true owner being cognizant and knowing that the matter concerns and pertains to himself does not intervene and make a legal claim against the person who has obtained it by purchase, gift, otherwise, he shall not have the legal right of recovering it, if he is on the spot, within 10 years, if he is absent, in 20 years. If however the true owner was not aware that the property belonging to him had been disposed of (in the several manners indicated) we declare that the true owner's remedy of recovery shall not be barred by 10 or 20 years prescription, but only by 30 years, since the person who acquired the property cannot declare 'I am the bona fide possessor' because he acquired it from him who obtained it mala-fide. And in regard to the prescriptive periods of 10, 20 or 30 years we make this further provision that if the true owner during part of the currency of such prescriptive periods was absent and for another part was present then for calculating the prescriptive period against him, there shall be added to the years of his presence the years of his absence.

36. If anyone takes proceedings against another in regard to realty which the possessor did not hold by lawful means, and is not yet excluded by the 30 years prescriptive period, and has not lost his cause of action, he can rightly claim and recover the property itself. Neither time nor custom will confirm transactions based upon false premises.

37. A proprietary title to a person is acquired in 3 years provided that possession is uninterrupted, that is undisputed by a sworn declaration.

38. Anyone who has servitude to pasture and water cattle on your farm can acquire the right of building a shed on it.

39. If anyone attempts to build near a threshing floor and by doing so injures the owner thereof the builder can be legally restrained from building.

40. If one person conducts water from another farmer's land and the farmer, knowing it, silently acquiesces for 3 years, he cannot prevent such person because the right becomes prescriptive in 3 years. If the farmer forbids the user such person cannot claim his expenses for making the water conduit and the farmer becomes the owner of the conduit.

41. If the person who owned a house (either the original owner or the builder) was unable to prohibit the passage of water his purchaser cannot prohibit it either since it is apparent that the purchaser bought the property subject to the encumbrance.

42. Inferior, that is to say lower lying, lands are subject to a silent servitude to upper lands, to receive water flowing down from them, obtaining, as compensation for the burden imposed, the 'fatness' of the upper lying lands.

43. If I have not availed myself of a servitude belonging to my farm for 5 years and I sell it, the 5 years are reckoned for a purchaser thus. If the purchaser does not exercise the right within the next 5 years the servitude ceases. If we require 10 years to expire before one party is freed from the servitude we also require the same period to expire before the other party loses the right by not using it. And we are not concerned to enquire whether only one or several persons did not avail themselves.

44. If anyone ploughs up a public road, that is to say land belonging to another estate not abutting on his own land, he shall forfeit the equivalent of 50 nomismata.

45. Anyone ploughing (or digging) near another person's farm must leave a space of 8 feet from the (common) boundary; if it is a wall boundary then up to 1 feet; if a dwelling house 6 feet; anyone digging a tomb or a pit shall leave between such excavations and the boundary a space equal to the depth of such excavations; if a well then a fathom unless the neighboring owner has a well which is injured by the new work. For planting olive or fig trees a spaceof 9 feet must be left from the (common) boundary; and in thecase of other trees 5 feet.

46. If I have a water conduit near your farm then the followingservitude tacitly inures to me; if I wish to repair the banks you must allow space enough for me and my workmen of ingress andegress so that I can have access to the right and left bank and aright to deposit soil, stones, and wood material and chalk and sand to repair it.

47. If I sell a part of my land to you and agree with you that you shall bring water through it and the legal time goes by and the watercourse is not made, my legal right is preserved. If however I made it but did not use it until after the 10 years expired, that is the legal period, my right to the servitude expires.

48. If there is enjoyment of servitude rights one year out of two or one month out of two, then the time allotment must be doubled in order to compensate for non-use. The same applies for servitude rights of access. But if such rightswere relinquished to just one day out of two or only during the day or only during the night, such rights would be lost through non-use. Indeed, if servitude rights were established to be used by the hour or one hour per day, then such rights would be lost through non-use since normally such rights are continuous.

49. Where limits and boundaries are in litigation the plea of 30 years prescriptive occupation and not 10 or 20 years applies.

50. When a question of ownership of boundaries arises the judge must either rely upon the boundary marks or the public records made before the suit arose. Unless it is proved that the boundaries were changed by the occupier from time to time, or for a time. For if that happened the boundaries must be deduced according to the arrangement made by those fixing them and not by the ancient boundaries.

51. If a public road is destroyed either by an earthquake or by the inundation of a river the owner of the adjacent land is obliged to permit a right of way across his land so that the public can pass over it.

52. If a river flows between my land and yours and then other soil accrues to mine gradually and imperceptibly, so that no one knows to what extent or when the accretion happened, the soil so accrued becomes my property and is mine. If by the violence and spate of the river a part of your land is taken away and added to my land it is manifest that the accrued land remains your property; for the accretion did not happen gradually and imperceptibly.

53. The period for taking every action which affects a venerable foundation whether personal or hypothecary must not exceed 40 years; so however that the 'exceptiones temporales competentes' in regard to each of the charitable houses are applied at the proper times. 'Personal' means when a person is in possession of a farm belonging to a venerable house, sells it and can defend his title by pleading the prescriptive possessory period of

40 years. 'Hypothecary' means when a mortgage was given and 40 years elapse, and no claim was made on the person who had it or on his son or his grandson.

54. If a free person is injured, compensation shall be made for the cost of medical treatment and the loss of work, that is for such time as elapsed while the person injured could not exercise his business or do his duties at home; the compensation is to be reckoned after that manner and not for the disfigurement inflicted. For the body of a free person cannot be valued.

55. It does not seem to us to be unfitting to decree that those who are excommunicated for crime shall not be prescribed by prescriptive period. That is to say those who are sentenced to punishment forbidding them to leave the city on account of crime be it adultery, theft, or slander shall not be prescribed in regard to their property. Banishment is sufficient for them.

56. Nor shall (prescriptive) time be reckoned against those who are absent on Imperial service, and as long as they are so absent, and until they return (Freshfield thinks that where soldiers are concerned this privilege was only accorded to them while they were on active service).

57. The deaf, dumb, mad, insane, and the prisoner of war shall not be prescribed by the period of 10 or 20 years. For the time begins to run for a captive when he returns from captivity and for sick persons when they are restored to health.

58. If a spring from which a person draws water runs dry for some time and then flows again in its own channels, the servitude is renewed and restored, as before.

59. Anyone who sells defective or rotten timber, and did so in ignorance of the defect, shall be liable to repay the price he received in excess of the true value of it. If however he knew the defect and did not reveal it to the purchaser but concealed it and so deceived the purchaser, he shall be liable to pay whatever damage the purchaser suffered by reason thereof. If therefore the house built with defective timber falls down he will be liable to the purchaser for the estimated value of the house.

Appendix 2.2 – Statute of Cosenza (A.D. 1333 – 1557)

Source reference

Unknown. (1982). *Privilegii et capitoli della citta de Cosenza et soi casali* (Napoli, 1557). Sala Bolognese: Arnaldo Forni Editore

Background

Organisation and Contents

The source is made of 144 sheets. Articles that are titled and listed in a table of content at the end. The source has no chapters but is divided in privileges which usually have a preamble and a conclusion that contains the date of emission. Each privilege contains one or more arguments that can be seen as articles which are not numbered. The statute addresses a variety of topics related to urban governance.

Sources of the documents

The Stauti of Cosenza (*Privilegii et capitoli della citta de Cosenza et soi casali*) is one of the first printed collection of municipal documents of the entire Italy, and among the most ancient of the Calabria region. The analysed source is an edition from 1557 printed in Naples of which we do not know the author. The document groups a number of privileges allowed by different rulers of the Kingdom of the two Sicilies, starting from the year 1382 to the 1557. It represents a codex of rights that free city of Cosenza and its Casali obtained in the second half of the XVI century.

Referencing territory

Cosenza is one of the most relevant cities of Calabria, and, already before roman time, it was among the major settlements in the whole southern Italy.

At the time of the Statuti, the territory of Cosenza was larger enough to comprehend part of the Sila, the largest mountain plateau that occupies a large part of the northern Calabria region. In adjunction, Cosenza had a large influence on the valley of the river Crati which finds its way into the Ionian Sea. This territory corresponds to the description of the boundaries of Cosenza's territory in the year 1333, as defined by Roberto d'Angiò, contained in the privilege at sheets 113-114.

Within that territory there were several small rural settlements called *Casali*. Those were prevalently small aggregation of houses and farms located on hill-tops where people used to live almost in a regime of self-sufficiency conducting a life based on agriculture and breeding. Cosenza represented the centre of reference for commerce as it hosted annual fairs and weekly markets (Greco 1849, p. 5), a frequent topic in several privileges. Cosenza and its Casali was a sole administrative entity among the complex geography of the northern Calabria. Although Cosenza and its Casali were independent from the administrative point of view they cooperated on matters of common interest, they consulted each other, operated, deliberated and took decisions together (Galasso 1975, p.18; Greco 1849, p. 5). Several privileges contained in the source show this cooperation on common issues.

Matters regarding the built environment

Articles addressing issues regarding the built environment are few and mostly about its management and related responsibilities from the public and private.

Significant articles covering issues related to the built environment

- Car 13 – Quod civibus Cosentie remitterentur quatuor untie pro colletta, attentis muris dirutis
- Car 13 – Quod Cives Civitatis et Casalium, manuteneantur in corum bonis existentibus in terries baronum
- Car 16 – Quod turris unionis et muri novi destruerentur et c.
- Car 17 – Quod reparentur muri Civitatis ad expendas regias infra septemnium
- Car 17 – Quod burgi Civitatis potuissent murari et fortificari
- Car 30 – Quod in sindicatu officialium intimentur Casaleni
- Car 44, cod 1 – Contra occupatores publici, et immittentes immunditias et sterratures instratis
- Car 88, cod 14 – Quod lina non possint abunari in fluminibus infra miliare
- Car 88, cod 15 – Contra immittentes vermes sericorum & immunditias in stratis
- Car 88, cod 19 – Contra venditricis in platea publica
- Car 88, cod 22 – Quod porci mandarini non possint detineri in Civitatem, & quod occidentes lucrentur quartum
- Car 138, cod 4 – Decretum observetur constitution Sancimus de iure prothomisios

Car 44, cod 1 – Contra occupatores publici, et immittentes immunditias et sterratures in stratis

ITEM lo ditto Signore provede & concede, che tutti quelli si haveranno occupati lochi & vie pubbliche tanto detro quato i fore de ditta Citta sèza licètia de la Regia corte ò de li mastri portulani siano costretti ad relaxarli, & che per lo advenire non li possano per modo alcuno occupare senza licentia dela Regia corte & anche ognuno Citatino dela ditta Citta sia tenuto innanzi la casa sua tenere de continuo netta la strata, & non gettarce immonditia alcuna, ne carnage de cani, gatti, Cavalli & altri animali, ne máco li vermin de sirico ne fusia de sirico, ne altro genere de monditia ò litame & debea ciascheduno acconzare la ditta strata quanto dura la casa sua, & ciascheduno che ha fatto & fara sterrature in ditta Citta, sia tenuto cacciare lo terreno frau no mese, & anche ognuno debea fare le privase dentro la casa sua ò vero inla strata con bone fosse murate & lamiate per modo che non gettino lo sterco humano per le ditte strate per che ditta Citta de estate & de inverno sia preservata de ogni infettione de malo airo & per exequutione dele cose preditte lo ditto Signore fa commissario & exequutore de Vicerre presente & future & in defetto suo li Commissary che perlui saranno deputati al quale se debea obedire in li báni percui sioni (fioni?), & ordinationi che per questo si faranno quanto alla propria persona del ditto Signore Duca il che similmente intendemo si debea exequire dele fontane che se tengano nette, et se ripareno, & che apresso ditte fontane non se getti mondezza alcuna, & si fossero gettate si debeano annettare, & questo lo ditto Signore Duca comanda se debea observare ad pena de onze dece per ciascheduno che contrafarra, dela quale pena la terza parte habea lo accusatore & lo resto si converta in reparation & radriczo de ditte strate & fontane et alter cose preditte.

The aforementioned Lord provide and allow that everyone who have occupied public places and roads, either within the city of outside, without a licence from the Royal court or the masters *portulani* (officer in charge of road maintenance, construction and water distribution) has to be forced to release them, and they cannot occupy them anymore in the future without a licence from the Royal court, and that every citizen of that city has to keep constantly clean the road space in front of its house, and do not throw in it any garbage, nor meat for dogs, cats, horses and other animals, nor the silkworms, nor the cocoons, nor any other kind of rubbish or excrements, and it (the citizen) has to repair such road for the extension of its house, and everyone who did or will do digs in that city has to remove the soil within a month, and, also, everyone has to build the *privase* (sewers) within its house

or in the road with good walled and laminated ditches in order that they do not flow the human excrements in the road, in this way that city both during the Summer and the Winter will be safeguarded from any infection and stinky smell, and for the execution of those said things [...] similarly, we intend that this has to be done for the fountains which has to be kept cleaned, and they have to be repaired, and in those fountains has not be thrown any garbage, and if that so, they have to be cleaned, and the aforementioned Lord Duke commands that this has to be respected under the penalty of ten ounces for each transgressor, of which penalty a third part goes to the accuser and the remaining has to be used for reparations of those roads, fountains and other aforementioned things.

Anno 1475

Car 88, cod 14 – Quod lina non possint abunari in fluminibus infra miliare

ITEM per che li lini se fanno nel territorio & distritto de ditta Città & per quello se causa malo aero, & infirmita in ditta Città, per questo si ordina che ad nesciuno sia licito abunare li lini infra uno miglio lontano de ditta Città, & chi contravenera ipso fatto perda lo lino & incorra la pena de una onza irremissibiliter exigenda.

That the linens that are made in the territory and district of the city, because it causes stinky smells and infirmity to that city, it is ordered that anyone is allowed to macerate linens within one mile from the city, and who transgresses will lose the linen and incur in a penalty or one ounce to be demanded without remission.

Anno 1509

Car 88, cod 15 – Contra immittentes vermes sericorum & immunditias in stratis

ITEM per che inditta Città se fa gran quantità de serico & finite la massaria ciaschuno in lo fare dela sita butta li vermin in le strate donde se causa gran fetore, & aere pestifero in ditta Città & cossi in le strate de ditta Città se buttano le immunditie, & multe cose puzolente non senza grandissimo detrimento dela sanita de ciaschuno in genere & inspetie de ditta Città, perquesto si ordina che non sia nesciuna che dala publicatione delli presenti capituli avanti debea buttare in le strate de ditta Città nulla cosa de immunditia ne puzolente ne de fetore ne meno li ditti vermi, ma tutte quelle le debeano fare asportare fora la ditta Città sotto la pena de una onza ipso fatto applicanda region fisco.

Anno 1509

Car 88, cod 19 – Contra venditricis in platea publica

ITEM per che le venditrice de pane, foglie, & frutti haveno restritta la strada de la piazza in modo che li Cavalli & alter bestie che continuamente ci passano vanno con qualche periculo de fare inconveniente se ordina che ditte vendetrice debeano stare alle bande dela piazza bene allargo per evitare ogni inconveniente & che li sindici qui pro tempore fuerint habeano de fare stare netta ditta piazza & lo segio fandoli scupare ogni otto di, & annettarne ogni lorditia.

Anno 1509

Car 88, cod 22 – Quod porci mandarini non possint detineri in Civitatem, & quod occidentes lucrentur quartum

ITEM si ordina che nesciuno presume dala data deli presenti capituli innanti tenere porci mannarini dentro ditta Città, per evitare le lordie & fetori che ditti porci causano in le strate de essa Città, & quelli che sence trovassero sia licito ammazarse per qualsivoglia persona impune, & quello che lo ammazara se guadagni lo quarto del porco.

Anno 1509

Car 138, cod 4 – Decretum observetur constitution Sancimus de iure prothomisios
ITEM fo proposto per ditti magnifici sindici che atteso molte volte occorre che quando se vendeno possession & alter robbe stabili & case ad persone extranee per non se usare lo ius congruo & prothomisios, sonno successe & succedeno inimicicie & homicidy & liti & discordie infiniti in grandissimo danno & interesse deli populi lo fanno intendere alle S.V. che piacendogli de usarsi ditto ius congrui & prothomisios lo poranno provedere come meglio piace.
FO concluso pari voto & c. Che si supplichi la Eccellentia del Illustrissimo Signor Duca Dalva & Collateral consiglio che se usi in ditta Città & casali la Cōstitutione fancimus super iure congrui & prothomisios.

Anno 1557

Appendix 2.3 – Statute of Laino (A.D. 1470 – 1475 – 1535)

Source reference

Unknown. (1982). *Privilegii et capitoli della citta de Cosenza et soi casali* (Napoli, 1557). Sala Bolognese: Arnaldo Forni Editore

Background

Organisation and Contents

The town statute of Laino is made of 32 numbered sheets containing 87 codes, plus a schematic map of the territory (Cappelli 1931). Other codes from two additional issues complete the statute with a aotal of q48 articles. Among the pages, they have been found documents that refer to the statute, and one of them reports the date 1718 providing a proof that the old norms were still in use in the XVIII century.

Contents of the statute are listed without an order, and refers to the administration and commerce. The statute is similar, and sometime identical, to the calabrian statutes of Castrovillari, Altomonte, and Cetraro (Cappelli 1931). In general, they shares a similitude with those of several south Italian towns (Alianelli 1873).

Sources of the documents

The complete statute of Laino was issued in three different moments. The first one dates back to the 14 February 1470, committed by the University of Laino, and containing 88 codes. In that year a representation of citizen asked and obtained the approval of the Statutes from the local feudatory Venceslao Sanseverino, count of Lauria. The second issue dates 1475 and the last one is from the 1535. All the times, the University asked to the feudatory to approve additional codes.

The statute of Laino is known from a copy from the XVII century, while the original is lost, for what we know. The copy was in the hands of the notary Benedetto Sannazzari from Laino, living in the same century, and which house is still present in Laino (Cappelli 1931). Today, the copy is in the archive of the family of Biagio Cappelli, author of the "Laino e i suoi statuti" (1931)

Referencing territory

The village of Laino takes its name from the close river Lao where populations used to live before moving to the hills, and founding two settlements, Laino Castello and Laino Borgo, distant each other just 2 kilometres. The Byzantine influence and the greek monastic order of S. Basil left tracks in the local toponymy such as for the place named S. Sofia where the town council used to gather as indicated in the art. 15 of the statutes (Cappelli 1931). During the Angevine dynasty. The town was fortified and nown as Castrum Layini

Matters regarding the built environment

The built environment is not significantly addressed apart for certain codes that contains principles of hygiene to be safeguarded in public roads from the activity of animals.

Significant articles covering issues related to the built environment

- Car 13 – Quod civibus Cosentie remitterentur quatuor untie pro colletta, attentis muris dirutis

Car 13 – Quod civibus Cosentie remitterentur quatuor untie pro colletta, attentis muris dirutis

ITEM reparentur muri Civitatis ad expensas Regis infra septemnium, & alias tempore viciniori secundum facti occurrentiam.

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Appendix 3

Covered Issues to the built environment in Calabria

Ten categories of covered issues were identified starting from those already listed by Hakim (2014, p. 98), then refined accordingly with the sources of this research. Categories were kept few to facilitate the interpretation of sources and for the purpose of generalisation. Each one of the ten categories groupes the related codes, progressively numbered accordingly with their order in the original text documents.

Text documents	Categories of covered issues related to the built environment									
	Land Use	Public space and accesses	Houses	Private Property	Light & Views	Overlooking	Walls, stairs, beams, and roofs	Drainage & hygiene	Planting	Codes that do not strictly cover built environment issues
Prochiron Legum, ch. 33	4, 5, 6, 45, 49	9, 14, 44, 51	1, 4, 5, 6, 9, 11, 12, 38, 39,	4, 5, 7, 9, 10, 11, 12, 13, 16, 17, 19, 20, 21, 39, 59	4, 5, 6, 8, 9, 12, 30	9	10, 16, 18, 29, 31, 59	17, 21, 22, 46	19	2, 3, 15, 24, 25, 26, 27, 32, 33, 34, 35, 36, 37, 40, 41, 42, 43, 47, 48, 50, 52, 53, 55, 56, 57, 58
Statute of Cosenza*		44(1), 88(19)		88(14,15)				44(1), 88(15), 88(19), 88(22)		138(4)

Tab. A3.1 – Categorization of covered issues related to the built environment addressed by codes. *For the source of Cosenza, numbers out of brackets indicate the sheet, and those within brackets are codes number assigned by the author.

Codes concerning servitude matters are grouped separately (Tab A3.2) from those covering a specific built environment issue. This is due to their flexible application that allowed their covering a variety of different issues. However, they were definitely considered for deriving principles underlying the traditional building system (Appendix 4).

Text sources	Servitudes and agreements between individuals
Prochiron Legum, ch. 33	4, 6, 7, 13, 15, 17, 21, 26, 27, 28, 30, 31, 32, 38, 40, 41, 42, 43, 46, 47, 48, 51, 58

Tab. A3.2 – Codes concerning servitude matters.

Appendix 4

Derived principles and rules for contemporary uses in Calabria

Eleven principles were identified starting from those already listed by Hakim (2007, p. 88-90), then refined accordingly with the evidences from documental and town sources of this research. Principles were kept few to facilitate the interpretation of sources and for the purpose of generalisation. Each one of the eleven principles groups the related codes, progressively numbered accordingly with their order in the original text documents.

Text sources	Principles and intentions underlying the traditional building system in Calabria										
	Freedom to act within its property	Prevention of Harm	Interdependence	Rights of original (or earlier) usage	Respect for the property of others	Privacy	Rights can be derogated by servitudes	Compensation	Respect of the public realm	Shared responsibilities on the maintenance of the public built environment	Pre-emption
Prochiron Legum, ch. 33	4, 5, 9, 11, 14, 17, 24	4, 5, 6, 9, 10, 11, 12, 13, 16, 17, 20, 21, 24, 27, 29, 30, 33, 34, 39, 45, 55, 56, 57, 59	4, 5, 6, 7, 9, 10, 12, 13, 16, 17, 18, 19, 20, 22, 23, 27, 28, 30, 31, 39, 45, 46, 47, 48, 49, 50, 51, 52	4, 5, 6, 9, 12, 26, 28, 30, 31, 32, 35, 36, 41, 43, 45, 46, 47, 48, 49, 50, 52, 53, 58	7, 10, 13, 16, 17, 18, 19, 20, 21, 27, 39, 40, 45, 46, 48, 49, 50, 52, 55, 56, 57	9	4, 6, 17, 21, 30, 51	40, 42, 44, 48, 59	9, 14, 44		
Statute of Cosenza*		44(1), 88(14, 15, 22)							44(1), 88(15, 19, 22)	44(1), 88(22)	138(4)

Tab. A4.1 –Derived principles and intentions underlying the traditional building system in Calabria and evidences in sources' codes. *For the source of Cosenza, numbers out of brackets indicate the sheet, and those within brackets are codes number assigned by the author.

Appendix 5

A dynamic system model testing the reaction of an historical urban generative system to earthquake impacts[1]

Research question

The main research question is "How long used to take for a Mediterranean historical town to recover from an earthquake that impacted on its urban system (such as population reduction, damaged economy, damaged built environment, etc.)?"
The model can be customised for a specific town by simply modifying the initial inputs, both the earthquake factors (year of occurrence and intensity), and the initial characteristics of the urban system including those related to the historical built environment (Fig. A5.1, A5.22).

Fig. A5.1 – On the right an interface allows to setup the initial conditions of the model. Variables can be customised at level of town. The occurrence and intensity of the earthquake can be established or left random. Drawing by Guglielmo Minervino

Fig.A5. 2 – An example of possible scenario about the reaction of a historical Calabrian urban system to the impact of an earthquake of intensity equal to 5 on the Mercalli scale after 100 years since the run of the model. Drawing by Guglielmo Minervino

General topic of the model

The model simulates the physical organic growth of a hypothetic historical Calabrian town. Those towns used to grow organically without a master plan, and were influenced by several cultures that introduced and shaped the traditional building rules over more than 800 years (Hakim 2014, Guidoni 1992). Traditional Mediterranean Urbanism is characterized by a building system of common rules and codes, including local customs. These customs were followed during the construction process, which included building activities at the neighbourhood level and a decision-making process that took place between neighbours (Hakim 2008b). The emergent physical form of the town also reflects local environmental characteristics and building materials.

Especially in Italy, that kind of settlements experienced a number of earthquakes that severely conditioned the then socioeconomic development and urban growth. For example, the earthquake above 5,9Mw that hit the Calabria Region in 1783 destroyed most of the settlements, causing 50,000 victims (Mercalli 1897). The impact of earthquakes on the urban system would be the major focus of the model.

Relevance

The Calabria Region is prone to earthquakes, landslides and other natural disasters due to its geological characteristics. These natural disasters must be mitigated and prevented to make the settlements secure and promote territorial development. In this sense, this model would allow a better understanding of how those settlements had responded to natural disasters in terms of reconstruction time, considering the then building system and regulations. It also would be useful for contemporary post-disaster reconstruction simulation: this would require the implementation of modern parameters influencing the building system.

The model can be readily adapted and localized according to local context, meaning its initial data such as population, wealth, size of the basic housing module (room) and other parameters as are described in the next paragraph.

2

Model description

The whole model reproducing the town system is shown in Fig. A5.3. Following are presented its sub-systems.

Town Growth

The physical growth of the city is measured in No. of *Rooms*, by the interaction of the 3 sub-systems as following:

o *Population (stock) (Fig A5.4)*

It is divided in *Youths* (0-20 years old) and *Adults. Adults* are assumed to be 20+ years old, the average age for marriage (Bruno Bedini, 2009). This is the age when they moved out from parents' home to make their own family. It is influenced by births, deaths, immigration, and out-migration. It is also affected by the occurrence of an earthquake.

• *Births, deaths*, and *immigration* are influenced by the *Wealth.*

• *Immigration* occurs only if the town riches a consistent size, here assumed above 500 inhabitants.

• *Out-migration* depends on the *wealth*, and the possibility to build new residences (rooms); once the maximum residential density was reached, new adults had to move away toanother city. It is assumed that only adults (over 20 years) moved once married.

• There is an *Out-migration due to the earthquake* impact that occurs when more then the 90% of the housings are destroyed. In that case the whole population moves away.

• Lastly, there are occasional *deaths due to an earthquake.* The number of victims depends on the intensity of that calamity.

o *Total Rooms (stock) (Fig A5.5)*

A room is also the basic housing module for the town under study, hence the minimal building unit chosen for the model. This is due to the traditional building system that was incremental and based on family needs (basically, newborns).

• The n° of *New rooms* depends primarily on the *new net adults per year* as when they make families (*new families = new adults/2*) they need to move to a new house or expand an existing one. However, the opportunity to build a new room is constrained by the economic disposal (*Wealth*), the possibility to built a new house (*maximum density*) according to local regulation (*n° of stories allowed* – other rules can be implemented), and the *neighborhood cohesiveness* that influences local customs such as the permission of a neighbor to build attached to its housing wall or over its roof (Hakim, 1986).

• Local building materials concurred in defining the size (*Width* and *Length*) of a *basic room area* for that specific geographic area or town.

• Other initial built environment's factors are the *total town area, public space area, and non residential building area* that define the *available residential building area.*

• The *room*'s stock can be reduced due to an earthquake.

• The available number of *rooms* determines the number of *people per room* which is used in the model to determine the number *deaths due to an earthquake.* The model ignores those victims occurred in fields or traveling, etc.

• 3 months is the time required to build one room; this define the DT in 1/4

o *Wealth (stock) (Fig A5.6)*

It is represented by the per-capita income of a single person. The model assumes that the maximum income

3

is 1,000 money, regardless of the currency. Real data can be used for more realistic tests.

• It influences the *birth rate, death rates* and the building of *new rooms*. It is influenced by the *earthquake* which determines its loss as a representation of the negative impact on the local economy.

• After an earthquake, the model considers a gradual *wealth recovery* over time until the pre-calamity wealth level is reached. The recovery rate depends on the wealth, assuming that the bigger the loss of wealth is, the lower is the regain rate, i.e. the economic recovery.

Earthquake occurrence

o The earthquake event depends on its *intensity* and *year of occurrence. (Fig A5.7)*

• The *earthquake intensity* can be either set between a range that goes from a Magnitude (Richter scale) of 1 to 10, or randomly determined by the model. The effect corresponding to each earthquake intensity is based on the Mercalli scale, and esteemed by the authors according to the building characteristics of the analyzed town (here, a hypothetical Mediterranean historical centre)

• The year of occurrence of the earthquake can be either set or randomly determined by the model between a range from 1 to 199, as 200 years is the running time of the model.

• The damages (destroyed rooms, killed population, wealth reduction) depend on the intensity of the earthquake event.

• The model allows testing the system only with one earthquake event; however, it is possible to implement the model with a recursively function, either randomly or with a defined year of occurrence and related intensity. This can be useful to test the model with real historical data.
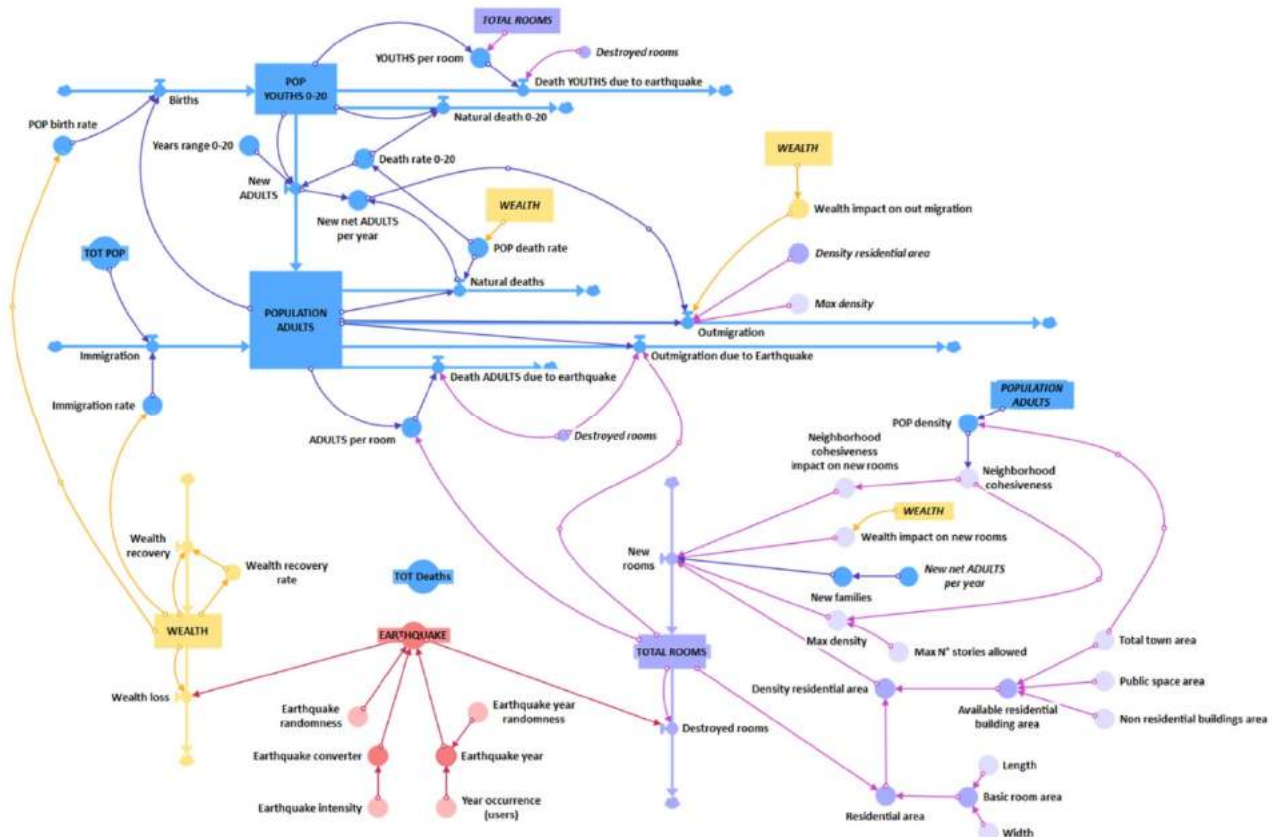
Fig. A5.3 – The whole dynamic model developed with STELLA software. The model is composed by three sub-systems (the population system – blue colour –, the economic system – yellow colour –, and the built environment system – purple colour –) plus one representing the earthquake effects impacting on the town. Overall, the model uses few initial variables but allows the generation of a number of different scenarios as result of the each other interdependence of the sub-systems which generate a series of feedback at any change in the model. Drawing by Guglielmo Minervino
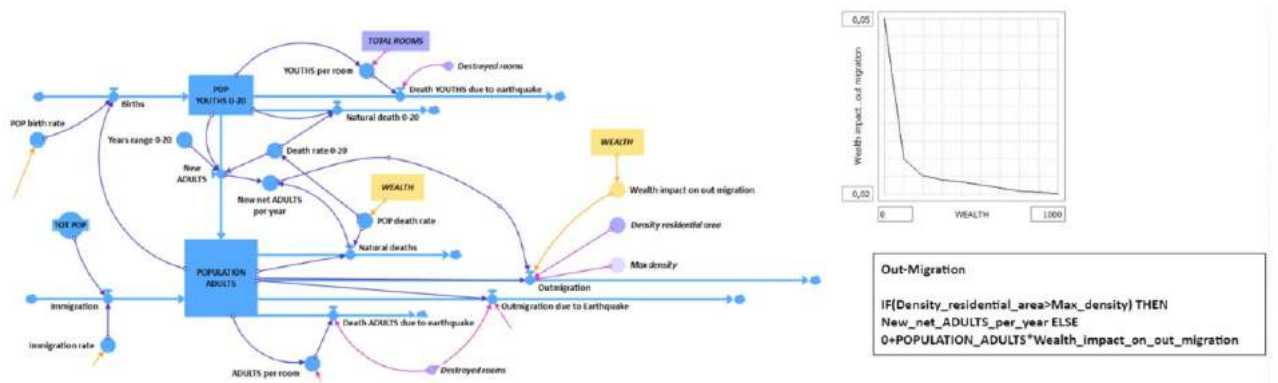
Fig. A5.4 – Part of the model showing the module containing the Population system. Drawing by Guglielmo Minervino

5

New Rooms

IF Density_residential_area < Max_density THEN New_families*
(Wealth_impact_on_new_rooms+Neighborhood_cohesiveness_impact_on_new_rooms) ELSE 0
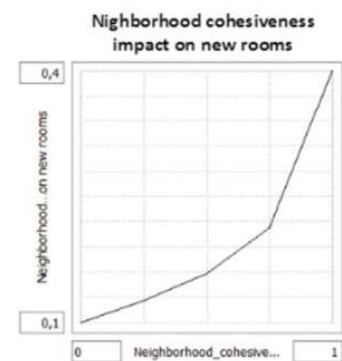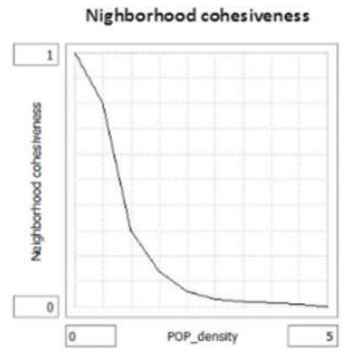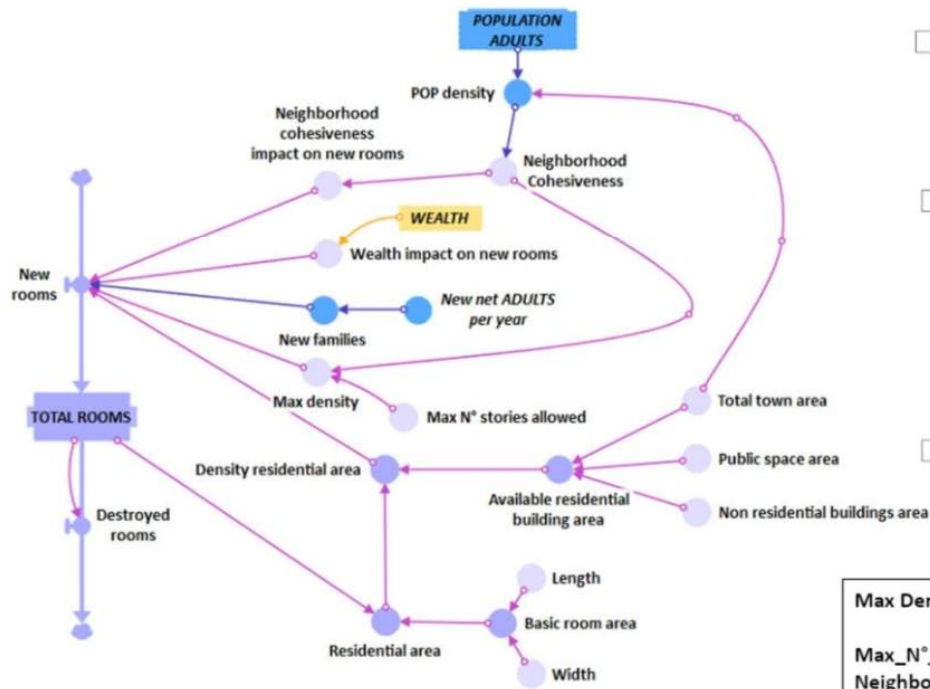
Max Density

Max_N°_stories_allowed+(IF
Neighborhood_cohesiveness>0,5 THEN
Max_N°_stories_allowed*0,1 ELSE 0)

Fig. A5.5 – Part of the model showing the module containing the built environment growing system simply based on the housing module (basic room area) and the available space for building that is limited by city walls. That module interacts with the population and wealth. Drawing by Guglielmo Minervino
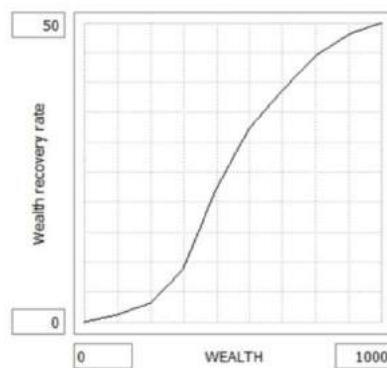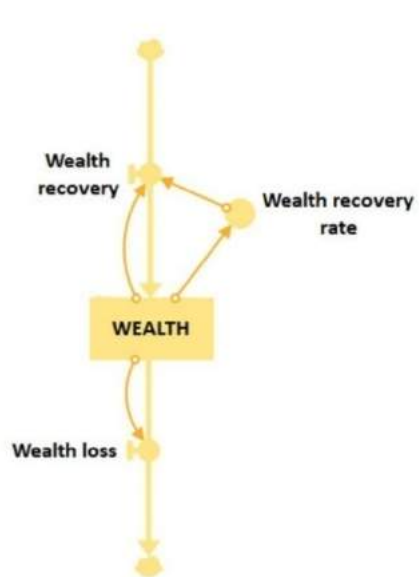

Fig. A5.6 – Part of the model showing the module containing the economic aspect of the urban system, hear simplified by the wealth of a single person. That module can be made more sophisticate. Drawing by Guglielmo Minervino
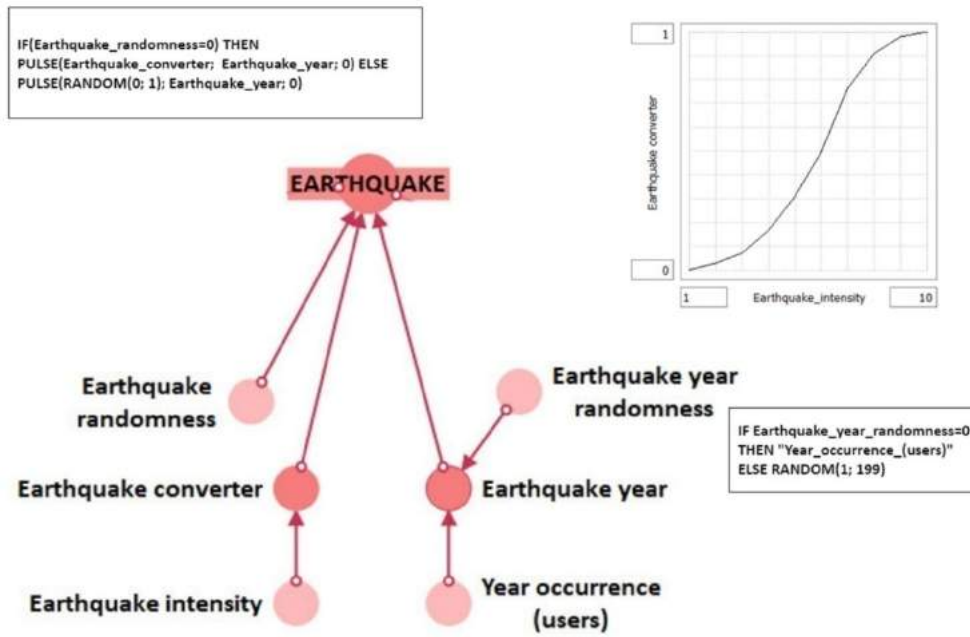
6

IF(Earthquake_randomness=0) THEN
PULSE(Earthquake_converter; Earthquake_year; 0) ELSE
PULSE(RANDOM(0; 1); Earthquake_year; 0)

EARTHQUAKE

Earthquake randomness

Earthquake year randomness

IF Earthquake_year_randomness=0
THEN "Year_occurrence_(users)"
ELSE RANDOM(1; 199)

Earthquake converter

Earthquake year

Earthquake intensity

Year occurrence (users)

Fig. A5.7 – Part of the model showing the module containing the earthquake impact. Drawing by Guglielmo Minervino

Appendix 6

Two examples of urban regeneration that had generative aspects in their development process

Following are presented two micro interventions of urban regeneration in two different historical Calabrian hill towns, Zagarise in 2016, and Belmonte Calabro in 2017. During its PhD, the author took part, as one of the co-coordinators, to both of the initiatives which experience revealed to be useful to understand and experiment bottom-up decision making mechanisms of the type envisaged in the functioning of a generative program.

6.1 – Collective landscape work "Acqua e fhore" - Zagarise (Calabria)

Fig. A6.1 – Cover of the project

"Acqua 'e fhore" is a dialect form meaning "outside water". It indicates a place just outside the historical centre of Zagarise where there is a XIX century wash house. The project has been an urban regeneration initiative realised by the Pensando Meridiano Association during the cultural festival named I Giardini delle Esperidi, in the Municipality of Zagarise (Italy, Calabria) a 1.600 inhabitant historical centre that originated in the X century.

The work was done in 5 days (19-23 Oct. 2016) by 23 young students who recovered the 60 years abandoned wash house. The project relied on place-making, self-building activities, on-field design and 3D printing, materials recycling, community involvement, video and photo storytelling.

Photos are available at https://www.flickr.com/photos/149090075@N04/sets/72157675098526531/ and the video at at https://www.youtube.com/watch?v=gfNNHviYL1k.

The project was born from the simple desire of citizens to regain possession of a space lost in their memories because after the advent of running water the wash house simply fell out of use. There was no predetermined projects nor any planning tools that accounted for its recovery. On the contrary, the wash house was barely indicated in a old map and completely disappeared in the natural environment (Fig A6.2).

The project idea was simply to refurbish the area while the elements to be built and the organisation of the space were ideated and developed mostly on field. Just a short workshop at the university was conducted in roder to organise the team, materials, and the logistic.

All the project relied on both, one assumption that was that the place should have become a public space, and on few initial principles that were:

- the safeguarding of the memory and history of the place;
- the respect of the natural environment;
- the recycling of any structure and material present on site;
- the engagement of local inhabitants in the process of ideation and development.

Fig. A6.2 – The wash-house and its surrounding before the intervention.

The final design was indeed generated from the combination of the site characteristics, initial guding principles, students technical ability, local materials, and local citizens participation.

During the 5 days work, the building site was opened to inhabitants and schools that visited it and chatted with students and coordinators. The building process become at the same time an occasion of know-how exchange and construction activity. Everything for the benefit of the local community that in exchange provided hospitality and accommodation.

The following pictures shows moments of the building process and final result (A6.3, A6.4).
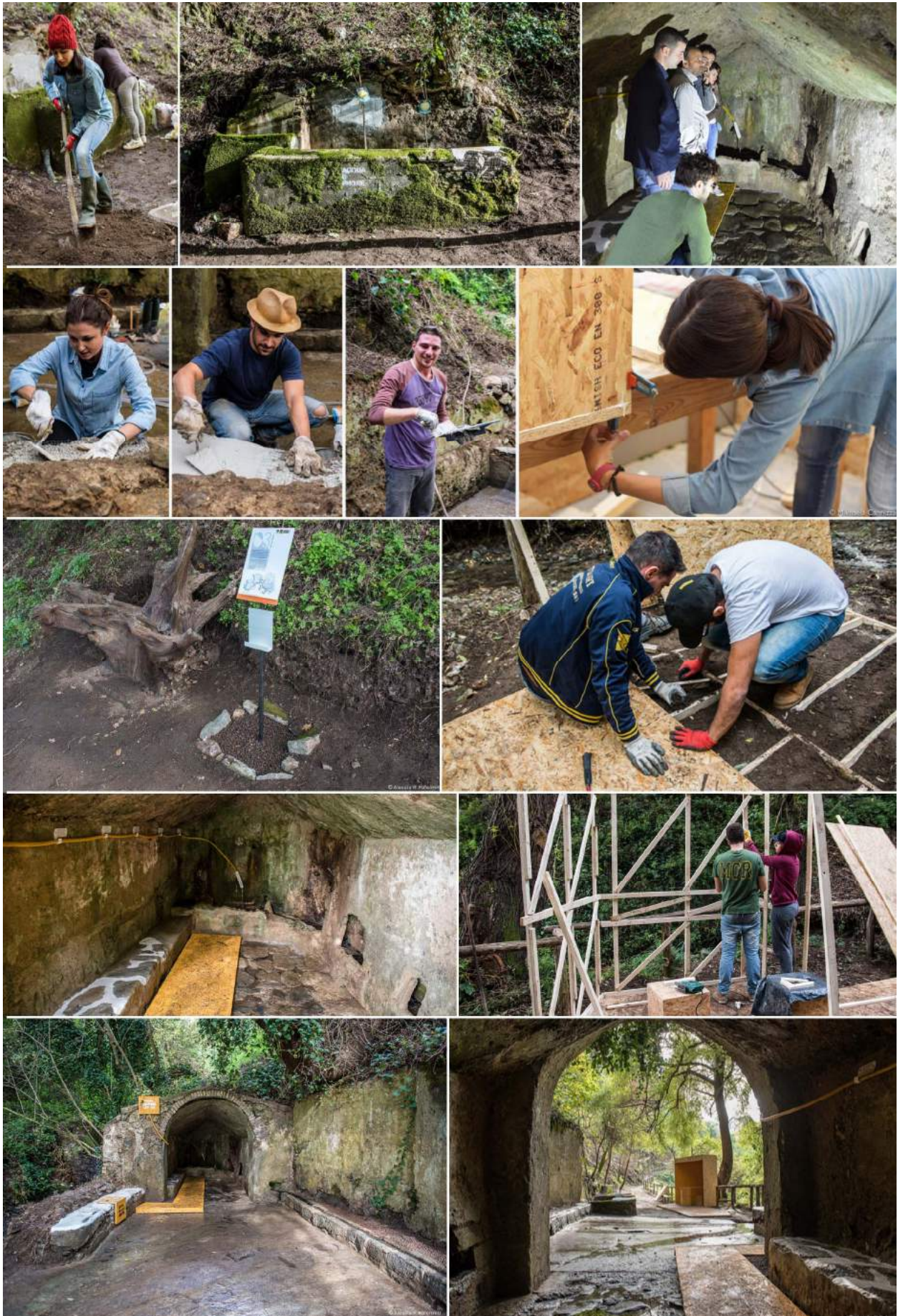
Fig. A6.3 – Moments of the building process and final result

Fig. A6.4 – Moments of the building process and final result

6.2 – ErgoSud 2017 open school - Belmonte (Calabria)

Fig. A6.5 – Cover of the project

"Ergo Sud" was a residential rural workshop realised by the Pensando Meridiano Association that focused on territories and landscape regeneration through the active engagement of the local communities and students realised in the historical centre of Belmonte Calabro (Italy, Calabria) a 1.900 inhabitant historical centre that originated in the XIII century.

The initiative lasted 3 days on the field after a preparatory week of university laboratories. The school dealt with environmental regeneration and cultural narrative of the castle area of Belmonte Calabro historical village. It was based on 4 laboratories: rural making, video/photo storytelling, additive manufacturing & eco-design, creative cultural projects.

Photos are available at:

https://www.facebook.com/pg/PensandoMeridiano/photos/?tab=album&album_id=1142801162533248
and the video at at https://www.youtube.com/watch?v=ucy-XXJDgIM

The project relied on a local grassroot initiative named Belmonte in Rete, a social initiative emerging from the community of Belmonte Calabro having as mission to foster sustainable development in that village (www.belmonteinrete.flazio.com). The author of this research is one of the founders of Belmonte in Rete.

The project idea was to refurbish the abandoned castle area, including the only one remaining room caved in the rock, and the surrounding large green area mostly negected (Fig. A6.6).

Like in the Zagarise initiative, the project elements and the organisation of the space were ideated and developed mostly on field. The whole project was based on the wish to make the public space again available for inhabitants and at the same time show as participatory urban regeneration was a practable way to intervene on heritage districts. Few guiding principles were:

- the respect of the heritage environment that was the castle's ruins;
- the education through practice (for students carring out the work)
- the recycling of any structure and material present on site;
- the engagement of local inhabitants in the process of ideation and development.

The final project was also in that case generated from the combination of the site characteristics, initial guding principles, students technical ability, local materials, and local citizens participation.

During the 3 days work, the castle room was cleaned up and transformed in a place for cultural events. The garden was anriched with stone and wood sitting places, informative panels about the landscape they were facing at, a small vegetable garden developed with 6-8 years old students from the local elementary school, and other minor interventions such as new planings.

Similar to the Zagarise's project, the building process become at the same time an occasion of know-how exchange and construction activity.

The following pictures shows moments of the building process and final result.

Fig. A6.6 – Moments of the building process and final result

Fig. A6.7 – Moments of the building process and final result

Appendix 7

Map of the analysed historical centres

Fig. A7.1 – Map of the analysed historical centres

Appendix 8

Examples of Generative Programs in various fields

Biology – The embryo

Moving to the more complex biology field, generative aspects can be found in the developmental program of an embryo. As described by Wolpert (1997 p.21), "the structure of the organism is somehow encoded as a descriptive program in the genome, which contains a program of instructions for making the organism – a generative program". The pattern activity of cells that knows where and when to change shape is "part of the embryo's developmental program. It is a program that contains the instructions for making the shapes" (Wolpert 1991 p.17).

By looking at that type of generative program the *mean of specifyication* is somehow the whole embryonic system that self-develops within the uterus. Cells work both as *implementation components* and agents necessary to the build of what is needed for growth and changes. The *configuration knowledge* is the genetic information contained in the DNA that guides the cells' activity and their generation as different types. If we apply the embryo's organization to a town, the embryo itself would be the town in a permanent process of change and growth, cells would be the people under the role of agents, and the genetic information the set of principles, rules and codes that agents follow.
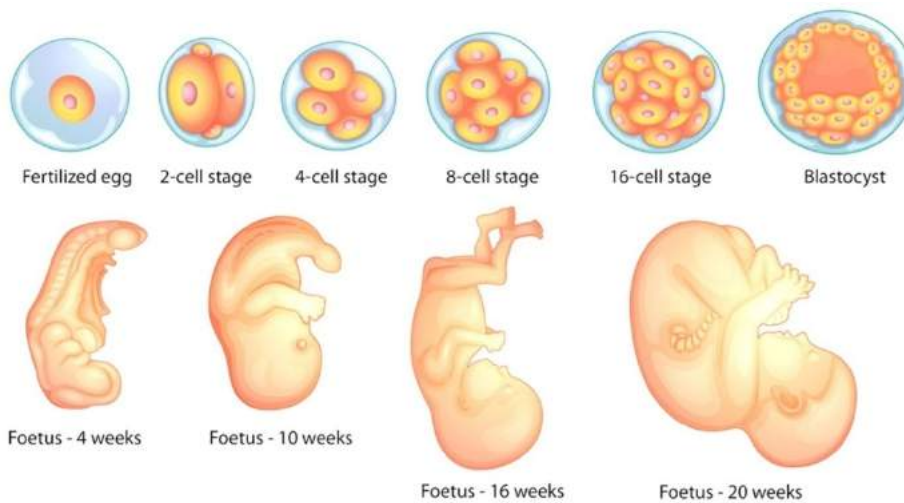

Fig. A8.1 – Human embryonic and foetal development. Retrieved from www.vectorstock.com

Art & Craft – Origami

A very simple one is the one underlying the process adopted for the creation of origami, the Japanese art of paper folding. The modern technique of origami uses few types of folds combined in an infinite variety of ways to create extremely complex figures. It would be very difficult to describe in detail the final form of an origami for the purpose of creation of it, while it is much more useful to formulate step-by-step instructions on how to fold the paper.

This type of generative program simply relies on a predetermined set of types of folds. The coded instructions limit to indicate which type of folds is needed to be used, at which step or in which order, and when to stop. For example, to make the frog in Fig. A8.2 it is adopted the same base used for making a number of different origami. That means that the first part of the instructions is the same for making at least two different structures. In that case, the algorithm is only one allowing taking two different directions once the process have reached a certain point.
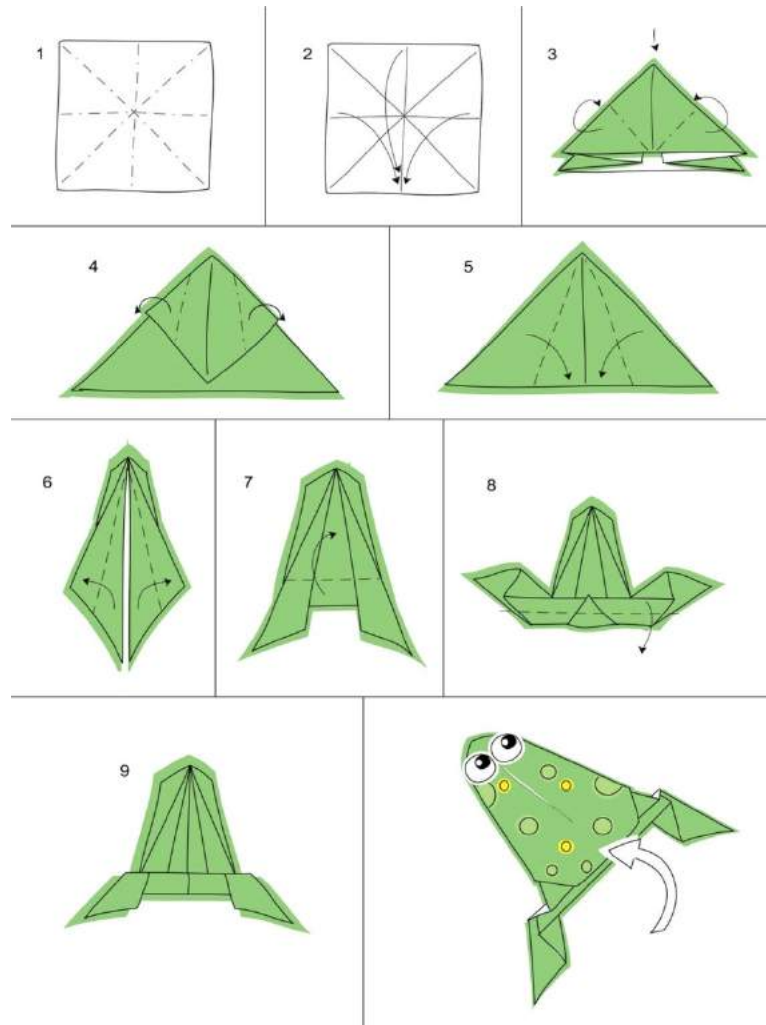
Fig. A8.2 – Frog origami instructions. Drawing reworked by Guglielmo Minervino

Overall, the generative system for making origami consists of a human operator who starts the program deciding which origami to do, and manages the process (*mean of specifyication*), a paper (*implementation components*), and the available types of folding dataset, both under the form of single folds or organised in sets of folding that are already developed and coded various parts of origami models (*configuration knowledge*). All the three elements can be the same for making numerous type of origami. What tights the elements together and allow the generation of the origami is the program's code, the algorithm, that establishes the relationships to be followed during the process which can be simply explained through one-page of step-by-step graphic instructions (Fig. A8.2)

Once we have a generative program model, this would still working at any change in the system such as the type of folding materials (paper, metal sheet, fabric...), the operator, that could be a robot instead of a human being, or even the dataset that could be implemented with a new type of folding. Finally, the system can be expanded such as by introducing controlling code-modules that verifies certain conditions such as the compatibility of the

folding material with the operator: perhaps a human being would not be able to fold a sheet of metal or a robot would have limits in the size of the folds to be made. In the traditional building system, this type of modules corresponded to a bottom-up system of control tying together the architectonic and urban solutions and the set of regulatory factors (principles, rules etc.). Moreover, the controlling system could have relied on a technical figure like a master mason as happened in Tunis in the XIV century (Hakim 2017) or a peer-to-peer feedback system between neighbours and master masons as in Calabria.

Art & Craft – Katana blade

The last example regards the traditional sword crafting sector from which an outstanding example of product emerging from the use of a generative program is the Japanese *katana* sword and its variety of blade surface patterns called *kitae-hada* (literally means forged and folded surfaces) (Fig. A8.3, top). The process of steel making consists of folding the steel bar back upon itself to form the distinct layers of steel that are unique to each blade (Morimoto 2004). It is simply the repetition of two steps, the flattening of the steel with a mallet, and its folding (Fig. A8.3, bottom). This two-steps process is repeated over and over again.

While the type of steel (*implementation component*) and the artisans (*mean of specification*) remained constant through centuries, the *tanren* methods (*configuration knowledge*) differ between the era and school of sword-smiths which gives difference appearances to the blade surface, yet it has always remained based on the two mentioned steps. The key characteristic of this example is exactly the simplicity of the instructions made of just two manufacturing operations contained in the generative program.
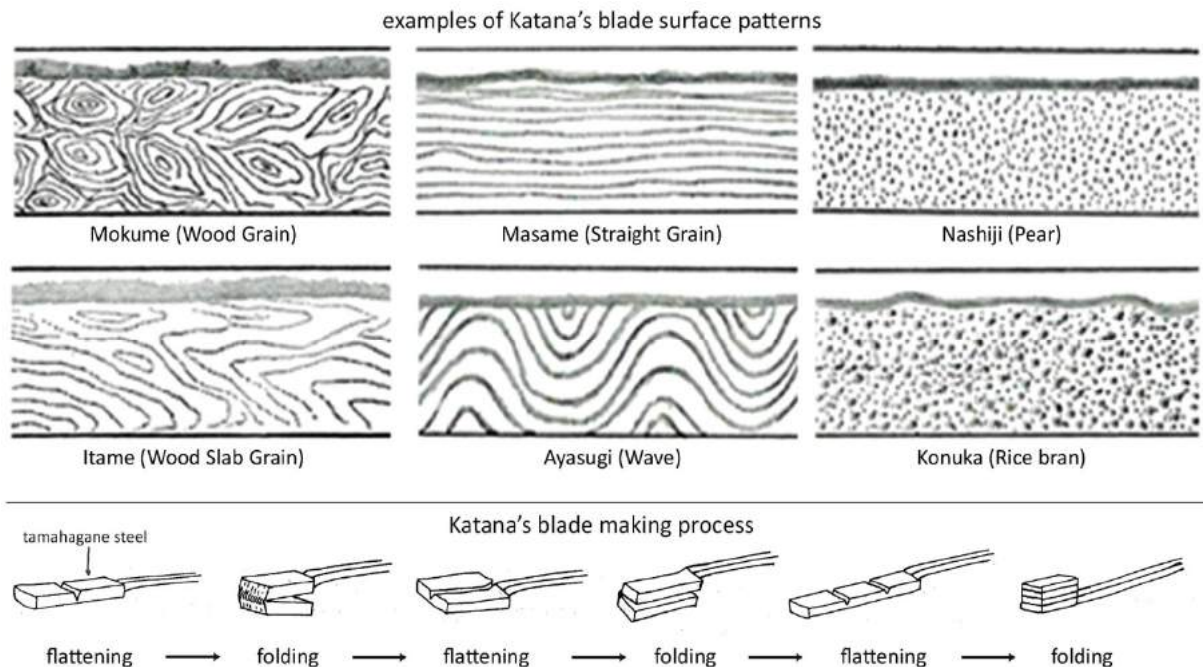

Fig. A8.3 – top) examples of patterns emerging from the traditional sword making process. Bottom) The two steps of the blade making program. Drawings from Morimoto (2004) and weblog.tozando.com

Gameing – Lego

Similar to the origami making process, is the one adopted by the Danish LEGO company which developed a line of plastic construction toys. This type of program relies on simple step-by-step graphical coded instructions (Fig. A8.4), without resorting to a text, for assembling a predetermined set of colourful interlocking plastic bricks (*implementation components*) that can be connected by a human being (*mean of specification*) in many ways to construct objects including vehicles, and buildings. Anything constructed can then be taken apart again, and the pieces used to make other objects. The key characteristic of Lego pieces is the *configuration knowledge* that, despite variation in the design and purposes of individual pieces over the years, allows each piece remaining compatible in some way with other existing pieces.

Fig. A8.4 – Example of LEGO instructions. Retrieved from www.brickowl.com