DOCTORAL PROGRAM IN ARCHITECTURE, URBAN DESIGN, CONSERVATION OF HOUSING AND LANDSCAPE

The purpose of the course is to train aware professionals and researchers, committed to the production of conceptual and operative instruments for the design of contemporary housing in the respect of the historical values. Taking responsibility towards liveableness of places, sustainability, good practices, while considering historical values within the complex and unstable reality, requires a critical revision and an update of the disciplinary instrumentation and of the training and research methods: to this goal, the Doctoral Program will profit from the contribution of thoughts and knowledge necessary to built up effective conceptual apparatus and design instruments.

The faculty board, where the different scientific areas of the Doctoral Program are represented, coordinates and constantly follows the students’ activity, which consists of an integrated activity of studies, theoretical and project researches, managing of seminar and meetings, organised in collaboration with Italian and foreign university, and involving external experts from the cultural and professional environment.

The PhD programme is three year long and evolves around three different phases, closely related each other and coherent with the research plans:

1. in the first period, the training proceeds along three interacting itineraries: start up of the permanent (three years) workshop, based on discussion and cross-disciplinary comparison between students and teacher board, focused on the main topics of the Doctoral programme; a research workshop, capable to handle the complexity of different scales and problems in the living project; a lecture tour aiming to develop the questions dealt with during the workshop. The triple activity, feeding the fundamental attitude to interconnect different knowledge, methods, codes and techniques, let each student to gain the critical and methodological awareness necessary to spot the specific areas of interest and to start up, coherently with the central themes of the PhD programme, the research work aimed to the thesis.

2. in the second period, the PhD student, besides being involved in launching and organising the permanent workshop activities, will develop his thesis research, taking advantage of the participation to congress, meetings, stage (it is mandatory to have at least one stage) in Italy or abroad, by institution or research laboratories in convention with the PhD programme, or by other institutes approved by the teacher board.

3. the third year will be devoted to the working out of the thesis: contents and methods, besides being constantly verified by the tutor, will be discussed with other PhD colleagues and with the teacher board during the permanent workshop activity.

At the end of the three years, the thesis will be the final dissertation subject and it will be judged by a commission of external teachers, allowing to the PhD student to obtain the title of Doctor.

Contents of the Doctoral Program

The Doctoral Program holds ‘the form of living space’ as a mandatory and strategic issue for the contemporary age.

The contemporary theoretical and practical researches are addressed through different disciplinary branches, capable to cope with questions as the relationship between the existing context and the new projects, the scales and the problems of the living space, in particular housing, public space and landscape. The Doctoral Program is articulated into three distinct but strongly interdependent “research itineraries” which together contribute to the training of the doctoral students, while retaining their specific approach.

1. The new living architecture through definition of settlement principles and construction types, rules of building processes, with particular attention to experimental sustainable models.

2. The conservation and functional adaptation of buildings belonging to historical and processing context, with particular attention to diagnostic, safeness material, historical, cultural and modeling aspects.

3. Traditional and innovating living spaces in relation to urban regeneration of suburbs and natural landscape.

Each year these guidelines will be articulated in specific research projects to be defined according to the scientific interests of teachers and to social and economic events.

In this respect it is crucial the relationship with the reference committee, with public institutions and with regional, national and international partner organizations.

While keeping their own scientific autonomy, the three research itineraries have to be explored and deepened by the doctoral students with an interdisciplinary approach. The interdisciplinary character is an important peculiarity of the Doctoral Program, viewed as a working method which allows to form researchers with a better understanding of the close relationship between theoretical studies and their practical applications.

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MAINTENANCE
A project of the city beyond the crisis

Marco Giuseppe Baccarelli - Supervisor: Marialessandra Secchi

This research is intended as a project, both in terms of its investigation into related disciplines and because of its exploration of a specific case study. The proposed thesis can be concisely represented by the image of maintenance, where this term defines a process of continuous, incremental and long-term transformations of the urban territory through the spread of built settlements.

At the basis of the research lies the hypothesis that it is necessary to attempt a redefinition both of the framework within which the multiple phenomena that currently engage the territory provoke its transformation, and of the fragmentation that lies in the territory itself, as well as of the literature that describes it. In order to do this, the research ranges from reasoning about structural issues to the investigation of local elements of a specific territory.

This maintenance project, therefore, is essentially an effort to recompose the different modes of thinking of various disciplines with the images that interpret, describe and influence a specific territory, suggesting consequently its capacity to give rules, as it is the proper finality of a project. After engaging and expanding on the “Urban Question”, the research critically approaches the several components that today inform an urban project under the paradigm of sustainability. The reasoning develops through the interpretation of several key concepts (such as the use of the land, the market, and the physical meaning of welfare), relating each of them to their general categories (ecology, economy and social implications). The investigation focuses in particular on the conditions of the urban diffusion where nowadays new methods and instruments able to look beyond the growth are most needed.

The urban design project -included as a way to test through the appropriate design scales the ideas expressed theoretically in the research- finds its location in the territory of the Brianza, north of Milan. This is a territory characterized by highly urban density, where long term construction has been flourishing as a way to accomplish individual wealth. Furthermore, this territory is characterized by continuous urban growth, while in parallel being subject to punctual underutilization and abandonment of many specific sites and locations. These are therefore examples of an evident distortion between territory imaginary interpretation models on one hand, and real current urban dynamics, which are no longer sustainable and functional to the new emergent territorial needs, on the other. We see this as a possible symptom of the crisis of the existing territory interpretation models.

For these reasons, the concept of maintenance should be interpreted as in contrast with that of growth, and as a means through which it is possible to interpret and to reframe the territory after the occurrence of the urban dispersion. Therefore the project of maintenance wants to be realistic, taking as a starting point the existing conditions of the territory, and referring specifically to its conflicting dynamics of using the land through diffused building growth and its contemporary local abandonment. At the same time, it proposes new long-term urban strategies, where the transformation of the territory builds on top of the existing growth, with the aim of recomposing a necessary and desired structure.

The urban design project -whose site is located in the central Brianza- proposes a strategic image based on development of a system in order put in relation to each other the “centrality”, both the historically urbanized ones and the contemporary open land areas, surrounded by the built environment.

Additionally the project identifies a thick and isotropic pattern of proximity spaces, consisting of urban connections and voids within the built areas. Once this structural system has been properly configured, it is possible to develop new and alternative scenarios, based on the different interpretations of the concept of sustainability. Finally, the project proposes new tools for the application of tactics that could manage the future transformation of the territory.

1. Brianza project of recomposition
Comparative Study of Sustainable Use of Renewable Energies in Houses: Learning from Vernacular Architecture in Hot and Dry Climate of Iran

Amir Bahramipanah - Supervisor: Maria Grazia Folli

Buildings in Iran are major source of energy consumption, which use lots of fossil fuel energy resources. Unfortunately sufficient attempts and researches have not been carried out for decreasing of non-renewable energies usage and increasing of renewable energies usage in building sectors. Furthermore, the amount of energy consumption in houses is very high in Iran, in comparison with the other countries. This could be originated from the country dependence to the cheap fossil fuels. The major part of Iran is located in hot and dry climate. According to the climate change predictions, the world is going to be hotter in near future. So, more areas will be exposed to hot climate in Iran and existing buildings in hot and dry regions will be confronted with energy problems in future. In this research, some solutions of the above mentioned problem is studied and investigated. Using the renewable energies in the buildings and decreasing the energy consumption is suggested. The main questions in this thesis are: According to the value of vernacular houses in Iran, how can we design houses that use renewable energies instead of fossil energy in hot and dry climate? And, According to the traditional behavior of Iranians, how can we decrease the energy consumptions in houses by changing their customs?

This research provides some architectural and cultural guidelines with consideration of the tradition and vernacular houses values in using renewable energies, sustainable energy consumption in them and the contemporary logical solutions around the world. These guidelines are useful for designing sustainable houses. Furthermore, the social cultural guidelines can decrease the energy consumption in the houses. This thesis is divided to five chapters:

1. The first chapter introduces the problems of climate changes and the necessity of decreasing fossil energy consumptions in contemporary houses of Iran.
2. This chapter is studied how architecture and social life patterns can generate energy consuming culture. It is proposed that the design of the contemporary low-consumed energy houses can be based on traditional principles with simple technologies and accurate social behavior. The architectural design should be based on vernacular houses with the consideration of new lifestyle and contemporary sustainable architecture that uses renewable energies. In order to achieve this goal, the following topics are studied in the next chapters.
3. The second chapter is based on concepts of the vernacular houses. In this chapter, the vernacular houses in different climate of Iran and especially the characteristic of vernacular houses in hot and dry climate is described. Some of the best vernacular houses at the late period of Ghajarye dynasty (1795 – 1925) in Iran are investigated. The research has been done with an overview on vernacular houses in different cities in hot regions such as Yazd and Kashan through some case studies. The research looks for different solutions that vernacular architects have used them in order to have thermal comfort in their buildings from renewable energies. These cases studies are based on symbolic and ideal cases of vernacular architecture. Then, the data are analyzed based on theoretical approach to suggest a strategy along with the theoretical bases. Different scales of consideration such as urban design, social behavior, tradition lifestyle and architecture are studied in order to find the guidelines which have been used in these houses. The hypothesis of the thesis is that some of these guidelines can directly or indirectly be used in contemporary houses.

Comparative studies between the traditional and contemporary solutions have been done in last chapters.

In third chapter, other research studies on sustainable Iranian architecture and their results are reviewed. Then, the problems produced in the houses with less using of renewable energies and high energy consumption is discussed based on the studies that have done on contemporary houses. The process of transformation from traditional houses of late Ghajarye period to contemporary ones is studied in order to find the main points which are missed during transformation and leads to the current situation. The survey shows that the less using of renewable energies and incorrect social behaviors of inhabitants lead to increase energy consumption in contemporary houses. In fourth chapter, some researches on new passive ways of using renewable energies in contemporary houses of the buildings which are integrated to renewable energy around the world. New researches are based on life with zero energy which means the use of energy without any impact on the climate or depletion of resources. In last decades, it has been proved that wind energy is one of the major renewable energy resources for ventilation, cooling or generation of electricity which could be very useful for hot and dry climate. Passive solar methods have been developed in various ways of direct and indirect gain around the world that can full fill energy demands in hot and dry climate because of high solar radiation in these regions.

In fifth chapter, some proposals, originated from comparative studies between the traditional solutions and contemporary ones, together with some guidelines are generated and architecture as a concept which could be helpful for generation of a sustainable solution. This concept tries to generate a balance between privacy, ownership, sharing services, facilities and cultural issues, something which has not been fully recognized in architectural studies yet.
Actually we admit that earthquake is a random, periodical event, driven by natural forces due to the evolutionary process of the planet we live on. Since the Eighteenth century, we have become aware of the ecological meaning of the world: the need for maintaining the well-being balance between humans, species and the whole world. By the early Twentieth century investigators interested in the origin and effects of seismic events started to develop methods to measure both the actual intensity of the shaking and to pinpoint its root. The development of advanced devices to aid in the recording, categorizing and forecasting of earthquakes and their effects is one of the main consequences of the international seismic protocol.

Currently public awareness of worldwide population growth has increased. This worrisome demographic phenomenon leads to an equally worrying need for maintaining the well-being balance of the size and number of villages, towns and cities. Such an alarming situation draws attention to the necessity of taking care of environmental condition, building heritage and human life and last but not least reducing the losses due to earthquakes. Moreover a dramatic lack of suitable tools and strategies to deal with an efficient preventive intervention against seismic effects on constructions time after time and to face the emergency has been pointed out. Environment, building heritage and human life and losses due to natural disasters (e.g. earthquake) are relevant topics. Therefore nowadays problems related with Defence Against Earthquakes have to be evaluated in terms of decisions, management and predictions. Whenever natural catastrophes strike abroad, some questions turn out to be critical: can a natural disaster be predicted in advance? Which preventive actions can be planned in order to successfully withstand almost stronger effects? Why hasn’t any preventive action been performed? Who should make decisions on preventive interventions?

Approaching decisions, past experiences may positively or negatively affect choice; indeed, they make the cognitive process more effective, working and accurate. As buildings age, they become permanent parts of local culture, and witness of environmental transformations over time. They become unique, as buildings are simply no longer made the same way, and time provides them with characteristics that could never be designed into a new building. Knowing and understanding buildings is necessary for properly evaluating current preventive strategies and choosing adequate rehabilitation, reconstruction, upgrading, improvement and local interventions. Considering building heritage, a multi-level investigation, advanced analysis and interpretation methods (on-site surveys, historical researches and laboratory tests) should be performed on existing buildings. That combined approach results in efficient strategic decisions. Decision makers should consider proactive sustainable and performing operating strategies, which optimise the requirements for ensuring structural safety, decreasing environmental impact, assessing cost-effectiveness and preserving the architectural identity (design semantics).

Risk mitigation should be considered as a social fact rather than merely a physical or numerical assessment operation. An integrated and multidisciplinary risk mitigation program should propose three principles in the master plan for sustainable intervention and development, including: the preservation of the area identity in urban design, the strengthen of the existing buildings, complying with design provisions of the National Building Code, and the fostering of active people participations in various aspects of physical, environmental, social and economic issues. Thus, this thesis focuses on life cycle management as the heart of intervention and design strategies on both new and existing buildings in order to preserve their architectural identity, ensure them a long life and deal with strategic policies for handling emergencies. The basic idea is that the comparison with different intervention scenarios is a suitable instrument for supporting the decision-making process within intervention strategies and risk mitigation policies. Over the time, every building changes its dynamic response to both environmental and load uses: building’s reliability decreases, while its vulnerability to natural (or man-made) hazards increases. Thence, the whole building’s condition has to be deeply investigated. The need for maintenance, repairs and asset renewals varies depending on several factors, such as the quality of construction, design details, environmental conditions and the standard of care given to the building. Understanding this correlation enables to predict the future structure performance and make decisions about operating strategies (maintenance, fitting, repairs and asset renewals). To explain the general combined approach, the Function of Possession Frame Energy, theorised by Professor Imagawa Nonihde (Tokyo Denki University, Tokyo, Japan), the evaluation of material CO2 consumption and the vulnerability index and class assessment, based on the Italian method proposed by Gruppo Nazionale per la Difesa dai Terremoti (CNR – GNDT), have been directly applied to a case study in San Pietro di Fontecchio (L’Aquilia, Abruzzo, Italy) stroke by the April-6th-2009 earthquake occurred in Italy.

That resulted in the definition of the system global performance as well as the environmental impact of building materials and improvements at different times of the service life (i.e. initial condition, right before the earthquake, after the earthquake, after seismic improvements). Three different seismic improvement scenarios have been proposed and compared: the official improvement approved by the Municipality, a steel improvement and a timber improvement. Implementing performance, maintenance and vulnerability assessment and economically comparing the different intervention scenarios through a preliminary cost-benefit analysis, lead to define the optimal decision-making process with a proper balancing technique and material choices, retrofitting (improving the original structural system) and maintenance. The Life Cycle Assessment considers the impact of the manufacture of building products, over the whole useful life from cradle to grave, in order to minimise the environmental load of a system and optimise the structure performance. That is the basis of any decision-making process. With refer to economic damage and massive social disruption caused by earthquakes, implementing an integrated method in current mitigation practices, the awareness on traditional low-tech construction techniques and materials characteristics may benefit. Furthermore, considering lifespan, low-tech materials may provide a good balance between long-life, efficiency and environmental impact. Improving and sharing the knowledge of such a combined method should finally foster the development of an international networking.

LIFE CYCLE MANAGEMENT
Development of a Risk Mitigation and Maintenance/Rehabilitation Planning Approach for Seismic Prone Regions

Noemi Basso - Supervisor: Elsa Garavaglia

with an efficient preventive intervention against seismic effects on constructions time after time and to face the emergency has been pointed out. Environment, building heritage and human life and losses due to natural disasters (e.g. earthquake) are relevant topics. Therefore nowadays problems related with Defence Against Earthquakes have to be evaluated in terms of decisions, management and predictions. Whenever natural catastrophes strike abroad, some questions turn out to be critical: can a natural disaster be predicted in advance? Which preventive actions can be planned in order to successfully withstand almost stronger effects? Why hasn’t any preventive action been performed? Who should make decisions on preventive interventions?

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COLOURS AND MATERIALS OF HISTORICAL CENTERS: sustainable conservation and management

Margherita Bertoldi - Supervisor: Lucia Toniolo

PART ONE – state of the art
The attention to materials and colours of the façades of historical buildings arises in the seventies from the renewed interest for the historical centers and the debates about the conservation and restoration theory: the “minimal intervention” theory conducts by Dezzi Bardeschi and Bellini against the “philological renovation” theory whose Marconi is the maximum exponent.

The conservative approach expressed into the Restoration Cards is fundamental. Any intervention that consider the removal of material and its substitution with new materials is disapproved: the concept of “sacrifice surface” was abandoned in place of the acknowledgment of the intrinsic historic value of the materials. The conservative interest is no longer limited only to monumental buildings, but also extended to the whole historical context.

The need of a colour planning into the historical centers grows up also after the introduction on the market, from the middle of the last century, of polymer-based paints hardly compatible with historical supports and available in any hues. Until then, the colour did not require special guidelines cause the individual choices were limited to the materials available on-site and the hues were mostly in the range of earth colours. In Italy the so-called Piani del Colore represent a first response on the need for tools to regulate, discipline, control and plan the identification, and for a new reality intentionally decontextualized (plan of Tirana). But in a real context can’t be easily made a clear distinction between typologies of plan.

PART TWO – methodology guidelines for the Colour Plans
A Colour Plan consists of research and investigation activities aiming at a methodology proposal for the restoration, the maintenance and the realization of a Colour Palette for each architectural elements which constitute a façade. These activities can be summarized as follows (Fig. 1):
1. Historical and documentary researches on building and finishing materials, through documents found in public and private archives and bibliographic sources.
2. Stratigraphic investigations on-site on finishes and plasters, in order to understand the stratigraphic succession of materials and colourings.
3. Direct diagnostic investigations to characterize the materials used in façades and evaluate their state of conservation. These investigations include visual surveys on-site and thematic mapping, non-invasive on-site investigation techniques, laboratory tests on samples of material (Fig. 2).
4. Colorimetric survey of the different architectural elements that constitute a façade.
5. Data elaboration about historical research, materials and chromatic investigations. The data are analyzed and elaborated divided according to the architectural unit and the architectural elements on the façade.
6. Realization of a color palette.

It represents the catalog of the current colours surveyed and reproduced in laboratory in according to the Munsell notation system. It provides suggestions for an appropriate chromatic proposal for the restoration and maintenance (Fig. 3).

COLOUR PLAN PROCEDURE

1. Colour Plan procedure

2. Stereomicroscope observation of sample from the façade of Corte del Doro in Castiglione Olona: polished cross-section under reflected visible light showing the finishing mortar and the superficial ocre paint.

3. Colour Palette of via Roma in Castiglione Olona. The different hues are faithful to the paper version because they are photographs taken directly from the original painted colour samples realized in laboratory.

The photographs are taken with natural light, to simulate the lighting of an external surface

The fifteenth-century historical center of Castiglione Olona (VA) is used as case study for the application of the methodology above described. The opportunity rises after the participation to the 2011-Fondazione Cariplo competition called “Promuovere le metodologie innovative per la conservazione artistica” and the subsequent financing obtained for a two-years project “Castiglione Olona: laboratorio di metodologie integrate per la valorizzazione” in partnership between the local Administration and the Politecnico di Milano.
FOR A CULTURAL DIMENSION OF THE WIDESPREAD BUILDING PROJECT
Principles, tools, procedures

Roberta Mastropirro - Supervisor: Maurizio Boriani

The contents and the reasoning of the thesis originate by an analysis of the current urban design scenario in those fields of urban transformation that suffer a lack of normative and frequent contradictory actions that compromise the building heritage conservation and the durability of material, formal and morphological features of the landscape.

The historian involved in the projects evaluation have nowadays to face projects that lack a clear methodology definition, objectives, choice motivations and methodological coherence; these are all aspects that, most of the time, lead to projects that only partially respect the main elements of the existing context.

Before analyzing the connection between normative, authorities involved in the evaluation and the project is therefore important to examine the definition of architecture quality and, more widely, to focus on the theme of territory and city public quality.

The connection between architects, their creative spaces and institutions focused on urban quality is increasingly a crucial aspect of the current professional practice.

Assumed that each building intervention, by modifying the public landscape, gets an added public value, we hereby identify an ethical dimension of our profession, characterized by a responsibility that goes beyond the mere relationship with the commissioner.

Starting with these assumptions, the research proposes to analyze the theme of quality by considering it as a social concept, whose evaluation may differ as the time and the context change.

The research introduction intends to examine the potential principles that can determine an architectural quality in a broad sense, from the building steps to the street, from the public areas to the biggest territorial transformation projects.

This introduction then proposes a few questions that highlight some problems: considering that the current culture is less homogeneous and shared than in other historical periods, what do we mean nowadays by quality of the urban transformation, which are its principles and features? Does intervention quality need controls, normatives, evaluations? Which criteria can we use to judge quality? Who can control quality? Considering which range do we have to legislate and evaluate quality? Is there in the Italian system a public interest on quality, not only from the architectural point of view, but rather extended to the whole urban transformation process?

The research aims to delimit the architectural quality concept within the contemporary context by highlighting those features that can lead to an evaluation of the intervention on the existing situation.

In order to examine the evolution of the quality concept, the thesis also analyzes urban transformation rules of different historical periods and contexts. Afterwards, by considering the project as a vehicle to integrate and coordinate cultural technical and human resources that respect quality, the thesis analyzes the current set of laws aiming to clarify the phases, the actions, the application fields and the principles that regulate its qualification and methodology.

Further international and national references, some opposed and some complementary to the set of laws, are “good practices” rules that define a specific and innovating projecting methodology.

A clear definition of the features that can determine how quality and evaluation standards have changed in the course of time helps to compare the plurality of instruments that have been significant for the urban and landscape transformation by giving the necessary interpretation to identify addressing parameters and project contents for an appropriate editing and evaluation of the interventions on the quality building.

The analyzed case contents highlight that it is necessary to describe the architectural quality concept not only by referring to it the product conformity to technical specifications or to the standardization of the project processes, but rather by rediscovering some principles that can legitimate the legibility and the social appreciation of the work, by disclosing its peculiar identity.

The urban development planning is nowadays testing structures and normatives of the urban settlement that contribute to realize “the cities” and territories, not only from the aesthetic point of view, but also considering their capability to communicate a “social beauty” and a “cultural beauty” in order to promote the urban cultural identity by highlighting the structure of its parts.

When a function, a logical connection is fixed between qualitative perception and some parameters, quality is measured, sorted and described in order to be explicit as a term of value, judgement criterion, decision-making factor. The quality parameters can be numerical variables, but the essential aspect is that they can also be features, characters that analytically describe the object quality without using a quantitative expression.

These features can lead to a quality management intended as efficacy and efficiency of the process that seeks the make the most of advantages in relation with the employed resources by respecting the community cultural interests.

If the existing good is considered as the combination of the relations between men and reality, as a memory of the variety of vital integrations, of critical and historical interpretation theories that have contributed to identify the current architectural projects as cultural goods, then no absolute knowledge, nor univocal truth systems exist. In this sense the intervention on the existing structure cannot be exclusively regulated by an exact science translated into a typification, nor by rationalism or by quantitative evaluation systems.

Defining and decomposing the project process, by identifying the essential cultural stages for the intervention result and by comparing them with the initial purposes, is a way of working that adopts an appropriate quality management of the transformation.

In order to answer if quality has to be submitted to a control and which would the evaluation criteria be, it is necessary to compare the complexity of contemporary cities with that of the past ones.

The responsibility of the architect is based on delicate relationships that involve the place, project and commissioner needs. If retracing the principles that have ruled an “architectural quality”, considering the features of the contemporary context, we think it is reductive to face the quality concept in an absolute sense, without trying to define its different meanings, that are indeed able to communicate at best the complexity of the urban contemporary context.

The attempt to divide the quality concept into many different “dimensions” is connected with the criteria and principles that can address to an appropriate durability and transformation project; the same definition of quality has to be compared with this combination of factors in order to better outline its general meaning in the architectural project process field.

In the architectural field, particularly in the landscape transformation processes, the pertinence and satisfaction concepts cannot be just referred to a “service performance”, but they rather have to get wider meanings.

The quality of the urban project consists first of all in the effectiveness of the project that is able to lead the project idea to its achievement, a process that is able to keep the good quality of the initial idea intact. It is therefore necessary to legitimize not much the architectural quality, but rather the quality of the project during its development trend.

We therefore highlight hereby the need of a cultural value of the project, value that has to be able to lead the process toward a good quality of the building identity character, in which the community can identify.
Elena Porqueddu - Maria Grazia Folli

URBAN INTENSITY IN DISTRIBUTED SYSTEMS
A multi-scale approach to the network city

Urban intensity, understood as the potential for endless random and unpredictable interaction between heterogeneous individuals and activities, has recently been re-proposed, within the debate on the contemporary metropolis, as one of the main conditions for emergent urban complexity. Since Jane Jacobs’s classic micro scale observation in Manhattan, this performance (ballet), connecting spatiality and sociality in everyday life, is considered crucial for a large range of unofficial and unforeseen plans, ideas and opportunities to emerge. On one hand, the compact city has recently been re-proposed as the habitat which best fosters a mix of different activities and an increasing intensity of interactions and exchanges between heterogeneous individuals and social groups. On the other hand, according to recent research by sociologists and geographers, in the contemporary society social interaction and sense of community often overcome the boundaries of a specific site. In fact, the rise of mobility and communication technologies have brought about a network of exchanges between discontinuous places, opening up new possibilities for interaction beside and beyond the traditional relationship of proximity. In broad terms this study sets out to investigate how this unprecedented space-time condition enables the emergence of urban intensity across the expanded field of the contemporary metropolis and what are the spatial conditions involved in this potential.

In order to understand whether intensity is related to density or to any specific morphology, a Multi-scale Atlas is here proposed as a tool for empirical investigation. The Atlas aims at combining a multi-scale approach with a social-spatial understanding, from the micro-scale of a single building or sidewalk to the macro-scale of the city region. In fact, in the expanded discontinuous territory of the contemporary metropolis, an analysis of urban space merely at the architectural scale of place-making would not highlight the spatial-social dynamic beyond the boundaries of a specific site. On the other hand, the planning scale of regional dispersion does not reveal anything about the micro-space scene of everyday “urban ballets”. The atlas was developed in a low-density Italian area called Oltrepò Pavese, situated 50 km south of Milan, beyond the river Po, at the intersection of two important infrastructures connecting Milan and Genoa and Turin and Bologna. A layer of new centralities overlaps here a fine grain network of small traditional settlements distributed across the countryside and the hills. Intensity emerges according to everyday flows of people randomly gathering in certain places at certain times. In this regard, this territory looks like an electric system where old and new centralities resemble lights turning “on” and “off” according to different impulses.

In order to understand whether these existing flows, developing on a metropolitan scale, temporary match up with local, place-based street life and whether this mix is related to any specific urban form or density, the Atlas combines quantitative and qualitative methodologies: statistic data collection and analysis are here matched with interviews, multi-scale mapping and behavioural-photographic survey. The Atlas highlights how urban intensity does not emerge in relation to abstract, coded city models. Instead it is related to the distribution of local activities and metropolitan attractions across multiple networks of connections and boundaries over a wide range of scales. In fact, the relationship between fast arterials and slow local networks of connections mediates the interaction between metropolitan flows, developing on a wide scale, and local street life whereas the interplay of private-public interfaces across space and time, mediates the synergy between local businesses and regional attractions and between private activities and public-collective spaces. This local-metropolitan perspective can contribute to overcome the dichotomy between “Generic” and traditional concentric city or between compact city and urban sprawl, based on the contrast between opposite coded city formulae, and shifts the focus toward the dynamic relationship between micro and macro scale, between fast connections and slow networks, between boundaries and flows, car traffic and “street ballets”, regional attractions and local activities, across heterogeneous urban fabrics and densities. This remodeled understanding is here considered crucial to inform all the design approaches which aim to engage multiple existing forces, accommodate differences and incorporate change and adaptation, rather than proposing or supporting universal principles or coded urban formulae. Finally, the multi-scale approach, here proposed, can contribute to foster an idea of “place as becoming”, characterized by connections and interactions rather than by enclosing boundaries and original sources. In this respect, urban intensity beyond proximity is here considered crucial for the development of a sense of place and identity which could be endlessly nourished by the experience of difference, increasingly enabled by our everyday journey.
Looking at the architectural history of any country regardless of its geographical situation or its climatic conditions shows that the architects used most of their skills on the improvement of the residential buildings. The architectural developments of dwellings have been much greater than any other type of building and this is because of the fact that the people spend most of their times at their homes, which they would like to find a comfortable place after a hard day of work.

The dynamic population growth that took place in 20th century, accompanied by a rapid process of urbanization, left its mark on housing type. Now at the beginning of the 21st century, with the advent of the digital revolution the dwellings are facing new changes. Socio – cultural influences play an important role alongside economical factors in defining the vague term “dwelling”. The aging of the population, emancipation, migration and etc. are changing the concept of housing.

In addition to that with so much attention being drawn towards the perils of our planet and the environmental impact that a global population is causing the environmental impact that the perils of our planet and attention being drawn towards The aging of the population, emancipation, migration and etc. are changing the concept of housing.

In the early days of the history of buildings, building forms, types of construction and the materials that have been used in the buildings was very much related to the climatic conditions in which the building was situated. This trend was contrasted within time, especially after the industrial revolution when satisfying the desired interior conditions was guaranteed by means of extensive technical systems and of course the corresponding energy input required by them. This led to introduction of international architectural styles. But today due to the importance of planning the design of building considering their energy efficient behavior, it has been proven that a more sensitive approach needs to be taken towards local characteristics of the buildings and its site location. Considering these facts, at the final chapter of this research a guideline is presented based on different climatic condition

The architectural design characteristics: building levels, roof types, building inclination, windows orientation and shadings. Ultimately this guideline is a unique tool providing information regarding both architectural design characteristics and building services (technological devices), intended to be noticed at the early stages of the integrated design process of new types of residential buildings for the architects, design team, constructors, architectural students, researchers and any one who is involved with the design of a residential building that meets the needs of the future. It can be used for any type of housing projects no matter the sustainability level, location, size and etc.

The purpose of the guideline is to provide advice on how to design and develop a residential building that is zero energy or zero carbon. The advantages of using a guideline is that firstly it can work as a checklist to remind the design team, main complimentary and one is not enough without the other. Here is the list of the issues mentioned on each part: The building services: source of energy, implemented technologies, ventilation systems and technologies, windows and insulation systems.

The case studies are mostly recognized building sustainability assessments methods such as LEED and BREEAM. They include different type of housing from single-family houses to big residential buildings and neighborhoods and belong to both public and private sector. Different characteristics of these houses have been studied such as; types, geographical locations, sector, affordability, sustainability certification type and level, energy sources, implanted technologies for energy supply, water efficiency systems, ventilation type and systems, windows glazing, shading types, materials choices, architectural characteristics and etc. In this research the main challenge has always been to suggest a hybrid solution to the design team. A hybrid design method includes both technological advances and architectural design characteristics, which both are influential on the sustainability level of the building, vital and complementary to fulfill the requirements of a house designed for the future, with high quality and high level of responsibility towards the environment. By using a hybrid design method, the integration level of the building services with the architectural characteristic of the building and especially the building envelope would become significantly higher. In this research it has been discussed that how the future residential buildings will be designed to adopt new technologies instead of traditional architectural forms with additional technological devices.

1. Architectural Integration Concepts of Solar Technologies with Building Envelope

1. FabLab House
The present research is an investigation on the role of the project in the contemporary European city. The European context is characterized by a high environmental quality and a thick historical sedimentation. Nevertheless, its condition are more and more precarious because of a growing divide between the rich and poor, an unsustainable waste of environmental resources and an elitist management of the infrastructure.

These questions represent a new challenge for the contemporary design. Today it is important to understand which kind of project is asked by the collectivity rather than to search an overall solution. Which tools can help us to face the new scale of the phenomena? How can we increase the collective character of the urban space? How can the project spread a social liveability of the space? In other words: which is the useful project for the contemporary society?

The aim of the research is to look at the design concepts produced in the last thirty years and to identify which one of them could stimulate a new design of the territory. The last three decades have been a very fertile period for theoretical speculation: the architects have debated about many ideas as that of renovatio urbis, of urban project, but above all, of modification. Yet only in a few cases, the design solutions provided have been really effective. In most cases, the design of the territory has been corrupted by a speculative process and by single interventions that have faced the problem case by case.

My idea is that the European territory needs a design action and that this effort is referred mostly to the question of modification. The hypothesis of the research is that today it is emerging a new kind of modification project. It is a very interesting design because it introduces innovative elements along a rut already mapped. It reaffirms of the centrality of urban themes. It is a research by design, developed through the morphological reason. It is a method that does not care about the size or the location of the single intervention. It is an exploration that poses a few questions to the city, very targeted and therefore fundamental.

To develop these ideas, the research makes use of four moves. The first is to describe the meaning, the potentials and the questions of the incremental development of the territory, through the analysis of the recent growth of the North Milan and the one of the South Holland. The incremental development is a logic based on a multitude of increments, which have been built next to the infrastructures, to the collective space, to the natural resources. This strategy changes the values of the spaces; it provides a urban mixité; introduces new shapes – like the contemporary market streets of the North Milan. However today it is getting closer to a paradox. The excessive attention on the single increments is sharpening questions like the soil sealing, the problematic relationship between mobility and social groups, the oblivion of public spaces. Even if the ecological problems are part of the political agenda – as in the Dutch case study –, they cannot be solved without a redesign of the territory. So this should be the task of the next contemporary project: intersect the incremental logic with a general reorganization of the territory.

The second concerns the study of some historical experiences. In the beginning of the eighties, the architectural research has started to discuss about an incremental design of the city. Cities like Berlin, Barcelona, Paris and London have represented an experimental field of work to verify the theories and the ideas produced. They have set the basis for a different design approach, that has been then codified in canonical forms. Nevertheless these cities are an open lesson, because they contain some issues still fundamental for the contemporary design. In this sense Berlin is the place of an interrogation on the role of the history; Barcelona embodies the criticism of the old planning instruments and proposes a redefinition of the city starting from a discrete transformation of the open spaces; Paris discusses the relationship between design and language; London epitomizes the exaltation of the private capital against the public powers.

The third is the study of the journal Casabella, directed by Vittorio Gregotti. This is an important place for architectural reflections because synthesizes and criticizes the European urban experiences just described. It builds a theory on the architectural project, by analysing current events and the mutations of the contemporary city. The attempt here is to underline some conceptual tools as the notions of modification, rule, material, ground project, settlement criteria. These ideas describe the main features of the contemporary design: its foundation lays in the shape of the context; it is a work at different scales, avoiding the strict division between architecture and urban planning; it rethinks the relationship between design and composition.

The last part regards a design experiment for the North Milan territory. It is a scenario that concerns the progressive abandon of the diffusion industry of North Milan. Nowadays several industries are experiencing here as well as in other part of Italy (i.e. in the North-East Italian regions) a serious crisis. Today, small factories, sheds and workshops are empty or on sale. This problem, that seems irrelevant in a small scale, represents instead a critical issue in a larger scale. Hence, it becomes reasonable to think about a future in which this process will be completed.

The aim is here to study a possible reuse of these surfaces, by avoiding a simply residential saturation, that would otherwise invalidate the metropolitan mixité.

The attempt of the four moves is to represent the background of the modification and to underline its potentials for the urban design. But, above all, what I’ve tried to show is the conceptual condition of the contemporary project. My idea is that the potential of a city is in the way people use their spaces. Thus, rather than the marvellous city of informations and bits, the city in this sense, I think that an investigation on the nexus between the built forms of the city (proper of the architectural discipline) and the expectations of the society (proper of the planning domain), might yet be useful.

1. The existing social capital of North Milan and in particular of Brianza. The image shows all the elements that play a collective role at the territorial scale: parks, public transport, river, natural systems, agricultural voids.

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The livable courtyard building hinterland of China, also spread extensively. It appeared in the fabric with the Chinese courtyard between human, society and standards and principles, made on the basis of a series social shapes. They integrated together buildings with various scales and are realized by the courtyard different functional buildings house, but a more large idea the definition of the single-family architecture is not only means to the city, the courtyard building types of fabric according to the organization, forms the different element of a systematic reticulate dynasties. It works as the basic element of a systematic reticulate organization, forms the different types of fabric according to the societies and theirs economic circumstances. From the village to the city, the courtyard building architecture is not only means the definition of the single-family house, but a more large idea which could reach the scope of the territory. In this system, different functional buildings are realized by the courtyard buildings with various scales and shapes. They integrated together on the basis of a series social standards and principles, made the best artificial connection between human, society and the nature. The influence of the fabric with the Chinese courtyard building architecture is very extensively. It appeared in the hinterland of China, also spread to the surrounding territories. The livable courtyard building could satisfy the different conditions; but because of the limitation of the traditional constructing technology, the single-buildings are mainly one or two floors height, and the dimension of the settlements expand mainly on the horizontal directions which seems that they provide a little low density when comparing with the developmental requirements of the contemporary time.

Nowadays, China is undergoing an unprecedented urbanization. After decades’ preparation of the Reform and Opening-up, the accelerated part of the urban development formally started from the beginning of this century. The year 2020 has been considered as an object stage to accomplish the so-called Xiaokang Society. It is supposed that in the coming stage the cities will be fully modernized and be constructing as typical international metropolis.

However, the construction which is supposed to bring people the high quality of living spaces pushes the traditional courtyard buildings into a great crisis. The original ancient city with the courtyard building architecture has been greatly demolished to release the spaces for the new construction which are mainly implemented in the American mode. Instead of the courtyard building architecture, the image building becomes the protagonist of the city, which causes the cultural crisis of the city’s appearance. In additional, the Chinese urbanization also produces the similar problems like the other countries which have undergone this process. The problems of population, environment, and resources happen in the Chinese way: the excessive resources consumption by the high-speed construction, the air pollution by the unbridled emission, the environmental decay by large demolishment, and so on. All these problems are amplified by the great number of the population.

It is real that the Chinese traditional courtyard building architecture couldn’t meet the requirements of the contemporary life? What are the ideas of sustainability in the Chinese culture? With the summoning of the Sustainable development, the research supposes to reflect the Chinese courtyard building architecture which was flourishing in the ancient time and has been badly treated in the urbanization as a response, and try to convert it into a useful instrument to treat the issues of sustainable development. By reviewing the generation and development of its system, the research would like to explore the sustainable spatial strategies which have carried by this architecture and could be used for the contemporary development.

For this purpose, the research is divided into four chapters:

The Chapter 1 is a brief review about the system of Chinese courtyard building to get a general sense, and also to make a clear definition about the system of Chinese courtyard building architecture. The courtyard building architecture could coordinate the relationship between human, nature and society. Following the stream of its generation and development, we could define some characteristics of its systematic structural ideology, although the forms of the courtyard building are definitely evolved and transformed according to the different dynasties, areas, and climates and so on. These characteristics influence the people’s primary consciousness to define the feeling about the living quality, the comfortable.

The Chapter 2 is the observation of the transformation of the courtyard building architecture in the modern time. In this section, according to the historical slices, the modern development of the courtyard building architecture has been divided into three stages. During these periods, some spatial characteristics of the traditional courtyard building architecture have been inherited; some new enclosure types were produced by the new social conditions and the new constructive technologies or were implanted from the other countries. Although the original form of the courtyard building had been impacted a lot in the modern time, we could also notice the potentiality of the typology and its possibility for the future development.

The Chapter 3 is about the requirements and hypothesis of the Chinese contemporary dwelling. The analysis is mainly form three aspects: the general background of the age; towards the high living quality, the important issues that China needs to treat; and the ethos of the Chinese contemporary architects. Through these reflections, the research proposes the characteristics of the housing spaces which could meet the Chinese requirements of the sustainable development. Meanwhile, according to its special features, the research recommends the courtyard building architecture as the proper instrument to provide the spatial strategies for the sustainability.

The Chapter 4 is the sustainable strategies to construct the living spaces by using the courtyard building as the effective instrument. The strategies have been raised in six aspects: use the fabric of the courtyard building to remodel the physical pattern of the city; use the courtyard building to fulfill the requirements of different community spaces; use the courtyard building to improve the quality of high density development; use the module idea of the courtyard building to create the diversity spaces; use the structural characteristics of the single courtyard building to create the flexible and transformable spaces; use the typical materials to express the identity of the courtyard building to keep the memory.

In the conclusion, besides summarizing the modern essence of the Chinese courtyard building architecture, the research would like to leave an open topic for the future discussion.