Type, Rule and Exception

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Marco Maretto, Nicola Marzot, Annarita Ferrante

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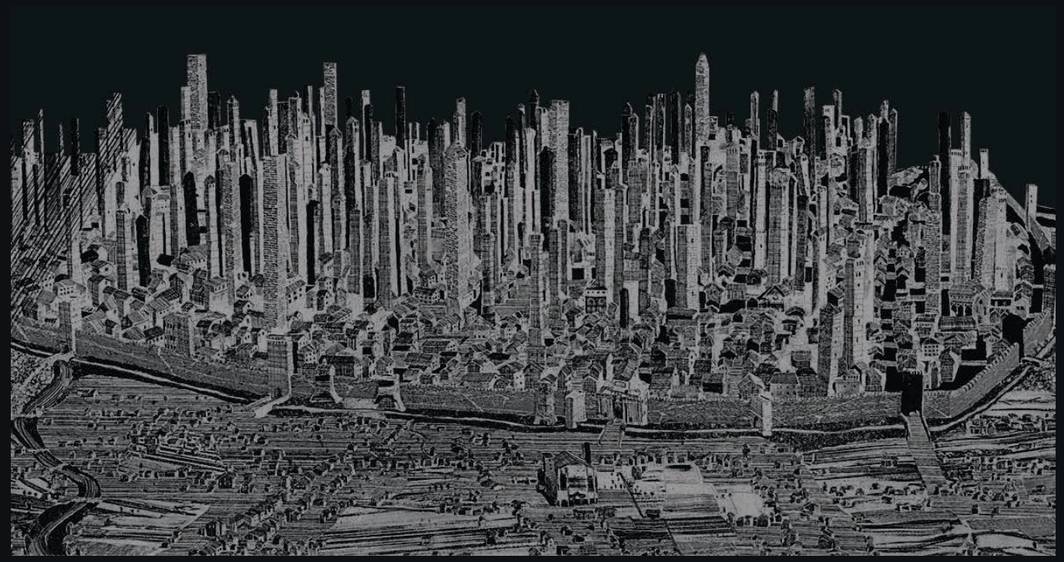

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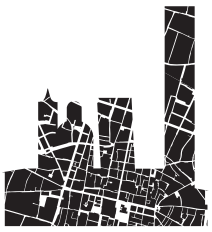

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MORPHOLOGY AND URBAN DESIGN

new strategies for a changing society

PROCEEDINGS

edited by
Marco Maretto, Nicola Marzot, Annarita Ferrante

with the collaboration of
Silvia Tagliazucchi, Francesco Scattino, Greta Pitanti

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Sixth ISUFItaly Conference Presentation

We open today the sixth conference organized by the Isufitaly Association, the Italian network of the International Seminar on Urban Form that we founded 38 years ago with the contribution of the English school of geographers which followed the scientific tradition of the researches of M.R.G Conzen (which had, in turn, roots in the tradition of German cultural geography) and the school of Italian architects referred to the studies of Gianfranco Caniggia and Saverio Muratori, with its roots in the studies on urban form conducted between the wars by innovators such as Gustavo Giovannoni, Arnaldo Foschini, Giovan Battista Milani.

From the beginning it seemed clear to all of us how useful the disciplinary differences and how fertile integration between the two groups were.

Geography is a fundamentally descriptive discipline. However, it was interpreted by the Conzenian school with great attention to the shape of the city, and after all the Muratorian school considered reading, in turn, intended as a critical study of the built reality, an integral part of the architectural design itself. Indeed it considered the very form of the territory as architecture. This explains why our Association, made up mainly of architects, had the project as the central object of our studies.

Isufitaly was founded much later, in March 2007, with the aim of promoting above all those studies in urban morphology having the architectural design as their goal.

In these sixteen years, during which I had the honour of being its president, the Association has grown a lot, gaining a significant role in the context of urban morphology scholars.

I think a good job has been done, despite few inevitable mistakes. Above all we remained consistently in our cultural area of interests, within the sphere of what can be rationally verifiable and didactically transmittable. This in a cultural context in which the disciplinary boundaries of the architectural design seemed increasingly uncertain. Today each of us knows well that beyond those boundaries other important questions arise, of different nature, linked to languages and meanings, to new investigation techniques, to perception and to the artistic component of our work. But we also knows that it is crucial to preserve and develop in contemporary terms a nucleus of knowledge and methods which allows any aesthetic synthesis to be based on sharable foundations, as required by the civil responsibility of our work.

In this spirit, since its foundation, the Association has organized conferences and communicated its activities. As president, I have also considered vital the parallel activities in which the members of Isufitaly participate, such as the organization of meetings, university courses and publications.

It seems to me that, over time, even in these specific activities, our Association has earned the esteem of similar organizations which, in the wake of Isufitaly, have been founded all over the world.

It would take too long just to list the activities carried out by all of us in these years.

I will only mention the two most recent, linked to each other, which, I believe, have had particular success and international echo. The first arises from the idea of transforming Isufitaly, from a structure that only plays an aggregative role and disseminates the themes of urban morphology, into an active subject, which carries out research and manages its organization. The occasion was the Kaebup project, (Knowledge Alliance for Evidence-Based Urban Practices) coordinated by Nadia Karalambous of the University of Cyprus with the aim of studying the relationship between urban morphology and design. Unlike the other participating academic partners, who reorganized the research within the university structures, I chose to involve Isufitaly which was supposed to represent, symmetrically to other departments, the Italian referent in research management. It should have been a first experiment: other members could have brought other projects and funding, contributing, while their autonomy would be respected, to strengthening the scientific credibility of the Association.

As part of the research, some of us organized the ISSUM, International Summer School in Urban Morphology, which we will discuss in a future session in this conference. I think it could be a useful experiment not only for Isufitaly but also for all the Isuf regional networks and could have interesting developments.

As president of Isufitaly let me therefore say that the outgoing Isufitaly Board has not only taken care of the administrative aspect of the Association, but of an organic structural project that includes communication (conventions, conferences, website) research (participation in financed projects) and, finally, teaching (with the Summer School).

Let me also make a brief consideration on the future of Isufitaly.

As it should be, within Isufitaly the interests of each of us, our beliefs, even our own values, have differentiated, and are increasingly differentiating, over time. The reasons are several (scientific, professional, academic) and all valid, but we must not hide the fact that, for this reason, we are going through a phase of crisis completely new in the story of our common work.

Change, however, is the salt of any structure aimed at experimentation. If it is likely that this condition leads to difficulties in organizing common work, also implying a risk of losing our identity, it is also true that the differences that have arisen could constitute, if well used, not a reason for division, but a resource. And since I consider that my duty, under the new conditions, has been exhausted, I believe that whoever will takes my place, will have to place this consideration at the centre of future projects.

A mention to the specificity of this conference.

This sixth Isufitaly meeting has a particular character for several reasons, all linked to the fact that it takes place in Bologna. For the

first time it is not organized within an architecture faculty but an engineering one, opening up, in my opinion, a new field of interests for Isufitaly. I recall that the Bologna Faculty of Engineering boasts an illustrious tradition in the field of urban studies, and that a well-known representative of it, Adolfo Dell'Acqua, participated in our first conferences proposing important reflections on the integration between morphology and design. This tradition continues today, in contemporary terms, with the work of Annarita Ferrante (co-chair of this conference) on the existing building heritage.

Bologna was also the seat of some of the most interesting urban experiments in Italy.

I recall, among others, the innovative ideas of Pier Luigi Cervellati on the function of the historic centre organically understood in the context of the entire urban and territorial organism.

Furthermore, Bologna has a particular interest for us as well for the tradition of studies and experiments on the relationship between governance and the city development process. Not surprisingly, the city has had, over time, administrations that have sometimes been an example of a virtuous management in the transformations of the building fabric.

For this reason, some of the central themes of the conference are precisely the problems of urban policy, governance, urban communities and public space as a laboratory for transformation.

Another relevant theme is that of the renewal of the analysis and design tools of the urban space, the study of new technologies dedicated to new environmental strategies.

Of course, ample space will be given to traditional themes of our conferences such as the reading and design of the existing city integrated with the ever-current theme of urban regeneration, I believe that the organizers of the conference and their collaborators have done a generous and intelligent job. I thank them all on behalf the Board of the Association and I wish everyone a good job for the next few days.

Giuseppe Strappa
President of ISUFITALY

Foreword

Since the beginning of the third millennium, the rapid changes that contemporary societies are facing are radically transforming the perception and the structures of our cities. New topics seem to dictate the political agenda, suggesting alternative options to manage the emerging urban mutations.
An increasingly "data-driven society" is forcing the migration into an almost immaterial world, prompting Information and Communication Technology together with the Smart City .
The crisis of the traditional real estate industry, propelled by the global finance system, is contributing to a renewed consideration of the Public Space as a "space of encounter, sharing, experience and inclusivity", mapping the everyday life to discover unexpected urbanities , through the application of GPS to record pedestrian movement flows.
Most of the deficiencies in the governance methods are addressing us with new social, economic, cultural roles, inviting human beings to perform as strategic Agents of Change. As an immediate consequence, new "forms" of cities are strongly brought to our attention: the "city of sharing", the "city of temporariness", the "city of Life between buildings ", giving an unexpected impulse to the so-called incremental Urbanism processes.
In such a way, the very idea of the city is radically under discussion. We are then required to answer these numerous questions in order to define the scientific coordinates for the city of the 21st century. In that respect, the conference has been calling experts in the field of Urban Studies in order to reflect upon the following main topic:

1. Communities and Governance
The role of Communities and Neighborhoods, conceptually framed within urban policies based on new participatory concepts, sustainable oriented principles and supported by the idea of "proximity" and multi-layer strategies of land management, are one of the test beds of new approaches in Urban Morphology.
Research approaches, as well as design strategies, must be able to read these phenomena, to understand them and translate them into tools for supporting decision makers, stakeholders, citizens, in the transformation process of the city.

2. New methods and Technologies for the urban analysis
The society of the 21st century, being "data-driven", will be highly technological. Urban Morphology should be able to deal with these issues and learn to play an active role in their development, so as to consist in a mediation tool between environmental strategies and the city. It should also experiment with new technological means by developing new analytical methodologies capable of grasping the ongoing transformations.

3. Reading the changing Urban Form
A Classic in Urban Morphology, urban analyzes and the theories underlying them constitute its very foundations, the greatest legacy, of the International Seminar on Urban Form. A legacy that must be fed and implemented in new research and new studies, demonstrating the capacity to deal with the new emerging challenges of evolving cities. If unsuccessful, in that respect, the meaning of the urban morphological discipline will be lost.

4. Designing the sustainable Urban Form
Urban Morphology is also the basis for Urban Design. The city of the 21st century has to be sustainable, to react the ever-changing conditions of existence. The complexity of urban phenomena requires, therefore, a scientific awareness capable of catalyzing different disciplines and expertise, different needs, different themes, within the urban fabrics. Fabrics that will, in turn, be an expression of this complexity, giving "form" to it.
Under those circumstances, Urban Morphology can claim again a disciplinary status.

It is not simply a matter of broadening the disciplinary horizon of Urban Morphology. It is a question of defining a new theoretical and methodological framework, a new "horizon of meaning", and new analytical tools, to understand the complexity of the city's transformation processes. In other words, it is a matter of building a renewed morphological discipline able of intercepting the needs of the globalized society and translate them into physical forms.

Marco Maretto, Nicola Marzot and Annarita Ferrante
Conference Chairs

Urban morphology and the challenges of transition

Plenary Sessions Foreword

The etymology of the term 'transition', from the ancient Greek μετάβασις (metábasis), still bears a trace, evoking its presence, of the implicit threat contained in the unfolding of its effects. It is, in fact, a compound of μετά (metá), meaning "between", "in the middle", and βάσις (básis), denoting "foot", "base" and "foundation". As such, it clearly expresses that condition of profound uncertainty, unconsciously removed, between a stability that "is no more", i.e. the socially constructed reality we have left behind, that has now entered crisis, and that which "is not yet", implying the expectation of a new system of values. The multifaceted call for transition, continually evoked by EU policies, especially since the Next Generation EU program, therefore entails an equally obvious assumption of responsibility by all those involved.
These include, first and foremost, individual and/or collective subjects already operating within institutions that have fallen into disgrace having lost their credibility and authoritativeness, to which must be added the outcasts, the marginalized citizens who, in the previous season, were not considered organic to the systemic logic conventionally accredited by the majority, being prejudicially expelled from it. These, along with the willing and enthusiastic for new adventures of all kinds and degrees, are thus faced with crossing a landscape of ruins, which need to be given a name, in order to be able to orient themselves in their choices.

For these reasons, as conference Chairs, we agreed that the function of the keynote speakers invited to the opening session was to provoke an "unreserved call" of challenges capable of activating the participants' reaction during the presentation of their respective papers and posters. It was therefore a question of imagining arguments whose compelling topicality was capable of programmatically destabilizing the fragile certainties of any knowledge that could be defined as scientifically founded, by revealing and opening up its conventional limits. The declared objective, since the original call for papers, thus became that of forcing teachers, researchers, and scholars to take a critical stance towards a built environment that is inevitably hostile to any ideas received, insofar as it has not yet been explored. Even more so, it was ultimately intended to allow them for comparison, verifying a posteriori the emergence of classes of belonging as future goals towards which the advancement of knowledge and the hoped-for identification of new refoundation epistemes could be directed.
With this in mind, we asked Raffaele Laudani to address the issue of 'agentivity' in the design of the contemporary city. This is, on closer inspection, a theme emerging from the progressive collapse of the credibility of representative democracies, whose legitimacy has been profoundly undermined by the behavior assumed by national sovereignties, first, and then by local administrations, in governing the disorientating effects induced by globalization processes. When the facts were tested, the demonstrated inability to administer territories was responsible for the emergence of movements claiming a role in the promotion and management of urban transformation. The growing demand, over the last decade, for regenerative processes involving a multiplicity of actors, many of whom had never before appeared on the political scene, is an 'immediate' confirmation of this phenomenon. Urban morphology has often misunderstood the principle of the "autonomy of form", almost canceling the dimension of the civitas from that of the urbs . It is therefore called upon to rethink the function of agency both in the destruens phase of overcoming spatial arrangements that no longer conform to change, and in the construens phase of new articulations prodromal to the demand for renewal of customs.
We asked Elena Cock to reflect on the function of 'energy' in contemporary society. The assimilation of nature as a resource to be consumed has produced states of increasing devastation and abandonment of the resulting landscape, in which many authors see the

effects of the so-called anthropocene. The paradigm shift in favor of a more responsible use of the planet, which is recognized as a potential to be preserved for future generations, leads to the identification of every human product as an accomplished expression of 'embodied energy' regardless of its dimension, complexity and impact on existing conditions. Its overall assessment must not only guarantee the balance between the various factors that contribute to its construction, but also allow for the full reversibility of its effects. This implies that the project is increasingly accountable to its community and aware of its dynamic interaction with the assigned circumstances.

We proposed to Kayvan Karimi a reflection on the impact of the material and immaterial 'flows' on the contemporary city. In a society increasingly characterized by movement - of goods, people, resources and data - exposure to change becomes paradoxically programmatic. This conflicts with the idea of stability and permanence in which we are led to recognize the meaning of the institutions on which the modern conception of civil living is based, putting the need for regulation of the operation of the subjects, that are part of it, to be verified. The notion of ex-ante government of territories, in this way, tends to be replaced by that of ex-post monitoring of the effects of processes beyond human control, through the increasing recourse to algorithmic logics. Urban morphology, in this way, is forced to review its own statutes, still based on the primacy of the type, as a principle of prediction and conformation of behavior and its relative arrangements, necessarily opening up to an eventual dimension in which the ephemeral and the transient find a full size and authority.

Finally, we asked Alessandro Melis to relaunch the debate on the function of 'information' in territorial performance. This is, on closer inspection, the most ambitious challenge, which somehow implies all the others in view of the objectives it intends to pursue: guaranteeing the transition from material to immaterial culture. This also implies that technology should cease to exist as an instrument at the man's service, capable of claiming control over him, to rather become the unprecedented 'environment' within which we will be made to inhabit. The result is the possibility of recording our continuous "leaving a trace", far beyond any possibility hitherto considered admissible in the natural and/or artificial pre-digital environment. The foundations are thus created for a new anthropology, based on a living/environment interaction that is far more performative than hitherto imagined, because of which the transformation of data into facts will be processable in real time. Thus, it is credible to think that urban morphology can be fueled by an impressive mass of information through the continuous monitoring of the transformation of natural and artificial spaces, drawing undoubted benefits for the definition of the coming society and its urban scene.

Although these aforementioned challenges to the study of urban form do not exhaust the full spectrum of possibilities, we at least consider them to be imperative priorities on which to reflect, and we therefore thank our authoritative guests and colleagues for their valuable contribution to the growth of a shared awareness of their implications.

Nicola Marzot and Annarita Ferrante

Comunity and Governance

Raffaele Laudani
Alma Mater Studiorum - University of Bologna
Municipality of Bologna

Thank you to all the organizers who invited me and thank you all for being at the conference opening today. I'm attending this event with a double role. On the one hand, I'm here on my institutional role, welcoming you on behalf of the Municipality, and its Mayor Matteo Lepore, whowas unable to be here today. In that respect, I would like to express how we are glad that such an important conference is going to be held here in our city. And then, I'm also here as a speaker. If the first of the two roles is relatively easy to perform, it is a little bit more complicated the second one, i.e. being here as a speaker. In fact, I am not an architect, neither an urban planner, nor even an engineer. I am here as Deputy Mayor of urban planning, but I am an historian of political thought, a kind of a hybrid "beast" between a historian and a political theorist. So then, I feel today has been sent in the "lions dip". So the only way to survive in such a situation is just trying to give some kind of insight useful for the discussion, starting from the new experience I'm dealing with as Alderman. Moreover, I will try to do it using my skills as a scholar, which is trying to bring to concepts experience. Therefore, what I will try to bring to the discussion is some insight, starting from this experience in these first six months as a Deputy Mayor on urban planning of the municipality of Bologna. So the first thing I would like to share with you is the kind of peculiar feeling I had starting my job six months ago, in particularly experiencing the fact that today urban planning in a city, in a municipality such as Bologna, is more than having to deal with the physical transformation of the city. It is something that is now quite obvious, especially for people that have expertise on that, that the relationship between urbs and civitas are an essential dimension of the urban planning of a city. Nevertheless, my first experience is that this is more than a definition. People mostly agree on the fact that the dimension of the civitas and the dimension of the urbs has to deal with. Then in practice, in most cases, these two dimensions are just opposed. And in some cases, there are, in reality, contradictions. I think we need to make a step forward on that.

The two dimensions have to be considered as one and the same thing. And this brings the necessity also to revise the tools, scientific tools, but also the administrative tools, to make this statement real. But my experience, especially in these years of great global challenges, of great transformation, is that it is not even enough to try to make a step forward in making the relation between the urbs and the civitas one and the same thing. Because today's cities are, on the one hand, the space in which global challenges are becoming real to people, where the effects of the global transformations are becoming real in the daily life of the people. But on the other side, there are also the space in which there are more opportunities to face with these challenges in terms of political, social, economic, technological conditions to give an answer to these global challenges. Therefore, this makes the municipalities more of the conventional local articulation of the State. More than that, cities are political actors that operate on a multiplicity of spaces. The local municipal spaces, the regional spaces, the national spaces, the European spaces, the global spaces. In addition, all these spatial dimensions operate simultaneously. So if we continue with the metaphor of the urbs and the civitas , I think that today two more dimensions are becoming essential in the urban planning

of a city. These are the dimension of the domus , i.e. the oikos . The economy interpreted as the "taking care" of the community has an integral part of the urban planning of a city. Another dimension which is traditionally the most neglected one, is the dimension of the foedŭs , which in ancient times was the dimension, let's say, of the foreign affairs, but more in general the federative power of the polis or the civitas .

This means the capacity of producing alliances internally among the actors of the civitas and externally between different civitate , different cities and in different levels. This is becoming more and more an integral part of the city. For me this is really evident in this first month of administrative job. Let's make an example. During the pandemic, of course, school and education have been deeply affected. The first reactions of people, of families, of parents, is complaining with the mayor. It is very complicated to explain that in our national administration the mayor has competence on school for very small dimension because others depend on the Metropolitan cities and then depend on the Region. But because cities are the space in which challenges are becoming real in the daily life, the mayor is the face of the institution. Therefore, you can say then that it is not on our capacity to give an answer to these needs.

You have the political urgency to give an answer to that beyond your administrative limits. So this makes necessary a politics of alliance between cities to lobby, to make pressure to the national governance or to create networks on the European levels to give an answer to other defies. Let us focus, for instance, on the development of new capitalist platform economy tha are deeply affecting the morphology of the city. Then, these four dimensions are becoming one and the same. They are the urban planning of the city. If this is true, then urban planning is becoming more and more the space of urban policies in all dimensions. And you have to take care of that as we are the people who are in charge- in my case the man who is in charge of the urban planning of the municipality. I have to move along these four dimensions: the urbs , the civitas , the domus and the foedŭs . If this is true, then also the tools, the administrative tools that we have, the zoning planning has to be redefined, deeply redefined.

So I start my job as deputy mayor when the new tool of the city, the urban planning tool of the city has just been put in motion. What we call the PUG (Piano Urbanistico Generale) is a tool that tries to give an answer to this request because it is less and less conformative and operates more on a strategic level.

Still, it is built on the idea that you make a photography of the city and then you deal with it. But cities are life, which is an inner part of the city. The cities are always changing. Therefore, if the city is an urban form, and what I was trying to say is that it's more than just an urban form, then it is a moving form.

So you have to operate considering that this form is moving and you have to adapt to that. In addition, if this is the case, and now is the part in which my political theorist dimension brings to surface, then urban planning is more and more a matter of governance. I am using governance as a concept, as a political concept. Therefore, the idea that political decisions are the result of a peculiar, complex, articulated process of conflict and negotiation between a plurality of actors that operates immediately beyond the form of traditional representation. This means that the planning of a city has to be covered, assuming this conflictual dimension has a key part of the process of political decision. Also in terms of renovation of the city, of the urban renovation of the physical space of the city. In order to make it real, this governance of the city, this governance of the urban intended as the space of urban policies, as I was mentioning before, then you need political priorities. Because otherwise the risk is that the governance becomes, as it was in the last 30 years with the neoliberal bug that has dominated the transformation of the cities, the space in which the law of the strongest prevail. So then, you

have to be an active political actor as a municipality. This means that you need priorities. So in our part, what Bologna is concerned, we have defined a few priorities that will try to shape the urban planning of the city in the future.

I am just giving you some elements of that. First of all, we have two flagship projects. The "City of knowledge" and what we have called the "Green footprint" of the city. The "City of knowledge" and the "Green footprint" means that you have some priorities in governing the transformation of the cities, both in terms of big transformation but also in a small transformation. In that respect, I am in charge of urban planning but also private transformation. Moreover, my experience says that the transformation of the cities depends on big transformation projects, but also and probably mostly on the small transformation that operates during the city. So you need to govern that too. And today our national and regional legislation make almost impossible the government of a municipality of these small private transformations.

In addition to the two "flagship projects", we decided to participate to the EU mission on carbon neutrality. We have been selected among the first 100 cities. Of course, this will shape our ideas of the future of the city and also the urban transformation of the physical space.

Finally, in a city like Bologna, taking care of people is part of the history of the urban transformation of the city. So then taking care of the city, not leaving anybody out of the transformation is a priority.

Therefore, if we can make a summary of these four axes, we could say knowledge, greening of the city, carbon neutrality, proximity and community. These are the four priorities that will shape my job as the one who is responsible of the urban planning of the municipality of Bologna.

In addition, to make it a little bit more concrete, what does it mean, I will focus on one of these four axes of priority, which is the one I am more directly involved, which is the flagship project of the "City of knowledge". The idea, basically, is that for very historical but also actual reasons, Bologna can be a European platform for knowledge.

The history of the city, the intersection between the university and the city, also in terms of physical development of the city, it's so evident that it doesn't really need any explanation. There is no transformation of the city without the transformation of the university.

In addition, as it was said before, when Bologna was in the past a model for urban planning, it was when the two institutions worked together. Therefore, this is essential. It is not always the case. I think that in the last 15 years, we lost this kind of priority. We need to work on that.

But for some very peculiar reason, in the next few years, the territory of the municipality of Bologna will host, just to make an example, 90% of computing capacity of the country. We will host one of the five most powerful high-performing computers in the world. 90% of computing capacity of the country, almost 30% of the European capacity. Therefore, this territory is becoming a strategic asset for the country and for Europe in the digital revolution we are experiencing. So, the municipality cannot be just the space that hosts that. It has to be a proactive actor in this process; the city of knowledge. Basically, the idea is that knowledge, science, research, education has to become the keystone for rethinking all the urban policies of the city.

Both in terms of urban renovation, but also in terms of economic policies, policies of attractions, and so on and so forth. This will shape my job in the next few years during this mandate.

Concretely, we are organizing this project around two axes, two levers. We could say the hardware, which is the urban planning actually levers, the capacity of orienting the transformation of the city, the physical transformation of the city, in order to make real this goal of making knowledge the keystone of our city in the future. And on the other hand there is the software, we could say, what is the strategic levers. So the idea that we need a political

governance of the process. We need to put together all the main actors operating in this territory on science and research and higher education to define priorities, strategies, common actions.
And this is not the case so far. I was mentioning the necessity of a real strong political alliance between the University of Bologna and the municipality. This is a goal in itself. Nevertheless, in these few years, new actors on science and research emerge in this territory. Among them, several US American universities, the Academia delle Belle Arti and new corporate academies. And then I can continue mentioning of that. They all operate separately. We need to make all this potential a system. We need a systematic approach. Therefore, we need a strategy and a governance. It is the goal of the municipality to create the condition of transforming this potential into a reality.
To say it differently, we need to rethink the action and the functioning of the city in terms of platform. Actually, we need to think the city has an urban platform. And what makes up, what platform do? Platform connects the users. So we need to connect physically and projectually all the different actors that operate in the territory. This is a priority. This is part of the activity that urban planning has to do. Connecting physically and projectually. Then what a platform does. Platform habilitates the users. Therefore, we need to work to fully involve all the potential of these actors that we have in this territory. It means to habilitate all the actors including citizens. This is because the fact that we will be hosting 90% of computing capacity of the country would be of interest for citizens. It is our goal to make it clear how this could be possible. This means use this potential as a way to empower citizens and this is what the platform does. Platform attracts new users. Therefore, we need to work to attract new research centers, new talents, new quality investments. Coherent with this idea of the city as a "city of knowledge". Moreover, this is what is going to guide the municipality in this idea of quite complex governance of political relations for the near future.

Design a Sustainable Urban Form

Helena Coch
Polytechnic University of Catalonia

Understanding cities: from the analogy to the human

Understanding cities has been a recurring interest and challenge for many fields and a very diverse range of scholars. Cities are key for humanity, as places of exchange, innovation, progress and civilisation. They defined the history of humanity and the future to come. They are also the battle place of environmental and social issues, defining the direction that our society at large may take in the future to come.

A recurring challenge in urban-related research is the understanding and study of cities. They are highly complex systems, they are unique, and they bring together multiple disciplines and perspectives. Is it possible to find a single understanding that can consider all of their aspects and relations? How can we find ways to measure, characterize, quantify and describe them that allow us to extract generalizable conclusions, or find universal trends and principles that guide us towards certain desired futures? How can we ensure that we are considering everything, not leaving anyone out, or overseeing the exceptions, the cases that differ from the norm? How to strike the right balance between abstraction and complexity, generalisation and uniqueness?

Re-thinking our cities as dynamic realities

Urbanism is not the only discipline faced with the challenge of understanding a very complex system. Other disciplines, such as biology, have developed approaches and methods to study complex systems, like living organisms. An interesting step that interdisciplinary research can take is using the concepts developed in one field to look at phenomena in another discipline through different lenses. In this case, can urban planning better understand cities by relating them to living organisms? The discipline of urban metabolism takes this approach and borrows concepts from biology and ecology to apply them to the understanding of cities.

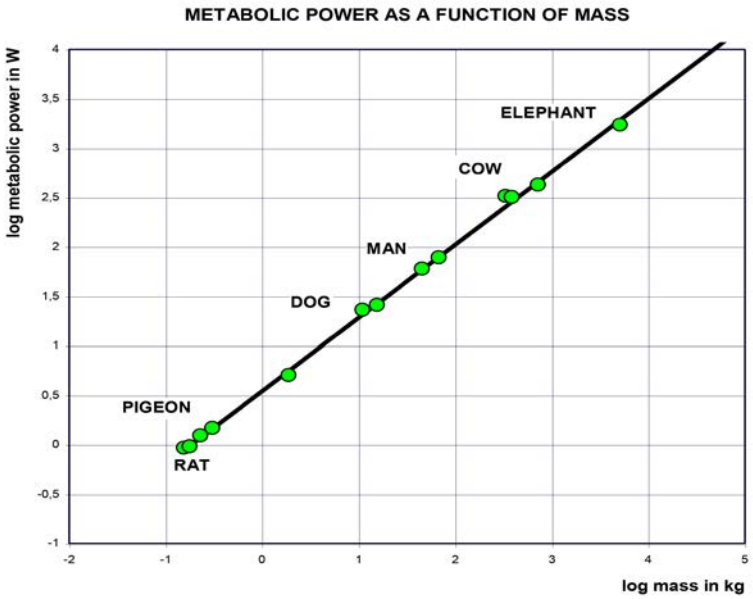
Vascular systems in mammals are key to providing them with the nutrients they need. In biology, scaling laws have been used to explain the structure of these vascular systems. In fact, the explanation of biological scaling laws as a consequence of vascular networks has had an enormous effect on biology, including the creation of an entirely new field: “metabolic ecology”.

In metabolic ecology, the scaling observed is a simple power law:

$$Y = Y_0 \, M^b$$

Y is an observable magnitude
Y_0 is a constant
M is the mass of the organism
b is usually a simple multiple of 1/4

This allows to relate the metabolic power of living organisms as a function of their mass (Figures 1 & 2) that is, the energy needed for an animal to function is proportional to the size of a living organism. A similar comparison could be drawn between the heart rate and the mass. Other examples include animal circulatory systems, plant vascular systems, and intracellular networks. Therefore, it can be proposed that these scaling laws reflect the specific constraints of the networks[1] (West, 2004).



Examples: 0.75 (3/4) exponent law

Examples: -0.25 (-1/4) exponent law

Figures 1 & 2. The metabolic power of living organisms as a function of their mass.

[1]G. B. West, 'Life's Universal Scaling Laws', *Physics Today*, September 2004.

Therefore, it can be proposed that scaling laws and the generic dynamical behaviour of biological systems reflect the constraints inherent of such networks. Putting in relation the metabolic networks of organisms and their mass allows us to extract three observations. First, networks service all active regions in both mature and growing systems.
Second, the evolution of these organisms tends towards a state in which the energy required for distribution is minimized. Lastly, these properties are presumed to be a consequence of natural selection.
These patterns cannot only be identified in the case of living organisms, but also in larger systems, such as urban systems. In the same way that vascular networks in organisms give service to existing and growing parts, urban networks also give service to the city, the part that is already there but also the area expanding. All forms of life transform energy from physical to chemical sources, inter-organic molecules, and then metabolic processes, and, even though cities seem quite far from living organisms, some activities are comparable: transporting energy, information and goods, and repairing damage.
Therefore, we can re-think the urban systems of transport and the distribution networks in a city as entities that possess the same scaling properties as those of living biological organisms. In fact, Helbing suggested that the properties of traffic networks might influence the size and functioning of cities.
Considering these parallelisms, the question that arises is can we apply these scaling laws to cities? To address this, we tested this basic prediction of the distribution network theory, considering the metabolism of a city as its power consumption and the mass as the weight of its built environment. The graph displays the relationship both for specific species of mammals and cities in the world (*Figure 3*). Cities approach the predicted extension of Kleiber's Law (Kleiber, 1975), that is the city data points are slightly above the extended energy. It is remarkable that the relation between the mass of the city and the energy used are similar to those used by living organisms. This observation offers a novel perspective to study and understand cities and consider their similarities with living organisms.

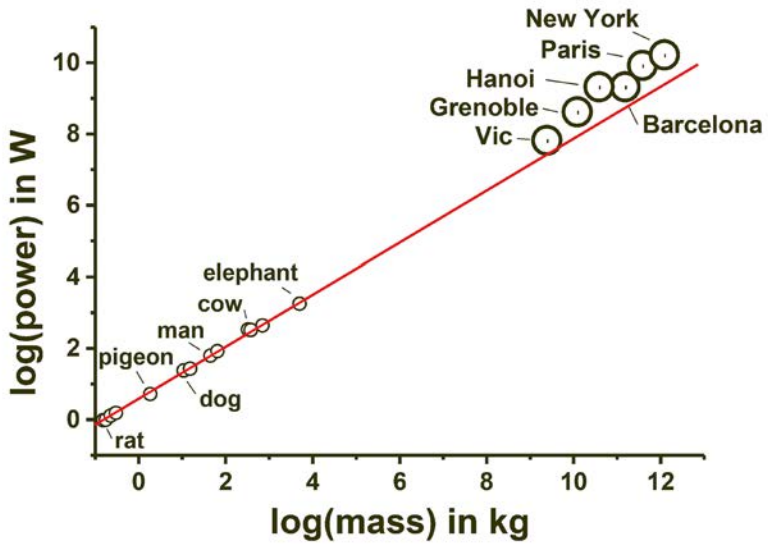


Figure 3. The relationship for specific species of mammals and cities in the world.

The application of metabolic scaling laws into cities was introduced as a concept more than 50 years ago and has regained relevance currently due to more data availability and computational power that allows us to take these comparisons and models further. Several studies have developed models to predict the growth of cities based on these scaling laws, sometimes considering transportation networks as input and other times complementing it with other types of data, such as population, rental or property prices, race or green spaces. However, when observing these parallelisms and their applications in predictive models, some conceptual questions arise.

Firstly, the dimensionality of organisms compared to cities. While living organisms develop in all three dimensions in a fairly equal manner, cities grow mostly bi-dimensionally, with the vertical axes growing at another scale. How does this difference should be considered when studying the growth of cities through the lenses of networks and scaling laws?

Secondly, many of these models have a predictive nature, introducing a dynamic dimension that is not present in the previous comparisons we presented. The idea is that the relationships identified are going to hold through time, while the city evolves. However, some conceptual aspects should be considered when moving from a static to a dynamic approach. One approach would be to consider the evolution of a city in line with the lifespan of a living organism. In this case, cities, like living organisms, are dynamic beings, that do not only grow but repair damage and change. They are never a finished entity, but a system in constant evolution and change. Like cells in a body, humans in cities appear and disappear in a much shorter lifespan than the city where they experience their lives. The city, however, retains an overall identity through all these changes and transformations. However, how can we define the lifespan of a city? Can it be directly compared with a living organism? If we zoom out on the time scale a bit, we may also look at the evolution of the species "city". If we focus on the case of Europe, we could talk about an evolution from the ancient city, to the medieval, to the industrial one, modern and post-modern. Could we compare it with the evolution of species? If we look at the graph, we can see that the energy consumption of cities is not as optimized as that of living organisms. Could it be that they have had a longer evolution time and that's why they have reached a level of higher optimization? If our cities are in their evolutive phase, how can we work and contribute so they become more energy efficient?

Thirdly, and in line with the reflections presented above, the application of scaling laws in cities with a dynamic approach has generally treated growth as a quantitative unidimensional vector equated to augmentation instead of a multidimensional process reflecting a more complex transformation. In a way, it seems that we borrowed only partially the concept of growth from living organisms, applying a more restricted interpretation closer to the economic growth in power law models. Growth, for a living organism and, I argue, for a city, does not only entail augmentation but also transformation, metamorphosis and evolution. For instance, damage repair for living organisms, which could imply renovations in cities, but also neighbourhood change, rezoning, or infrastructure improvement, is as important as an increase in size, which translates to area for urban systems. Understanding the relationships and internal dynamics during this process of growth may be very revealing and a good approach to ensure that these models do not stop at an exciting correlation and try to explore the mechanisms behind it.

Finally, we should also ask ourselves, where is the limit? How much can we use these laws to abstract the dynamic and evolutive behaviour of cities and to what extent are we taking the generalisation too far and ignoring the idiosyncrasies of the context?

Re-thinking our cities as unique and contextual

Let's take a step back to think about the context. Better even, let's take a step up and look at several cities from above (*Figure 4*). By looking at these images, we may be able to recognize several cities only based on a zenithal shot, i.e. Barcelona, Bologna, Buenos Aires, Edinburgh, Paris, Chicago, Marrakech and Brasilia. The urban form of each city is so distinctive that makes the place easily recognizable from above. Each city is the result of geography, climate, and history, along with the social and economic realities. All these contextual aspects, spatial and historic, create a confluence of elements that affect the development of each city, swaying it from a generic conceptual model into a unique reality.

Figure 4. Aerial view of Bologna.

Furthermore, cities are not homogenous units with uniform geographic circumstances and a shared historical path. Cities have different neighbourhoods and areas that can also be recognized through distinct urban morphologies. In the case of Barcelona, we can observe the different fabrics that make it up *(Figures 5 & 6*). The medieval part of the city, as in many cases, has a much dense built environment, with narrow streets and an irregular structure. The area of l'Eixample, the expansion plan of Cerdà in 1860, shows wide streets and regular building blocks with an inner courtyard. The working-class neighbourhood of Gràcia displays an organisation around squares, based on the land-ownership structure, with vertical continuous streets, a consequence of existing rivers and water streams, and regular housing dimensions as a consequence of available construction techniques of the time.

These examples show how the morphology of urban fabric depends on several contextual aspects that render their development unique and, thus, challenging to introduce and take into consideration in generic models. One could argue that any model is an abstraction of reality and that one needs to compromise on what is included and left out. Although this is certainly the case, in this process of reading the city, we believe that the scale of urban tissues or urban textures is crucial to understanding the environmental performance of the cities we live in, and, therefore, understating the fluxes of energy, matter and information.

Figure 5. Aerial view of Barcelona.

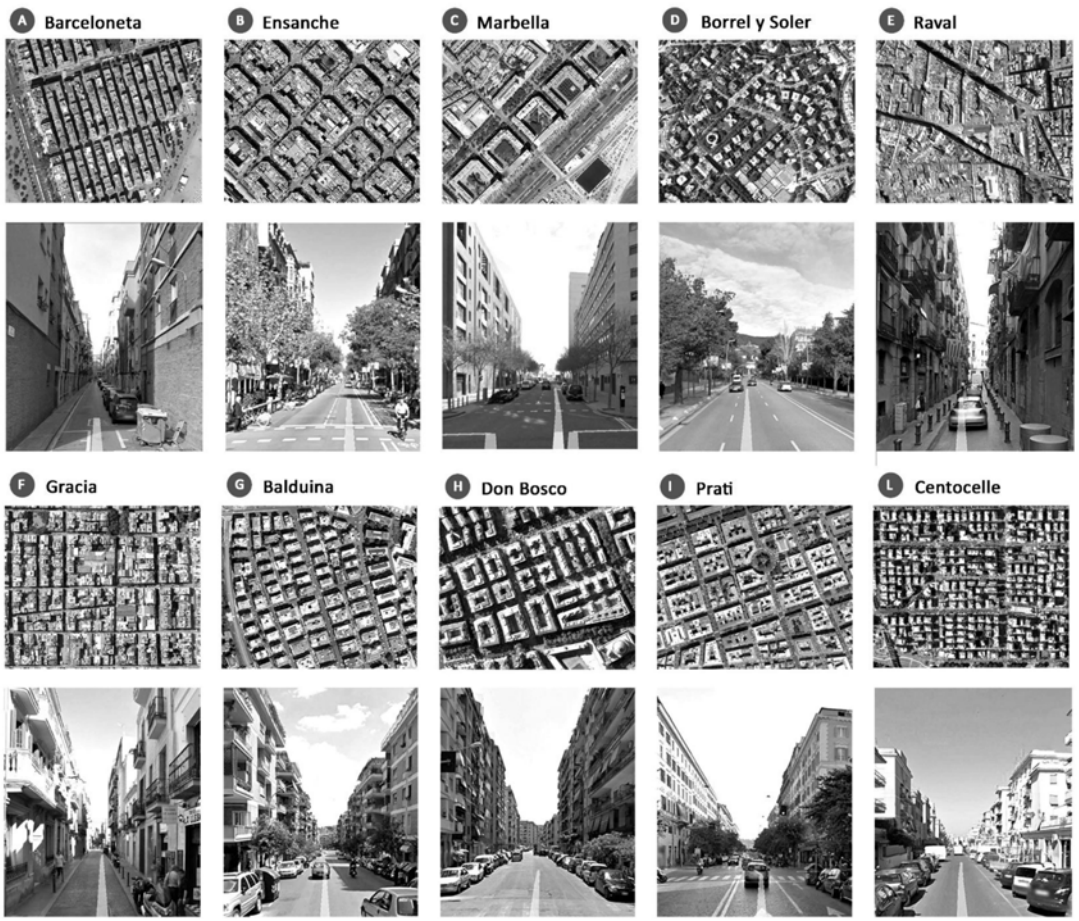


Figure 6. Urban textures of Rome and Barcelona.

Although it is not the only aspect that affects environmental performance, urban building morphology is an important one and perhaps the one in which diversities between cities and areas within cities are more visible. Building urban morphology, also called urban fabric, can be characterised by several variables, such as floor rate area, density, compactness... etc. These variables are useful to evaluate the effect of urban morphology on different environmental phenomena, such for instance, solar access, the number of sunshine hours at the street level or the urban heat island. Figure 7 shows that areas with different urban morphology, quantified through compactness and vertical density, display different urban temperature increases (UHI) in summer and winter.

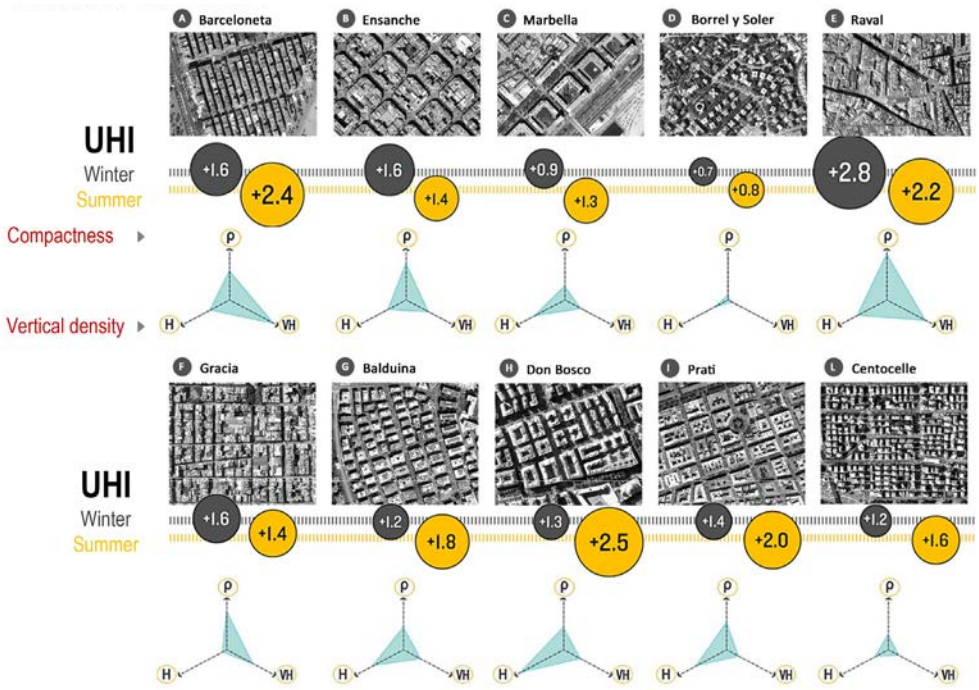


Figure 7. Urban temperature increase (UHI) in the different textures in summer and winter.

If we compare two neighbourhoods in Barcelona, the case of Gràcia and el Raval, we can evaluate the effect of the urban morphology and the specific types of the built environment on the temperature in different parts of the city, during summer and winter (*Figure 8*). While both neighbourhoods experience urban heat island effect during summer, in el Raval it is less extreme during the day due to the effect of sea breezes. It is important to understand the effect of the urban heat island both in winter and summer because the consequences are different. In winter, the urban heat island may be considered as positive, as it increases the temperate of living spaces and reduces the demand for heating. However, in summers of areas where the temperature rises above comfort levels, the urban heat island may be a negative phenomenon, becoming, in some circumstances, extremely critical. This effect may tilt the balance to raise the temperature above a healthy threshold, which may put vulnerable populations at risk, as well as promote an increase in air conditioning (AC) use in buildings. Additionally, the latter can have a ripple effect due to the additional heat that AC equipment produces while in use, approximately 2 to 3kWh of heat is released outside for each 1kWh used to cool the indoor space.

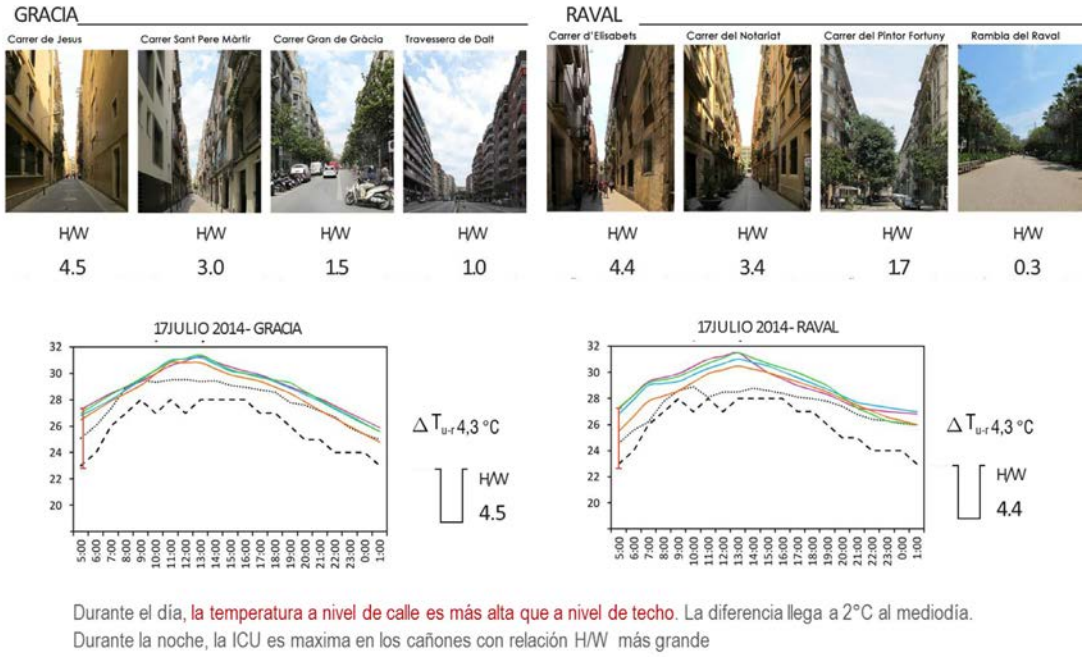


Figure 8. Atmospheric heat island intensity in Barcelona: temperature in *nivel de calle.*

The urban heat island is just one example of a highly impactful phenomenon that is very dependent on the specific characteristics of urban morphology. What these observations and studies show is that by overriding these specific and unique aspects of cities in our models and analogies we may be missing crucial aspects of their energetic performance. Therefore, it is important to aspire to find a balance between generalisation and understanding of the specific contexts and unique characteristics of each case as well as being aware of all the aspects that one may be overriding one developing generalized models. Nevertheless, we also do not want to transmit the idea that we will address these limitations solely with more data and detail. We argue that this tension cannot be only addressed by throwing in more data points into a large-scale model or urban twin that records every detail taking place in the city. We believe that it is important to understand the present and past mechanisms that form the history and dynamics of our current cities. It is important to keep asking ourselves the question why (causality?) but also how? (mechanisms and processes) to extract guiding principles and unique narratives that, together, will inform our choices when asking ourselves about the level of abstraction needed and what to include or leave out.

Re-thinking our cities at the human level

Until here, we have discussed how we can better understand our cities, learning from other fields, finding parallelisms, using analogies and models but also paying attention to the context, unique situation and particularities of the place. At this point, we may ask ourselves, what is the point of studying all this? Why do we understand how our cities function? We believe that the aim of these studies must be to focus on people's well-being. If we look at images of Barcelona during the COVID-19 pandemic, we have a feeling us uneasiness. We are all quite familiar with similar images in different cities. They toured the world on our televisions, smartphones or digital devices when we were sitting on our couches during the isolation parts of the pandemic. The uneasiness they transmit is due to the lack of people on them. Photographs depicting an urban

environment without people are disturbing because, in fact, what really makes the city are the people living in it and the potential exchanges and interactions that this confluence of human beings enables.

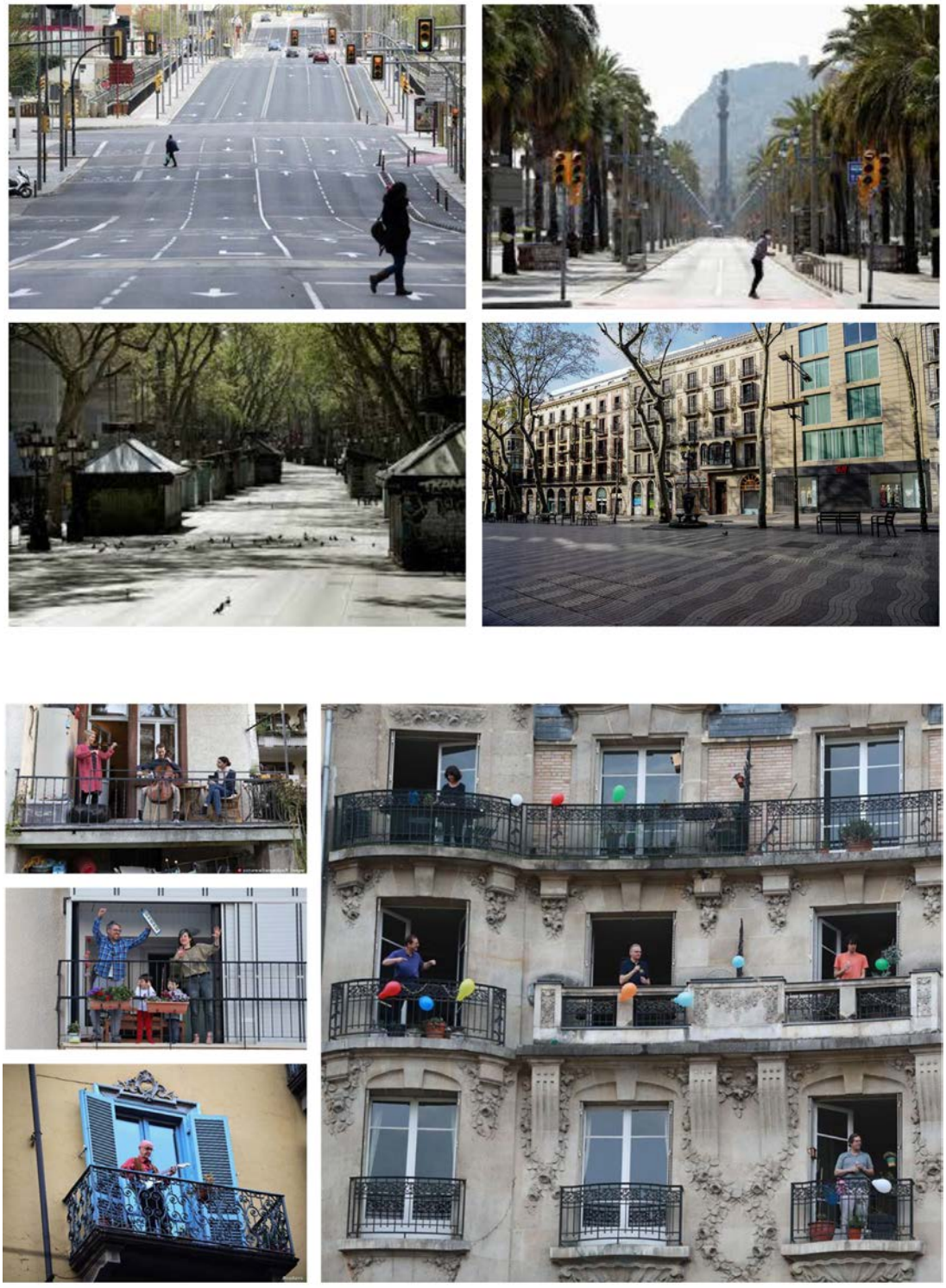


Figure 9. Social interactions during pandemic days in Barcelona.

It is not only the number of people that generates a city but their daily interactions in a common space. The pandemic also showed us how people needed to go outside, to see others and to have regular social interactions to preserve their well-being (*Figure 9*). In order to make these interactions possible, people need a common ground, a space to meet with friends and acquaintances but also with strangers, others with whom they would have never dreamed to exchange and that may open new worlds and perspectives to them. The public space takes on this role and becomes the living room of the city, a common room, as Louis Kahn would say. This common room needs to be a comfortable space for all to open up the possibilities for human interaction and, therefore, ensuring people's comfort in the streets and squares of a city is key to promoting our societal well-being.

To focus on people's well-being means to shift the spotlight towards where people are. Seeing the cities from an aerial point of view allowed us to recognize the different patterns of urban morphology. However, people do not live on rooftops and, for now, we do not move around flying with drones. Therefore, if we want to understand how cities affect people, we need to understand what is happening at the street level.

If we go back to the topic of the urban heat island effect, it is relatively easy to take measures on the roofs of buildings and, therefore, that is where our data on the urban heat island usually comes from. Measurements of urban climate at the street level are almost impossible to be accurately performed for reasons linked to instrumental constraints and urban boundary conditions. However, the difference between the two measurements is sufficient enough to justify making the effort to better understand the local urban climate. One approach to do that is to measure the radiant temperature of surfaces surrounding an urban space. An additional aspect to consider is the effect of shading in an urban space, which generally is tied to urban vegetation. These complementary methods aid in improving the estimations of the environmental conditions that individuals at the street level feel. Taking this approach implies looking at the city at eye level, not at bird's eye view, as well as taking human comfort as the focal point of the study, finding the variables that may affect it as a departure point, and not only as a consequence of a general model. We must study the city without ever forgetting that the objective is to make it a pleasant and liveable place.

Reading the Changing Urban Form

Kayvan Karimi
UCL - The Bartlett School of Architecture
Space Syntax

It is my pleasure to address the challenge of reading and analysing urban form. As the subtitle of this talk suggests, I want to make a case for how urban morphology can meaningfully contribute to the design and urban planning of cities. I am an academic, teaching at the Bartlett School of Architecture. We run master's and PhD programmes and conduct research studies at the University. I also serve as the director of Space Syntax Limited, a company established in the early '90s to transfer knowledge and academic know-how to the industry. The flow of people, ideas, questions, methods, techniques, and tools between these two entities is fascinating. I personally find this interaction recommendable for academia and universities to establish similar relationships with direct architectural urban design and urban planning practices.

The subject here is reading the urban form, the related complexities, and challenges. I am not a traditional urban morphologist, but I have been working in this field for the past 30 years. I have a specific way of looking at urban morphology, which might not be very different from most of yours. This talk will be slightly provocative because I was asked to set challenges for the next three days of the conference in Bologna, and I hope to address this task meaningfully. To start, I will introduce some sub-challenges.

The first sub-challenge is how we map urban morphology, how we represent urban morphology, and how we record urban morphology. The second sub-challenge is about how we measure urban morphology. Is urban morphology measurable? Can we do it, and if we can, in what ways can we do it? Finally, as a third subtask, how do we use urban morphology? How can it be used in real life for designing and planning places? What items are already there, and what items do we need to add in the future?

Let us start by making some reflections on how we map urban morphology. The figure 1 shows nicely how agricultural land parcelling and connections with the outside world turn into built fabric, and then the buildings, and the connections between the built and unbuilt, and how all this creates urban form. The first mappers of urban morphology were cartographers who shaped very old maps, such as the map of Paris (Figure 2), depicting built bits of the city versus unbuilt parts of the city. They also realised the importance of looking at urban blocks to identify the type of block buildings and parcels that stick together, creating a larger system. But they also realised that these insights were not enough to read and understand the urban form. They went to the level of plots, like in the incredible cadastral maps of Florence in 1427 (Figure 3), where the details of the plots and buildings are astonishing.

In almost 500 to 600 years, this was the way of thinking about and mapping cities. But then there's the issue of buildings. Urban blocks, plots, but then buildings. How do we map and represent buildings in the city? In the maps of John Speed (Figure 4), the British cartographer of the 17th century, there is an indication that mapping the built fabric is not limited to parcels and urban blocks, but also to the actual buildings of the cities and the ways they work and relate to the entire system, including the linkages, which can be linear links like streets or convex links, like squares. These latter ones are the public rooms, as Rob Krier Cock called them, or the

Figure 1. Agricultural land parcelling, connections and built fabric.

Figure 2. Map of Paris.

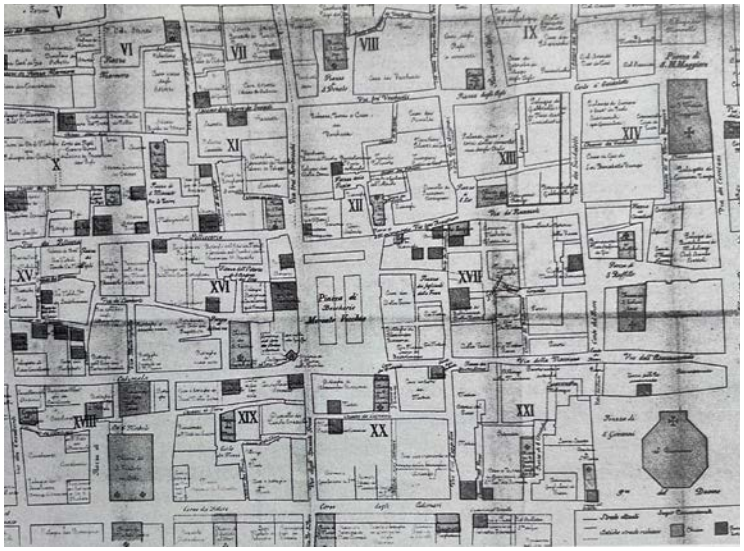


Figure 3. Map of Florence

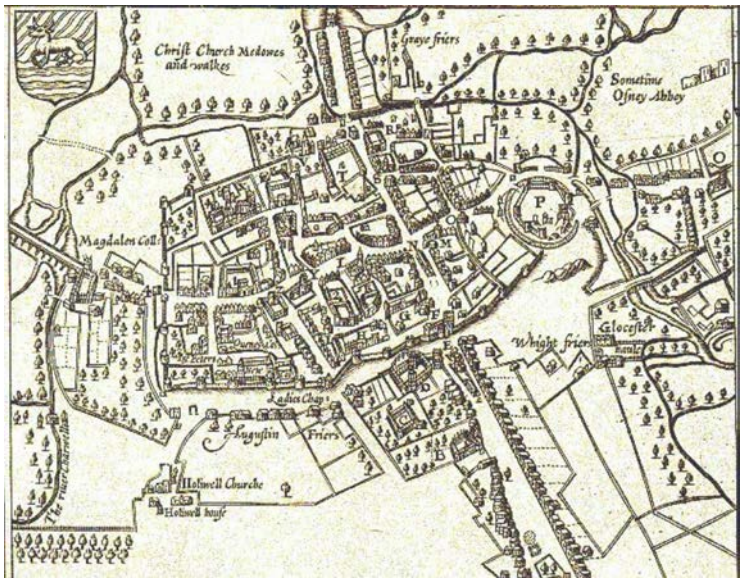


Figure 4. John Speed (*17th Century*)

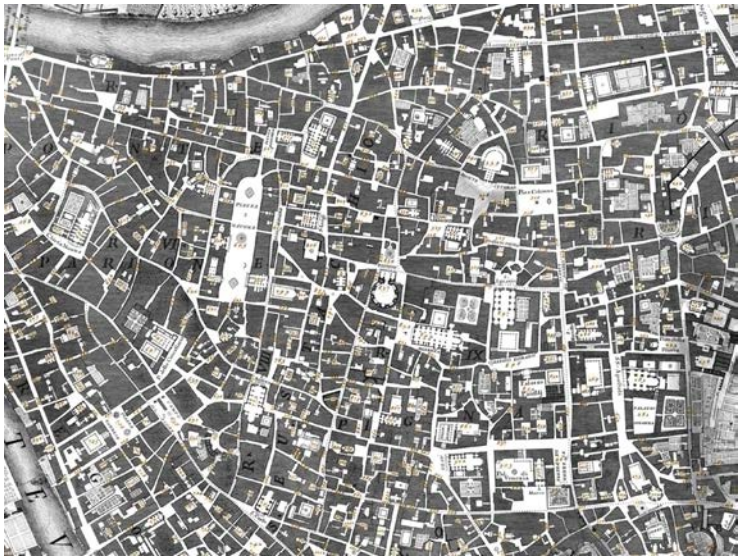


Figure 5. Giambattista Nolli.

public spaces that accommodate activities and interactions between people. We have linear access and activities in convex spaces, and we start mapping and representing them as entities in addition to buildings and many additional entities.

As an example, I mention the incredible map of Giambattista Nolli (Figure 5), showing almost every important element in a city, including public buildings. This map is still the best way of representing urban morphology. I must admit that I have not found any better way because urban life does not stop outside the buildings. It comes in, especially in public buildings, and including them is the best way of representing urban morphology. But is that enough? Or do we really need to know what is happening inside these buildings in terms of functions? The issue of land use and building use is very important. We must map, show, and use them. Yet, there are different ways of mapping.

Twentieth-century planners started to look at these big blocks of things, zones, and labelled them. But we know that this is not as simple as that. There are edges of the blocks that work with different roles and functions, and then there are interior parts of the blocks. Thus, there is the

issue of mapping land uses, which is important. Also important are the conditions, particularly the human conditions. In this context, a fascinating map of poverty in London, Charles Booth's map, shows where the higher income, or lower income conditions also in terms of health and well-being. More recently, in the 21st century, we can map different parts of the cities and show how they are performing in terms of various issues and socio-economic characteristics. Sometimes these factors can be combined into something that we define as the index of multiple deprivation, but they can also be separated into different indices.

But, is there something missing here? We have reached a good degree of definition in the reading of the city, mapping the built versus unbuilt, until now. So, what could be missing here, and what do we need to develop further? One of the biggest things that is, in my view, still missing is the issue of people and the understanding of space and people as one single paradigm. This was addressed by people like Gordon Cullen, a British journalist in the second part of the 20th century. Hence, how people see the space, how they navigate through the space, how people interact in the spaces has become an important issue. Again, another journalist, American journalist Jane Jacobs, wrote about the way people interact with the built environment and with each other, considering the city and society as one paradigm.

Furthermore, there is the issue of movement, how people, goods, and vehicles flow through the urban system, which we really need to map and represent in a more efficient way. This is another issue that started to be addressed in the second part of the 20th century, considering the city as a network, not as disconnected bits and pieces. The seminal paper by Christopher Alexander argues that the city is not a tree; it is more like a connected network of different places. And as you can see, the use of network analysis and graph theory started to be incorporated, which is something that we need to continue and develop further.

My first statement in response to the first challenge of reading the urban form could be the following: Urban morphology means much more than the study of physical form. The urban form is realistically understood only in a social context. Urban morphology is the study of form and people as one single paradigm.

Obviously, it is not enough just to map and show the urban form. We must find a way of measuring; otherwise, we cannot use it. Analysis of 'figure ground' in research is not new; we have been seeing and using it: the usually black and white image of the cities, where the buildings are the black masses, and the open spaces are white. We can even measure it by percentages, such as in a representation of the Elephant Castle in London before the Second

Figure 6. Elephant Castle in London before and after the Second World War.

World War that shows a percentage of 50% of built spaces (Figure 6). But afterwards, in the Second World War, everything was bombed, and new social and residential housing projects were built, along with nasty roundabouts, and large roads of the 1950s and 60s. The morphology has changed drastically, which we can measure and demonstrate how the figure ground has changed.

But is that measuring of the black and white of the urban morphology enough? Leslie Martin's incredibly simple and effective analysis of Manhattan (Figure 7) shows, for instance, that the entire mass of Manhattan could have been accommodated in a specific type of urban morphology, the perimeter block, developed for up to eight stories, without any need for high-rise buildings up to 100 stories or more to create high density. People from cities such as Barcelona and other European cities know that high density is not necessarily linked to high-rise buildings. Sometimes this is a misunderstood concept.

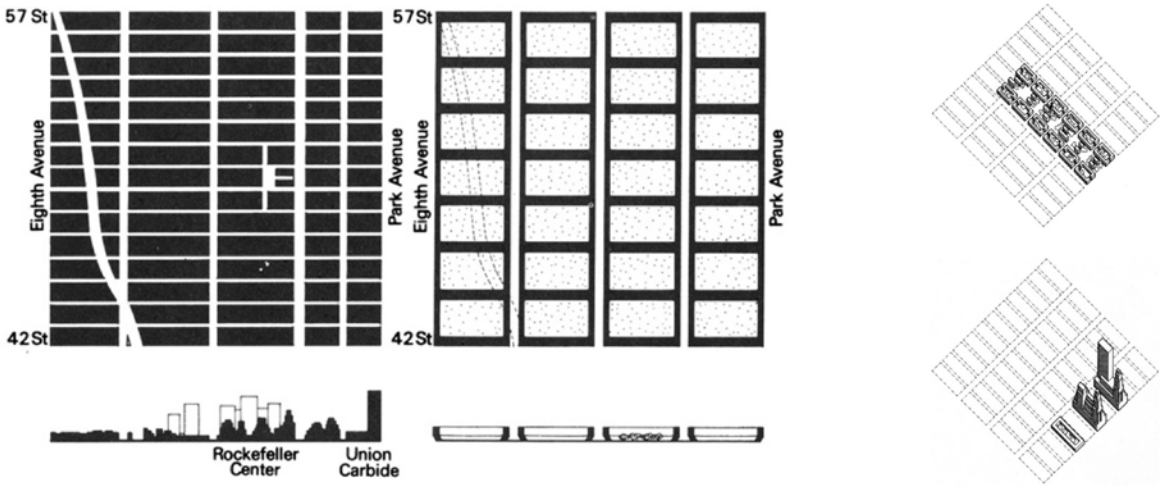


Figure 7. The height and floor space compared by two type of grid envisaged for Manhattan, New York. With the same floor area the courtyard (right) type produces less number of floor (Leslie Martin 1972).

We can perform this kind of block size analysis even more rigorously and easily through GIS analysis. The red colour on the map shows a small block, and the blue colour shows bigger blocks, with a full range between them. In the central places of the cities, we often find smaller blocks, where people can navigate easily. Furthermore, there are the issues of process and transformation in urban morphology.

In this context, it is worthwhile to mention the work of British geographers, which started from Conzen, and then went on with the work of Larkham and Jeremy Whitehand, to name but a few. They represent a very well-established and recognised historical geographical approach, and one of the most familiar approaches in urban morphology.

In relation to building types and building typologies, there is another well-recognised approach from the Italian school, starting from the work of Saverio Muratori and Gianfranco Caniggia, to the work of other colleagues and friends at the Sapienza and other universities in Italy. They are further implementing and developing this highly respectable approach in urban morphology.

But what is missing or could be missing here? Can we think about other things that complement or add to the way that we think about urban morphology? I think that the use of quantitative methods, sophisticated quantitative methods, is inevitable in urban morphology.

The use of GIS, Geographical Information Systems, not only for mapping but for analysing the cities through statistical models is fundamental and necessary. It could be used, for instance, to explore some regression analysis between the energy consumption versus the mass of the city. We must build these statistical models building upon big data, which is becoming increasingly available; we need to find a way of using this abundance of data in the world and link it with urban morphology, also considering network analysis since cities are networks, and there are multiple networks connected to each other.

I also think that we should not think about urban morphology only in geometrical terms. Geometry is the study of shapes, but there are topological characteristics that need to be investigated. Topology is the pattern of relationship, regardless of shape. So, if we look at an urban system, for instance, we always have a particular geometry here and there, but then if you think about the connections between these different places, they create a configuration that is meant to be extracted from geometry and investigated in a different way, to then be brought back to their relationship with the geometrical characteristics of the overall urban system. Graph analysis, persistence homology, deep learning, and other methods are all becoming more and more popular and well-used methods of topological studies or configurational studies.

Yet, I think that it is not even enough to have models of the cities. These models should be not only quantitative but predictive as well because we want to predict and make changes to the cities. The earlier speaker, Raffaele Laudani, mentioned their plans for turning Bologna into a knowledge city, or a city of green infrastructure. How could we measure that? How could we predict the impact of the decisions that are going to be made in the city? For this, we need predictive models.

Here is my second statement in response to Sub-challenge 2, or how we measure urban morphology: the reading (analysis) of urban morphology cannot be limited only to descriptive mapping/analysis of the urban form, nor purely to its geometrical characteristics. The study of urban morphology has to move towards a quantitative and analytical investigation of urban form, inclusive of non-geometrical characteristics and structural patterns. Based on these principles, an effective methodology should be capable of creating evaluative and predictive urban models.

Finally, how do we use urban morphology and what kind of methodology do we basically need? Here things are different between academic studies and practice. Yet, if you are equipped with tools and methods that can help you with design and planning, you will be much more successful in terms of design, communication with the clients and stakeholders, and in terms of proving that your design will work in the future.

Adopting a methodology that can help us with this process is extremely important, but this methodology needs to have strong theoretical foundations to avoid the fragmentary creation of bits and pieces of urban models without an overarching theory that brings them together. Now, there are some architectural urban theories to help in this endeavour; yet there are not too many comprehensive architectural urban theories that we could practically use. And even rarer are the theories that manage to produce the methodologies and tools.

We need a theory that can turn into tools, into a methodology capable of linking the physical space to human behaviour. I think this was mentioned strongly by Helena Coch, and you all agreed that we cannot really forget about people, since any methodology that does not consider people in its approach would potentially fail in the process of urban design and urban planning. Issues such as wayfinding, clustering, natural movement, and so on, should be considered in thinking about urban models.

In this framework, we should mention that social models also exist, but sociologists have an even bigger challenge linking with us; hence, we need a new generation of sociologists and anthropologists who understand that they cannot study societies without considering the built environment. And I hope there are no sociologists in the audience; otherwise, I might be in trouble!

A good methodology in this field should be constructed simply. There's no point in spending years creating your model, as the city would have moved by that time. For those who practice urban planning, it is well-known how things can happen quite quickly; this is why we need a methodology that can respond quickly and simply. Yet, at the same time, that same methodology should be capable of becoming more and more sophisticated when needed because we have to deal with very complex issues, and sometimes simple models are not enough for that.

Indeed, we cannot sit in our silos and think that we cannot or should not connect with other disciplines: engineering, economics, sociology, transport, and many other fields are important in urban planning and urban design, and we need a methodology that can bring these different disciplines together instead of separating them and putting them in different silos.

These are real challenges, and they are further complicated by the problem of the scarcity of data in the world. We have places with plenty of data, overflow of data, and places with nearly no data. Almost one billion to two billion people in the world live in unplanned settlements, or informal settlements, for which we do not have no to or very basic information. Is there a methodology that can help us with this kind of sparse data condition? We really need that; otherwise, we would forget about almost 60% of the world and just focus on places for which we have data.

Moreover, it is about integrating research with design seamlessly, the process of design and the process of research. If they cannot come together as one single process, there is no point. Research would do its job, and then the designers and planners would do their job without ever meeting. Unfortunately, this is probably the case with most of the things that we see in the world. I mean, there is a lot of research, a lot of studies, but then the practitioners go and do their own thing. There is no methodology to bring them together.

The issue of scale was mentioned by Nicola Marzot and other speakers. So, you need a scalable methodology that can take us from the smaller scales to the bigger ones and back without using separate methodologies for these different scales.

Here is my third statement in response to Sub-challenge 3, how we use urban morphology: Urban morphology can be efficiently used to study, understand, design and evaluate spatial systems based on their physical form, configuration, function and human use. To achieve this goal we need a methodology that can utilise quantitative spatial models, which link directly with social conditions and behavioural interactions, and are capable of integrating various layers of urban information into a network-based urban model.

This is a huge statement, but this is, I think, the challenge. This is the thing that we need to address if we want to bring urban morphology up to the highest level.

Now, does such a thing exist? I do not want to be accused of advertising my own work, but I just want to take you through some of the possible responses to this sort of challenge.

There is plenty of literature on space syntax. You can read and look at websites and videos. Very briefly, the theory of space syntax was developed in the 1970s by Bill Hillier, who is one of the greatest urban morphologists. What he means by space syntax is the understanding of spatial systems through configuration and in connection with society: thus, in brief, it is all about space, society, and configuration. Space syntax has also developed into various sub-theories,

such as the theory of natural movement, the theory of centrality as a process, and some other theories that you can investigate. It is a solid theory, which has branched in different directions and is becoming more and more inclusive: anybody willing to develop a further sub-theory under this paradigm or umbrella is welcome.

Bill Hillier went on to produce a lot of publications. The most seminal one is the Social Logic of Space, which explains that this theory is about the social logic of space or the spatial logic of society. All these theories started from the observation of failing urban design and architectural design in the second part of the 20th century and the projects that basically failed not only in the UK but in many other cities of the world, as we can observe in the former socialist countries or even in Italy.

This theory of space and society can be read in the more difficult-to-read versions of Bill Hillier's publications, but I am providing here a very simple explanation that can be summarised in two principles. The first principle is that space is intrinsic to human activity. It is not the background to it; this proposition is very difficult to challenge, to be honest, and I have never seen anyone who could really challenge it. Space and society as one thing, this is the first principle.

The second principle, which is slightly more difficult to understand, is that space is fundamentally a configurational thing, meaning that any spatial system is composed of different components in a special relationship with each other. Let us make the case of the space we are in now, just looking at this spatial system: if I open the door to the courtyard, the role of this courtyard and our behaviour in relationship to that open space would change. This is the concept of configuration: any spatial system is configurational, and on that basis, we can study the configuration, learn from it, and apply it to our design.

Human behaviour is a very interesting part of this approach. If we take this kind of urban room and its linear access, our movement will be linear predominantly, to be optimised according to the spatial configuration. This is, again, common-sensical. Considering public spaces, they can be scanned to find the interactions with them, by extracting very basic things such as axial lines, common spaces, and convex isovists (Figure 8).

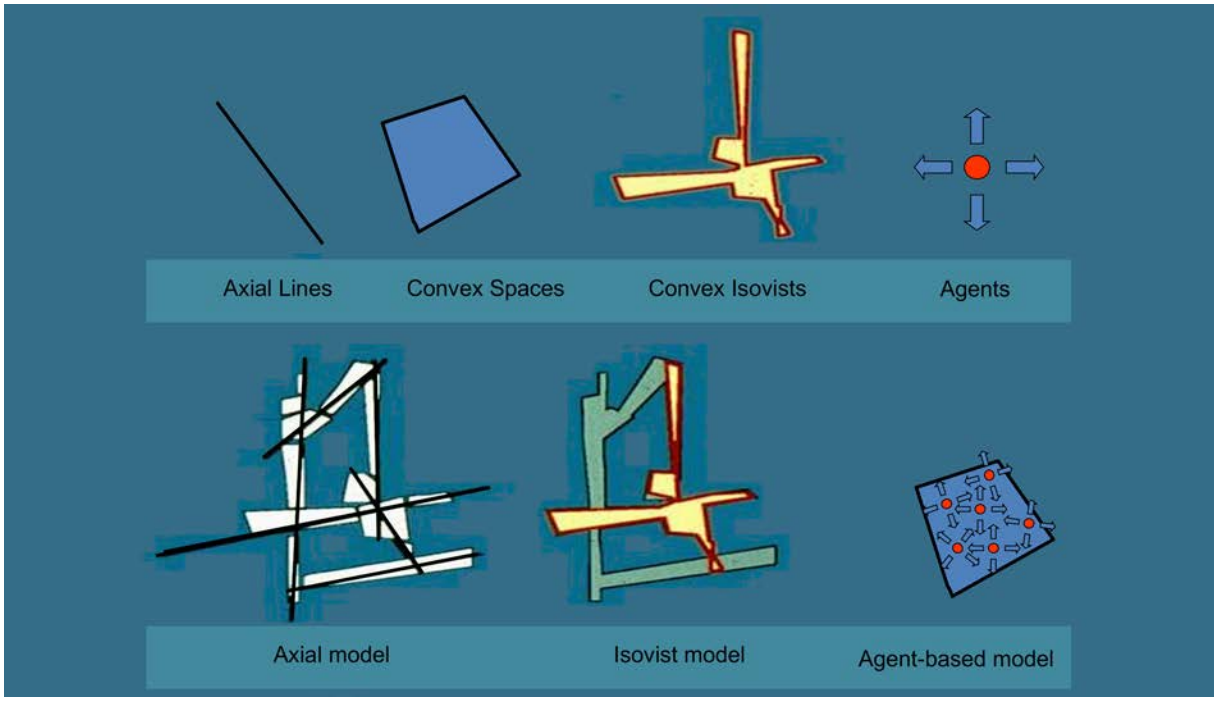


Figure 8. Basic things extracted from the spatial interactions of public spaces.

These are people-based entities, but they are also physical and geometrical entities; thus, we can turn them into models. This is what we call a spatial accessibility model: how every segment of the road network or street network connects with everything else (Figure 9). The virtue of this type of modelling is that it brings behaviour, cognition, and wayfinding into the built environment, into the physical space, and as such can produce a locational model that can offer a human-based modelling of space (Figure 10).

Another virtue of this model is that it can be scalable. We can observe a city, for example, an old city 300 years ago in the world, e.g. the city of Shiraz, in my home country of Iran and compare it with the entire Great Britain (Figure 11). We modelled the entire country using the same principles, and it is possible to download it, or use it online, zoom in, zoom out for free.

Figure 9. Spatial accessibility model.

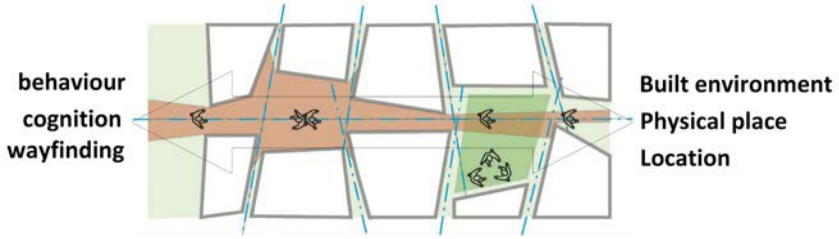


Figure 10. Human-based modelling of space.

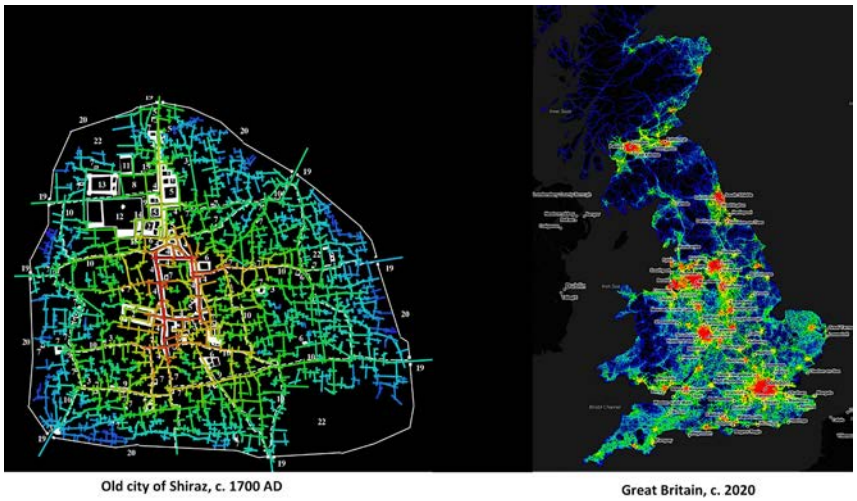


Figure 11. Comparison between the model of the city of Shiraz, Iran, and the model of the entire Great Britain.

This is the point: using a model for various small places as well as very large systems, always finding correspondence with things such as movement. So, we can measure the spatial accessibility versus movements and find out strong correlations (Figure 12). And if we cannot trace strong correlations, this kind of statistical analysis can help us to understand what is going on in terms of the relationship between space and society. Moreover, there are the issues of land use, viability, crime and safety, and many other things that we can additionally explore.
It is a very simple model, but it can be converted into a very complex one. It starts from a spatial model, morphological or configurational model, but we can build density, land use, transport systems, and other things like environmental layers. This example is what we are currently working on: an Integrated Urban Model that can be presented to and used by local authorities.

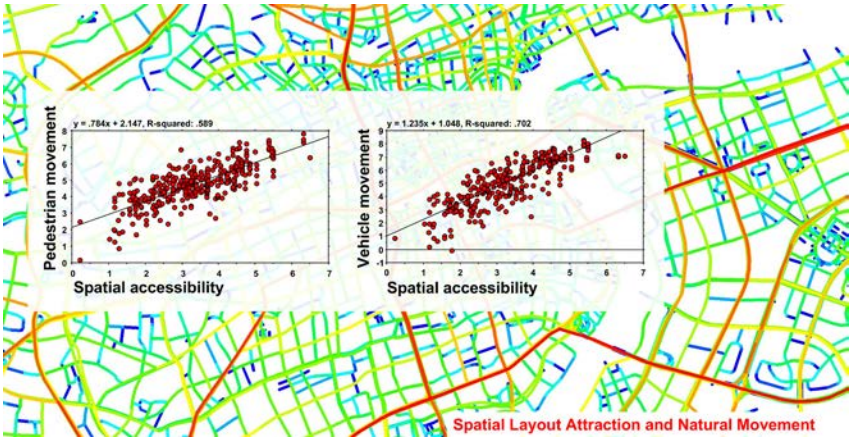


Figure 12. Accessibility versus movements

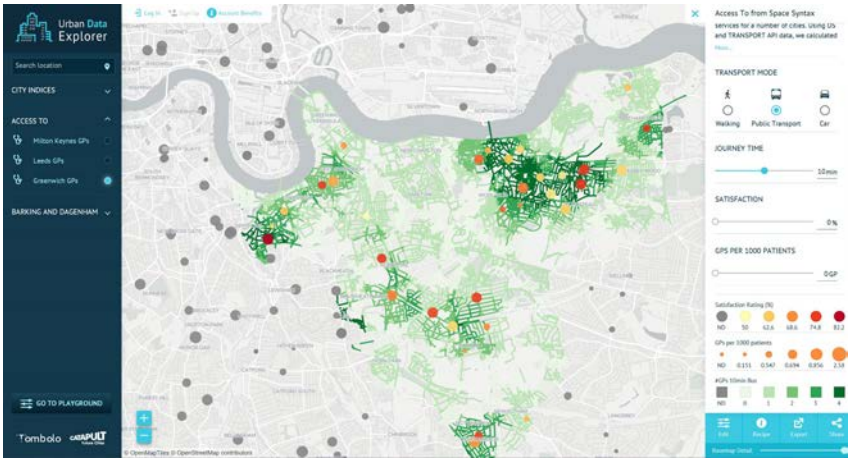


Figure 13. The Integrated Urban Model.

This (Figure 13), for example, is a platform that we developed for local authorities as they were not using the technology they needed.
When provided with these tools, they were able to use them efficiently. Nowadays, both for sparse and rich, dense data, it is possible to model cities in a few hours.For this kind of model, it is possible to just download the road centreline, for instance, from Google Maps or OpenStreet Map and then turn it into urban analysis. It is not perfect, but it might do the job. For example, the huge city of Mumbai was modelled in just a few hours.

It is very useful to have such a methodology that could be easily integrated into the design process and connected with the work of different specialists from various disciplines: economists, environmentalists, urban planners, transport engineers, and sociologists. They all understand the approach, and they can easily relate to it.

Now let's talk about the design process. In traditional design, starting from the brief, you develop your design ideas, perhaps on wider issues such as politics, social issues, etc. You consult with people and then develop it further to produce the final design.

In the analytical design process, which I think you're familiar with and that many of you advocate for, there is a baseline analysis in the beginning, and there is an analytical evaluation of the development of design options.

In our approach, the process starts with spatial analysis and carries on. I mean, it's fairly much like other analytical design processes, but it starts from this kind of specific analytical morphological studies in relationship with humans, but we build models for this purpose and then we use the models for assessment.

The process goes from macro to micro, and it helps us in the first phase to diagnose what is right and wrong with the system, and in the second phase, develop a prognosis, which is predicting what is going to happen. As I said, the model can be used to look at different aspects of a big city like London; if you look at certain measures, it shows the superstructure of movement. But if you use another type of analysis, you can see the urban villages and these kinds of organic places where local centralities are.

In the last part of this presentation, I would like to focus on the different scales of the projects that go from buildings to urban strategies. I will go quickly through a series of slides to show how analytical design can be used at various scales.

We start with building scale analysis and then move on to public spaces. This is a really interesting case in Nottingham (Figure 14), an award-winning project. So the analysis produced the foundation, not only for understanding the problems but also for developing the main concept of the design and evaluating the design scheme.

In the Elephant and Castle project in London, we helped with the replanning of this area with prominent architects and urban designers in the UK (Figure 15). We assisted them in stitching together fragmented bits and pieces of the urban fabric and resolving a problematic traffic

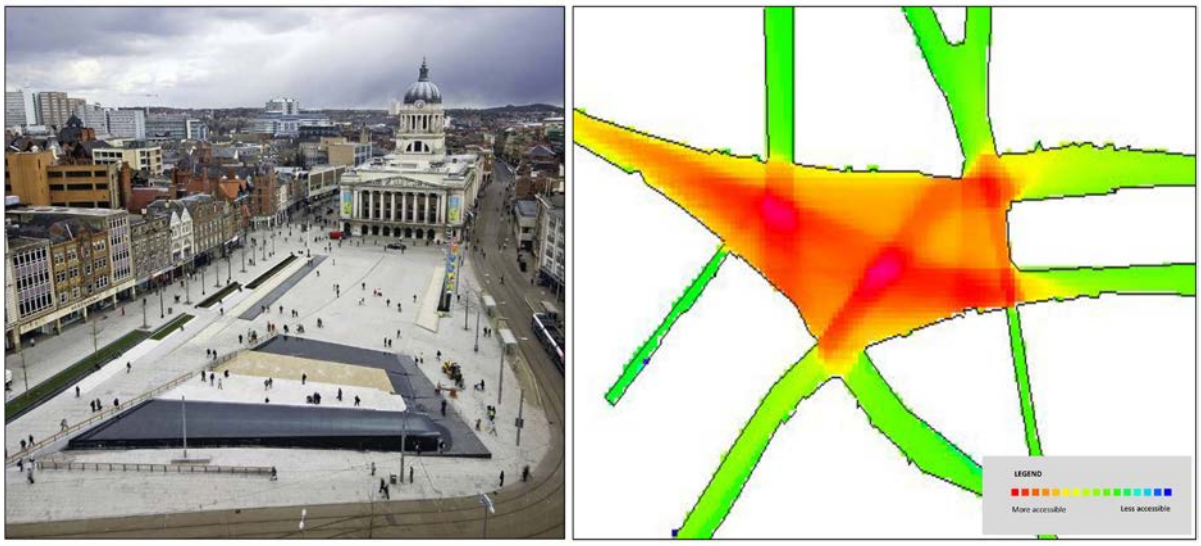


Figure 14. The Analysis in Nottingham, UK.

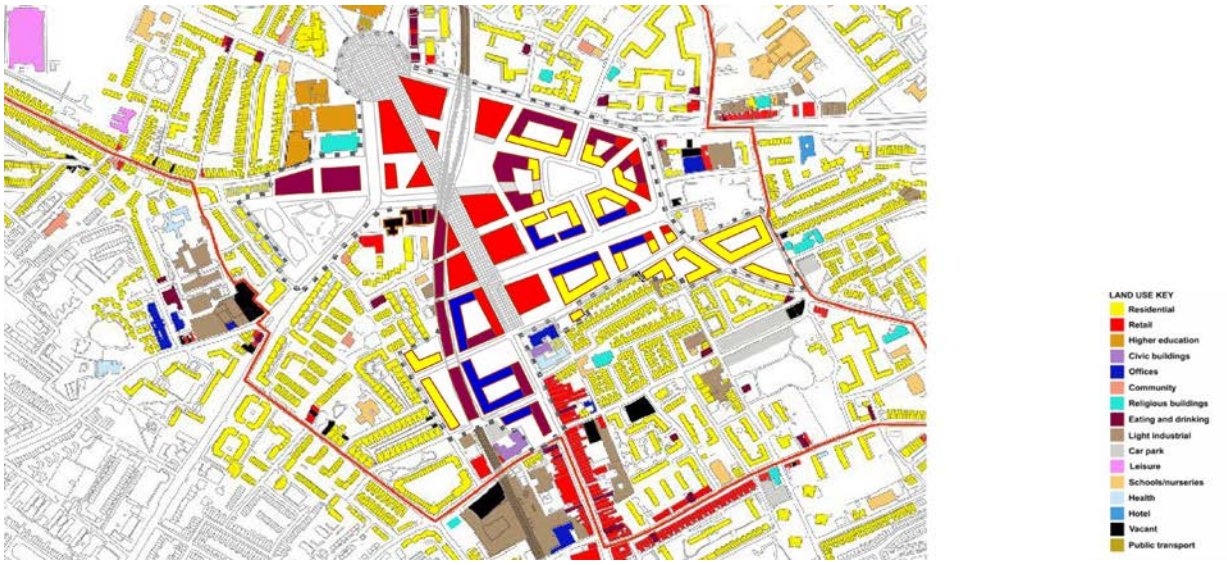


Figure 15. Elephant and Castle project in London.

roundabout, which has now been transformed into a public space. And then we helped them with properly locating the land uses and everything.

The next scale is large urban development frameworks, such as the City of Masdar in the UAE. In this one, the designers originally tried really hard to address some environmental issues, but they got the basics of city planning wrong, so we helped them to fix it (Figure 16). To do that, we developed a full-scale Integrated Urban Model for predicting how things will work in the future.

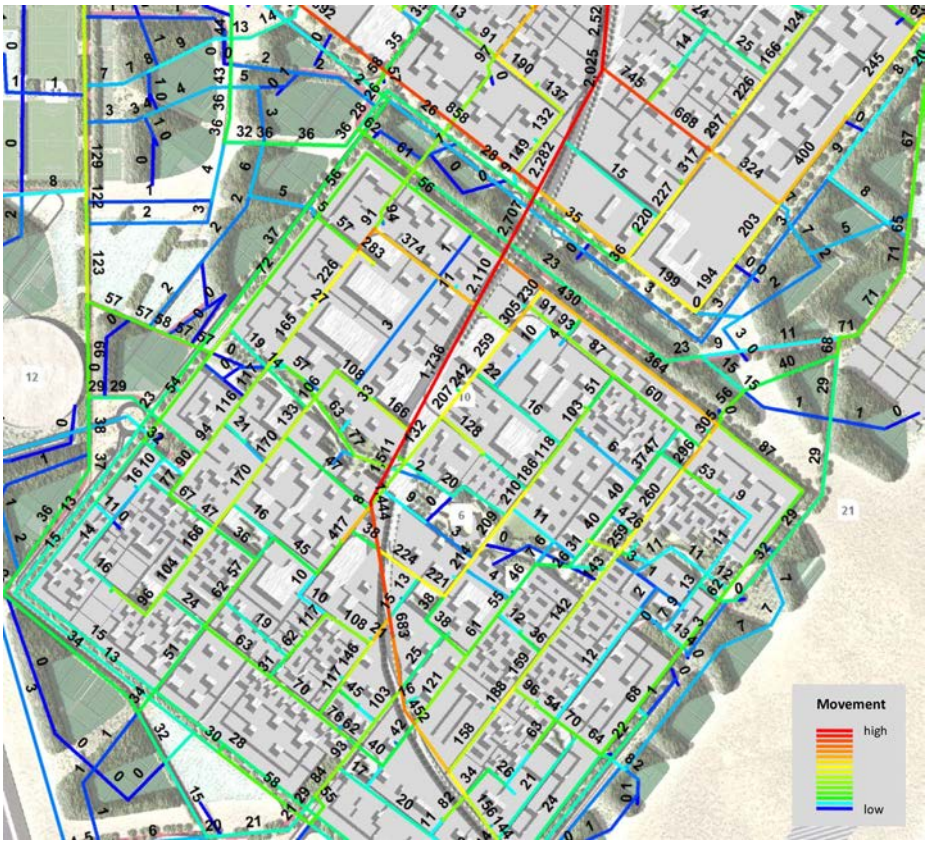


Figure 16. The City of Masdar in the UAE.

Finally, we can look at urban strategies at the city level (Figure 17). This is the city of Jeddah in Saudi Arabia, and how the city's plan was evaluated to assist them with the replanning.

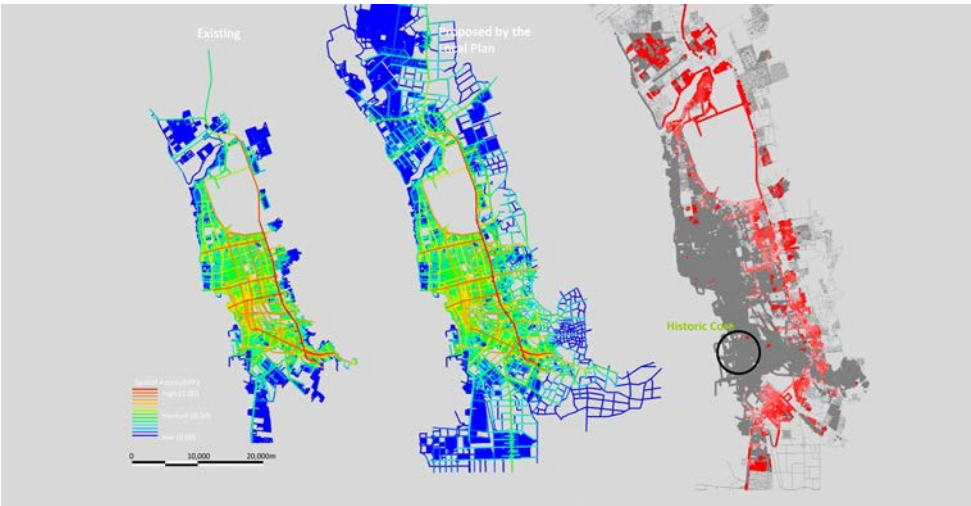


Figure 17. The city of Jeddah in Saudi Arabia.

This figure illustrates my view of cities as sustainable entities (Figure 18). Sustainability, in my opinion, is such an important thing. It's about endurance, continuity, minimising damage, maximising output, and so on. To understand sustainability, you have to prioritise the spatial structure or the morphological layers because they are the most resilient layers to change. You start with that and then overlay the movement layer, land use layer, density, economic viability, health, and so on. I should have added an environmental layer as well. Sorry, Helena! But yes, I mean, this is the way to look at sustainability as a very intrinsic relationship between these

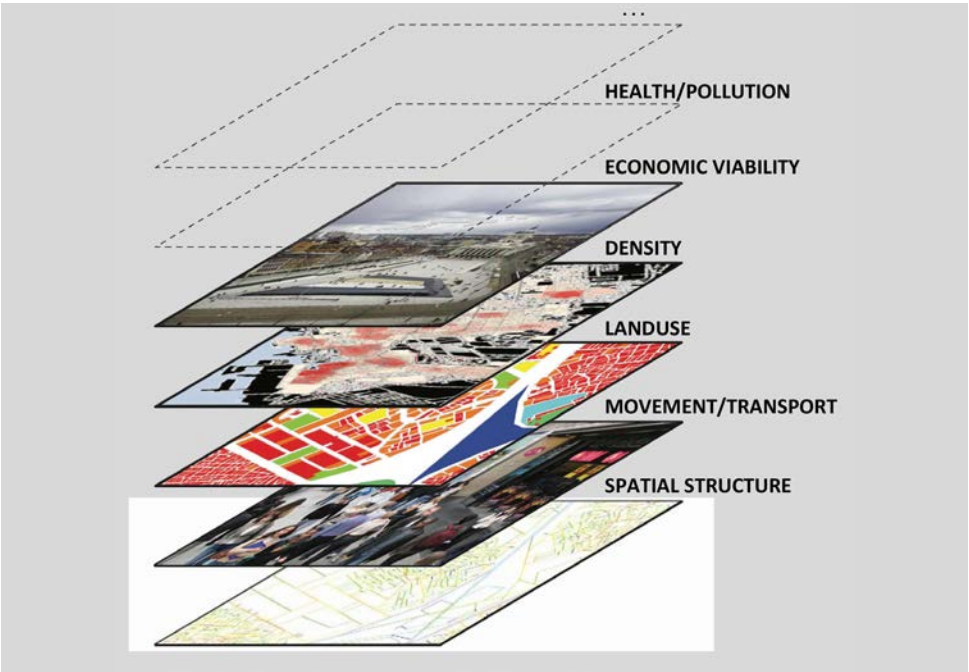


Figure 18. The view of cities as sustainable entities.

urban layers, but we should start from urban morphology, and this is the strength of this approach.
And finally, Integrated Urban Models (Figure 19). This is what we need to bring different aspects of the city and urban layers into one single model and try to complement it as much as we can.

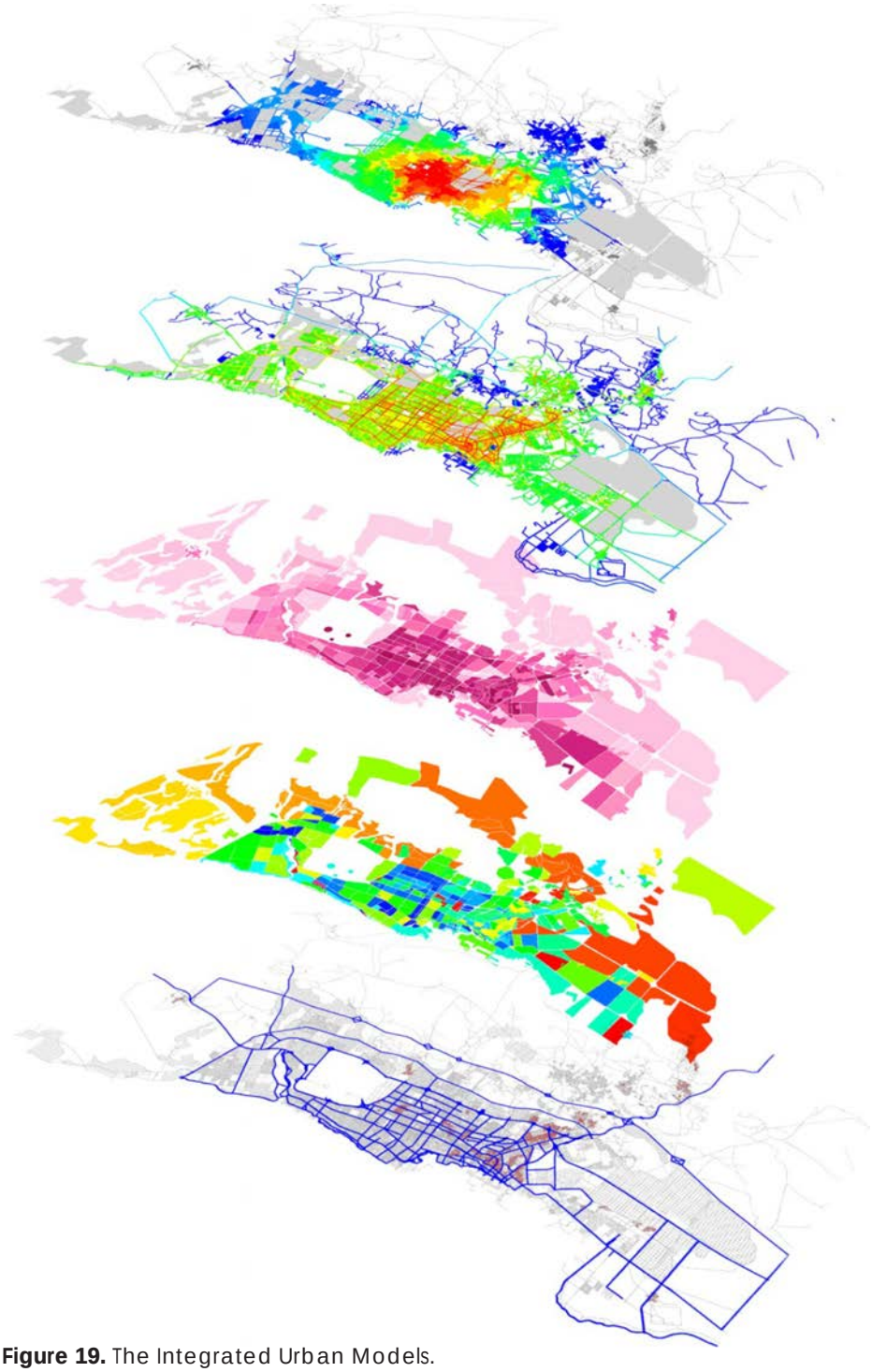


Figure 19. The Integrated Urban Models.

New Methods & Technologies for the Urban Analysis

Alessandro Melis
New York Institute of Technologies

I want to express my sincere gratitude for extending an invitation for me to participate in this conference. My primary objective is to explore the role that technology can play in our comprehension of urban evolutionary processes.

The relevance of this topic cannot be overstated, especially in the current historical context where we are grappling with significant environmental challenges. These challenges arguably represent some of the most profound obstacles our civilization has encountered since its inception.

To provide context for our discussion, I would like to draw your attention to a recent exhibition at the Italian Cultural Institute in New York (2022), in collaboration with the IDC Foundation and the New York Institute of Technology. This exhibition, co-curated by Christian Pongratz and Domenico Lucanto and involving a dedicated team of students, was titled "UpCycling." It focused specifically on the concept of ecocities, which explores the potential of creating inherently ecological urban environments. These are cities that can integrate biomass into their built environments, without adhering to the traditional distinction and rivalry between these two elements. To illustrate this concept, I've included images of three cities that were featured in the exhibition (Figures 1-2-3).

In fact, in contemporary times, we often perceive our planet as if it were a chessboard. The term "chessboard" serves as a metaphor frequently employed in traditional biological discourse to illustrate the contrasting roles played by humans and nature. With great consistency, we may also utilize this chessboard analogy to precisely differentiate, particularly in times of environmental crises, between the competing domains of the built environment and biomass. Therefore, when we contemplate this fundamental representation of our planet, characterized by the distinct boundary between water and land coexisting with a burgeoning population, we can gain an understanding of why we have started to view design, project planning, and architecture through the lens of photography. Some planners and architects can be still likened to photographers, capturing a frozen moment of the city at a particular juncture in its future.

However, the limitations of this perspective have now prompted us to acknowledge the importance of portraying the ongoing, dynamic evolution of cities.

Such complexity cannot be encapsulated in a solitary image but can be more effectively conveyed through means such as animation.

Hence, a territory in perpetual flux and its relentless adaptation to environmental factors necessitate ongoing monitoring, rather than mere representation. This incorporates into the design process a concept borrowed from evolutionary biology known as 'niche construction,' underscoring the notion that within the biosphere, there are no static circumstances; instead, everything comprises an incessant interplay among human and non-human entities, living and non-living elements, all engaged in an unceasing effort to maintain an equilibrium of adaptation. "This is what is usually called resilience.

When contemplating the cities of the future, it is essential to grasp the global environmental challenges, recognizing that a simple depiction of change can be somewhat deceptive. For

instance, when we consider the projection of a two-degree temperature increase between the present and 2050 in our designs, we should move beyond the fundamental notion of designing for a static snapshot of the year 2050.

Instead of designing exclusively for a 2050 scenario, we should consider crafting a process of continuous scenario evolution, transitioning from A to B to C to D, and so forth. This approach mirrors our previous research efforts, where we aimed to comprehend how this perspective influences the urban landscape's forms and, consequently, their representation. We know that all the revolutionary phases in the history of town planning and architecture have also had an impact on the way we perceive and represent the city. As an example, the central perspective has been a pivotal tool in the conceiving of the design of the ideal city of the Renaissance, which emerged after the 14th century environmental crises.

Today, we find ourselves contemplating the means of representation and how technology can assist us in comprehending a world that becomes progressively more complex, continually challenging the boundaries of established definitions and disciplines. Given these considerations, incorporating 'processing and monitoring' into the term 'representation' in our discourse on design more effectively conveys the need for ongoing engagement with a phenomenon that evolves and unfolds unpredictably, in contrast to the frequently mistaken assumption of predictability.

What if we were to start considering these advanced representation tools as a more effective means of promoting health security, sustainability, and their impact on the policies of future low-carbon cities? Our recent studies on the food-energy-water nexus, which have received increased support from organizations like the Belmont Forum and other international research funding bodies, have underscored the necessity of adopting a more systemic perspective. Recognizing the potential for two problems to become an opportunity is paramount in our quest for sustainability today.

From a political standpoint, sustainability is frequently viewed through the narrow lens of energy-related issues. However, in the field of urban planning, there is a growing awareness that inequality is one of the primary drivers of environmental problems. Consequently, the need to develop a representation that allows us to understand these complex relationships is becoming increasingly significant today. This shift in perspective encourages us to perceive cities not only as our objectives but also as our laboratories, where we can devise strategies to comprehend the phenomena of both the biosphere and our society.In the past, research often resembled an ivory tower where members used their own languages, occasionally employing cryptic codes. This situation perpetuated the traditional image of the science laboratory, where standardized conditions were imposed to comprehend the phenomena being investigated, following a cause-and-effect logic.

During times of global crises, research is increasingly viewed as an opportunity to have an impact beyond academia, particularly in understanding the complex and sometimes challenging interaction between decision-makers and researchers.

In fact, every time we fail to provide a clear and direct explanation of our actions in the field of sustainability, we potentially contribute to the promotion of climate change denial or enable deceptive practices like greenwashing.

Numerous examples can illustrate the consequences of our inability to effectively communicate with stakeholders, particularly decision-makers.

Therefore, addressing this communication challenge is of utmost importance.

Integrated Decision Support Systems (IDSS), for instance, serve as tools that enable the transformation of complex data into comprehensible and manageable decision-making

processes.
Dataframe, the research work, as well as an artistic piece, presented at the Italian Pavilion in 2021, by Guido Robazza, Filippo Lovato, Gustavo Romanillos, in partnership with the team coordinated by Andrea Taramelli was aimed at effectively represent and convey this complexity, making it comprehensible and integral to the decision-making process.
The 'Water World' segment provides insights into water resources, consumption by country, and the extent to which each country's population is affected by water-related diseases.
The visual clarity and the graphic effectiveness exhibited here pertain to the domain of decision support systems, as it facilitates the comprehension of complex relationships, such as the water-food-health nexus.
Indeed, through data analysis, we come to realize that in the post-pandemic world, the primary health risk factor is not the potential emergence of a new virus, but rather the scarcity and accessibility of freshwater.
Simplifying phenomena can in fact lead to misunderstandings. Many diagrams depict for instance the Heat Island Effect as a result of high-density urban environments. But is this the reality? Through a study regarding the Auckland area, we've collected data that has led us to realize that the issue doesn't solely depend on the quantity of urban structures or the compactness of the city. Instead, it primarily stems from the characteristics of horizontal surfaces, including their albedo, especially in areas devoid of buildings. The most significant Heat Island effect issues are concentrated, for instance, in airport and industrial zones.In cities such as Auckland, Melbourne, and Los Angeles, the primary issues are not related to the urban infrastructure but rather revolve around the expansive artificial surfaces like asphalt found in low-density peripheral urban districts. In contrast, historic European cities have demonstrated a more effective response to the Heat Island effect, even under extreme climate change conditions. This insight prompted us to formulate a blueprint proposal for the post-earthquake reconstruction of Christchurch, New Zealand (University of Auckland, Studio Christchurch, 2014).We were tasked with the southern industrial district of the city, situated beneath the greenbelt of the city center.
In collaboration with Emanuele Lisci and Alexander Figg, we harnessed satellite data to craft a smart grid network with the goals of efficiently managing energy resources, diversifying the urban landscape, improving the microclimate of the city environment, and enhancing connectivity through upgraded walkability and alternative transportation options. Our project included the extensive deployment of solar panel arrays on warehouse rooftops, the collection of water through a large canopy, and the utilization of hydrogen batteries. Our findings demonstrated that this design could enable the production of renewable energies sufficient to recover the reconstruction investment within 20 years.
However, during the official presentation of our design, a city council representative expressed reservations, suggesting that the government might not be inclined to support an initiative that doesn't directly bolster the economy of existing companies, particularly those involved in motorway construction.
Another research project in New Zealand, led by Liam Stumbles, focused on the Spaghetti Junction in Auckland, provided an opportunity to employ generative design as a decision support system. The intricacies of the information guided a theoretical process facilitated by generative software, and our research question revolved around repurposing asphalt and built-up materials from highways for alternative uses. We illustrated how agent-based modeling could transform the embodied energy of highways into a different configuration.
Additionally, this project involved the design of a machine capable of performing this

transformative process, repurposing highway materials for purposes contrary to their original function.

The converted filament materials were utilized in constructing climate buffers during the renovation of existing buildings in Auckland. This served to reinforce their structures while creating devices that shielded them from extreme climatic conditions.

Figures 1, 2, 3. Examples of cities that can integrate biomass into their built environments, without adhering to the traditional distinction and rivalry between these two elements.

URBAN MORPHOLOGY. Balance and perspectives.

Plenary Sessions Closing

We concluded the Forward by revealing the underlying and ambitious objective with which we would have to deal during the conference. That of defining a new theoretical and methodological framework, a new "horizon of meaning" and new analytical tools, to understand the complexity of the city's transformation processes: "I believe that the important question is to define a sort of new universe of meaning", explained Alberto Ferlenga, "that is, reconstructing a knowledge that is placed within a knowing activity that has limits much older, starting at least from Alberti, and which feeds on the great changes in history". In other words, it is a matter of building a renewed morphological discipline capable of intercepting the needs of the globalized society and translating them into physical forms.

But the reconstruction of knowledge necessarily starts from the reconstruction of a "point of view", without which any information is sterile and useless for the purposes of re-establishing a true disciplinary corpus. To this end, the conference defined some research and discussion "tracks".

We talked about communities as the new dynamic actors in the construction of the city. Raffaele Laudani gave us an effective and detailed picture focusing on the problem of their governance . Today the Civitas appears to be the true protagonist of the urban scene, apparently relegating the Urbs to an ancillary role with the emergence of new urban neighbourhoods as new units on which the contemporary metropolis is formed, as new Oicos through which define and recognize the different urban communities.

We talked about the great social changes brought by the digital revolution and how it is radically transforming our cities but in the awareness that is the Thought that must understand its coordinates and consciously guide its trajectories. We spoke, therefore, about the new methods of urban analysis, not only from an instrumental point of view, I am thinking for example of the words of Kayvan Karimi, but also and above all ontological. Different readings of the city can, in fact, offer us "different cities". They can highlight elements and characters once considered secondary, "invisible" to urban analysis but today bearers of meanings structuring society and the contemporary city. Elements through which a society modify the form of the present city adapting it to new needs. Alberto Ferlenga still remembers, "we have always lived differently in previous cities and the future has always been nourished by the present". New methods of urban analysis and new tools, therefore, as result of ongoing socio-cultural and economic changes, can contribute to the identification of those coordinates and trajectories of change that Thought is called upon to signify .

Finally, we talked about environmental challenges and how to metabolize them within a new disciplinary corpus for Urban Studies . Elena Koch it enlightened us in her essay on "Understanding cities: from the analogy to the human".

The latent theme of all the work was therefore the need to define a renewed dialectic between knowledge and project , between knowledge of the city and the project of its transformation. What for years has characterized the combination of analysis-synthesis and the difficulty of passing information and choices from one to the other must necessarily find a new definition.

The fragmentation of knowledge, typical of modern man, has entered into crisis, the plans of scientific research are rapidly changing, opening up new dimensions of knowledge aimed at apparently upsetting the traditional logical-compositional processes.

The themes that emerged highlight the focus of some concepts around which, from now on, we believe, the process of renewal of the Italian urban studies tradition, which is the basis of this conference, will have to be started.

The first concept is undoubtedly that of the City , its definition and the role that architecture can play within it: that of a "desperate beauty abandoned in a dystopian archeology of the

present?", asks Carlo Quintelli, or that of "wise builder of those spaces, of those relationships, of that beauty?". The city is certainly a "human thing par excellence" wrote Claude Levy-Strauss many years ago and as such it represents perhaps the most characterizing element of the new metropolitan realities. Franco Purini recalls: "It is the superstructure that determines the structure, it is the ideas that modify reality; therefore, when we read about a city we must go back to the genetic superstructures of the latter, to the human wills that started the processes of creation. Without an interpretative model, in fact, it is not possible to grasp the true meaning of what you are looking at.

To interpret the city we must have, in other words, a pre-judgment, or rather an "empathic model of knowledge" which is the only one that can allow us to proceed with an urban analysis that is truly human". To better understand the concept it would be appropriate to complete the definition of the city that Claude Levy-Strauss gives us: "Object of nature and subject of culture, individual and group, lived and dreamed, human thing par excellence".[1] The city as a moment of synthesis of the human being, as place of collective identity and personal identification, as experiential and memorable reality, as great narrator of that history of men called Anthropocene : "Reality in the absence of an attentive eye that interprets it critically is nothing, (...) it is empty and indeterminate", adds Luigi Franciosini, "In order to become a teaching, it needs a critical exercise, only in that moment reality changes and becomes "true", understandable, readable by man. This is especially important when talking about the form of the city, the soil and the geography." Because the form of reality is always a " semantic form ", bearer of meanings, stories, narratives and ultimately, values.

"Are we still able to reflect on these values?" continues Franciosini "I think that architects must rediscover the ability to observe things, from multiple points of view, broadening their gaze to poetry. Poetry is always, in fact, an opening of truth, it captures the issues in an authentic and at the same time, synthetic way. But the project is also a synthesis". We cannot talk about cities without talking about projects. The conscious project of the city is, perhaps, the instrument of knowledge that anticipates (and follows) the reading itself. It is the a priori of any cognitive experience of an urban organism and the a posteriori of knowledge itself. "It is an instrument of pre-vision, pre-figuration and pre-judgment on the city", recalls Carlo Quintelli, "We live today in a clear condition of heterotopia". But heterotopia is what is furthest away, upon closer inspection, from any idea of the city: "Utopias console; in fact, if they have no real place, they nevertheless open up in a marvelous space (...) they open up cities with vast avenues, well-planted gardens (...). Heterotopias are disturbing, they secretly undermine language, (...) they break and tangle clichés , they devastate syntax and not only the one that constructs sentences, but the less obvious one that makes words and things "hold together". This is why utopias allow fables and discourses: they are placed in the straight line of language, in the fundamental dimension of the fabula ; heterotopias dry up the discourse, block the words in on themselves, contest every possibility of grammar, unravel the myths and make the lyricism of the sentences sterile".[2] This is why the heterotopic city is not, in fact, a city. The city, "human thing par excellence", needs syntax on which to base itself; it is made of "fabrics", material and immaterial, which hold it together; it is made up of narratives, languages, " fabulae and clichés ", without which it loses the ability to transform and look forward, giving itself, from time to time, new perspectives; it loses the very ontological foundations of its existence. For this reason, Quintelli concludes, "a different vision of the utopia for the city must be regained." To do this,

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[1] Levi-Strauss, C., (1968), Tristi tropici , Il Saggiatore, Milano.

[2] Foucault, M. (1966), *Les Mots et les Choses (Une archéologie des sciences humaines)*, Gallimard, Paris. Trad. It. (2016), *Le parole e le cose. Un'archeologia delle scienze umane*, Rizzoli, Milano.

however, "it is not enough just to exit the apse and go to the churchyard, to get to know the city you must then return to the apse from the churchyard" in order to fix the experience and translate it into new awareness. An awareness capable of "situating oneself" as Lucia Latour would have said, recalls Orazio Carpenzano, or rather "understanding what are the interdependent variables of culture which in the meantime have gradually taken over and which have defined a palimpsest, in which it is necessary to trace both the reasons for some survivals, both the reasons for some roots and those of some overcomings". Among these variables certainly figures that "value of presence" that characterized the very first experiences of urban analysis. Both Muratori and Bill Hillier, apparently so far, begun their work by walking around the city, watching the buildings, looking at the streets and seeing what was happening inside urban spaces, trying to understand the "plastic value" of that dynamism that is the city as "human thing par excellence". In this regard Jeorg Gleiter writes provocatively: "Architecture is a function of time, more than space" and "the Urban Morphology is the embodied dimension of time". The present is thus cancelled, because it has a past behind it (now almost remote) and a future ahead which is often redefined, foreseen, even predicted, through an incredible quantity of interpretative models translating, in fact, this prediction into present evaluation tools. Today, in environmental issues, for example, this is extremely frequent. Mathematical models are created to say what will happen in 2050 or 2070. But the moment a future is "modelled" and we act in the present in response to this model, it ceases to be "future", becoming even "past", or rather, a "prior future".

The times of daily life and therefore of the city are changing. The new tools of Urban Morphology must necessarily take into account this renewed (and complex) "temporal" dimension of the city and of the society. They must be able to understand it, interpret it and translate it for the project. Luigi Franciosini writes again: "Igor Stravinsky, on composition, states that we must look for the "similarity of things", and therefore interpret, observe, study, analyze, (...) there is a scientific part that meets the synthetic one and in the synthesis it directs its action. But the similarity of things must be sought by renouncing the "seduction of variation." The latter poses easy, immediate and temporary solutions, while similarity proposes more difficult and longer solutions but with more valid and long-lasting results". Scientifically based solutions on which to ground the project of the contemporary city.

However, the true place of the urban Oicos is the public space. Many of the texts collected in this volume deal, directly or indirectly, with public space. It is the first place of knowledge of the city, it is the place where the Urbs and the Civitas come together in their maximum expression, where the city is truly "lived and dreamed" and finds that "recognizable form" of which Gino Malacarne talks about, "capable of making a synthesis between utility and beauty". But, before anything else, urban public space is the preferential place from which to start the city project.

The need for a renewed unity of vision of the analytical and design tools for the city and the landscape is another focus developed during the conference. The concept of landscape has been discussed for decades and this is not the place to reopen that debate, but certainly the idea that "city and countryside are part of the same landscape"[3] which unifies them "becoming simultaneous in the spatial image, (. ..) in the ability that they have to give us back, in the heart of the present, the intense succession of their past"[4] is strongly decisive. The incredible technological-digital development of recent years seems to push, moreover, towards a new

[3] Petruccioli, A, (2006), John Brinkeroff Jackson. A proposito dei Paesaggi. Dodici saggi brevi, ICAR, Politecnico di Bari, Bari.

[4] Assunto, R., (1973), Il paesaggio e l'estetica , Giannini, Napoli.

centrality of man, a sort of Digital Humanism, tending to simplify, reduce and above all unify the tools of human action towards an almost pre-modern dimension of everyday life. A few years ago, Peter Buchanan wrote an interesting article with the eloquent title "Back to the Future" in which he precisely investigated this progressive return to a holistic dimension of life (and the city) thanks to the digital revolution.

If the primary objective of modern scientific-technical progress was, in fact, that of providing man with tools capable of simplifying and speeding up anthropic processes, digital growth pursues the same goals, with more efficiency, reducing, up to cancel them, every device. It is the return to a "pre-modern physicality" of life and the city, through digital technologies.[5]

It is scientific research, with its ability to read those phenomena of complexity, dynamism and resilience, which characterize every aspect of urban life, that opens up new dimensions of knowledge aimed at transforming traditional logical-compositional processes.

It is the world of knowledge that plays a decisive role, not only in the understanding of urban phenomena, but, above all, in the ability to define new "horizons of meaning", new syntaxes, and new "utopias", for the construction of the city of the 21st century. Designing the city of the 21st century requires then a broad scientific awareness, capable of dynamically understanding its phenomena, "historically establishing them" and "semantically translating them", into a new form . A form that is changeable and complex in its contents, but simple in its syntax finding, from time to time, its own meanings "always the same and always different", within a single creative and knowledge process. Urban Studies will have to become active and aware interpreters of all this.

Marco Maretto

[5] Buchanan P. (1994), Back to the Future , in Canadian Architect, 39, 3 and (2015), The Big Rethink , in The Architectural Review, September.

Conference Themes

C | *Communities and Governance*

N | *New Methods & Technologies for the Urban Analysis*

R | *Reading the Changing Urban Form*

D | *Design a Sustainable Urban Form*

UD | *Reading U+D Prize*

Communities and Governance

New Methods & Technologies for the Urban Analysis

Reading the Changing Urban Form

Design a Sustainable Urban Form

Reading U+D Prize

Type, Rule and Exception

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Conference theme: Communities and Governance

Abstract. *The evolution of the urban form and structure reflects the generative processes of the city morphology which is strongly influenced by political, social, cultural and economic factors (Caniggia, Maffei, 1983). Following this approach, the present research is grounded on the concept of transitional morphologies (Trisciuoglio et al., 2021) stressing the continuous character of the morphological process. The research aims at improving the awareness of the transitional mechanisms and attempts to drive them to improve urban governance and urban quality. The specific case studied presented here consists in an operative investigation committed by the municipality of Rimini asking for the definition of a new set of urban codes. The new regulations are intended to manage the urban transition of the historical city centre in coherence with its urban morphological characters but to encourage a limited development of the consolidated and morphologically homogeneous urban fabric of the district so-called Borgo Mazzini. The objective is not to replicate existing forms but to apply the morphological types selected by the transitional process as parameters for future developments. In this sense, both ordinary types and urban exceptions become generators of the rule and measure of urban design. The research aims at setting flexible and interactive urban codes based on the dynamic interaction between form, rule and time. In this perspective, integrating the principles of administrative and private law is essential to define a new paradigm able to manage and respond to unforeseen and unpredictable urban dynamics (Bergevoet, van Tuijl, 2016).*

Transitional morphologies and urban codes

Urban morphology studies mostly focus on sequences of morphological stages (Muratori, 1960), analysing the differences between the initial stage and the final one. However, the study of the dynamic of changes in urban form, focusing on incremental metamorphosis/assemblages of urban elements and spaces, not only on specific stages, but on continuous dynamics connecting the single steps in between, can make an important contribution to the field in operative terms. In this frame, the transitional approach to urban morphology can support urban morphogenesis, urban regeneration processes, design processes and decision making systems processes as well (Trisciuoglio et al., 2021). The *Transitional Morphologies Joint Research Unit*[1] tries to overcome the merely analysis of the permanent elements of the city, seeking for a transitional paradigm in urban morphology, aiming at grasping the dynamics in urban evolution and providing operative tools for urban regeneration design through an adaptive approach (Trisciuoglio et al., 2021).

In this sense, considering the post-industrial city as the main focus of urban regeneration processes of the last decades, it is urgent to set a methodology, in the frame of morphological analysis studies, able to grasp the transitional character of urban phenomenon to and interpreting the above mentioned post-industrial city as a stage of a continuous transition in urban form and not as a final step. In this perspective urban regeneration processes can be based on impermanent configurations originating from the historical traces and types, anticipating future morphologies people centred. To implement this approach there is a need for regulatory tools enabling multiple scenarios according to the dynamic growth of the city (Barosio, Di Robilant, 2020). Urban codes, affecting the design and placement of buildings, streets and public spaces, have a profound influence on urban form (Marshall, 2011) and they are part of the 'hidden language of place-making' (Eran, 2005). They have a direct influence on 'the structure of the ordinary' – where ordinary connotes something not insignificant, but rather something representing the vast majority of the urban fabric (Eran, 2005). In recent years the significance of urban codes has been brought into sharp focus, as incumbent instruments ripe for reform, or new tools for shaping the future (Talen, 2009). Within the field of urban morphology, the relationship between form and codes is a debated issue. Urban morphology within a geographical and historical tradition focuses on the objective, rigorous and systematic description and explanation of the city (Oliveira, 2021), while urban code 'was primarily in support of an urban vision' (Dutton, 2000). The present research uses the typo-morphological analysis to highlight parts and components of the built environment as well as their arrangement, thus establishing what variations and changes are possible in the urban environment. The objective is to formulate guidelines to forecast urban development from the observation of the urban dynamic presently going on on the site.

This research on the relationship between urban morphology, transitional morphologies and urban code, found an ideal case study in the collaboration, started in 2020, between the Municipality of Rimini and the *Transitional Morphologies Joint Research Unit*. The opportunity was given by Emilia Romagna Regional Law no. 24 of 21 December 2017, which envisaged simplifying the legislative system of territorial government by merging municipal plans (Municipal Structural Plan, Operational Coordination Plan and Building Regulations) into a single General Urban Plan by 2023. The approval of this law led to a virtuous political process in the city of Rimini that, first and foremost in the figure of the former mayor[2], focused on promoting urban regeneration through the drafting of the General Urban Plan. In this context, the role of the

[1]The Transitional Morphologies Joint Research Unit is a research group founded in 2018 between Politecnico di Torino and South East University of Nanjing.

[2]Andrea Gnassi was mayor of Rimini for two terms, from 2011 to 2021.

research conducted by Transitional Morphologies Joint Research Unit is to develop guidelines that allow the formulation of innovative urban codes (General Urban Plan), able to trigger urban regeneration mechanisms, based on the concept of continuous evolution of building types and urban morphology.
The research is focused on the study of Rimini's historic centre, its structure and composition in terms of formal evolution and regulation development. The morphological relationships emerging from the analysis of the historic centre ground the definition of the transformative potential of the site as well as the starting point for formulating guidelines for the development of consolidated urban fabrics. The formulation of guidelines has to deal with the so-called *ambiti consolidati* which in Italy are the subject of Article 17 of the Ponte Law, which specifies that if the urban agglomeration has a historical, artistic or particularly environmentally valuable character, only consolidation or restoration work is permitted, without volumetric variations. Despite numerous variants of this general law in force throughout Italy, local regulations (part of the hierarchical regulatory system) are referred to for the protection of these assets. This regulatory trend demonstrates a general tendency towards conservation with absolute regard for the undisputed protection of artefacts. The regeneration of historic urban fabrics is a complex operation in discordance with existing regulations. This system does not have a solid track record of consistently producing high-quality development. It sometimes succeeds in blocking the construction of the worst projects, but, with the exception of a small number of exemplary planning authorities, it tends not to be proactive in ensuring high-quality urban regeneration. In this context, two main questions are arising. How to formulate transformative guidelines for the historical centres? What role does urban design and planning can play in urban regeneration processes within historical contexts?
The topic's discussion is structured around three main points: starting with the analysis of the relationship between urban form and regulation in the context of the urban regeneration of Italy's historic city centres, the case study of 'Rimini as a laboratory' introduces then the investigation methodology based on the dialogue between academia and municipality, as well as the main objective of the study and the operation carried out to analyse the historical centre, and finally the focus on the topic 'Toward a dynamic growth: the case of Borgo Mazzini' shows a specific example of the possible operative outcomes of the coding methodology set by the research. Measurements and analyses of data on the urban fabric arranged in-line with a focus on urban design as a research tool, are displayed and a matrix based on the urban morphological analysis allows to investigate the rule as a guideline and to to propose adaptive regulation vision for urban regeneration of compact historical urban fabrics. The analysis of limits, opportunities and open questions of the study concludes the discussion.

Rimini as a laboratory

Rimini is a privileged field of observation because it is an opportunity to examine an ongoing process and to connect the links between theory and practice. Launched in 2020, the dialogue between the Transitional Morphologies Joint Research Unit and the city's municipal administration has allowed for an intense exchange of useful discussions to guide the research. Firstly, the mayor's urban vision of promoting the historic centre as a focus for urban development initiatives has allowed for a look back at a part of the city long forgotten in favour of the more productive seaside area. In this sense, the realisation of numerous projects for the redevelopment

[3]Literally, consolidated areas, i.e. settlements or parts of settlements with notable or valuable characteristics, these include historic centres.

of public spaces has triggered the administration's desire to incentivise private initiative, with the formation of the new General Urban Plan, in order to restore a coherent image of the city (Lynch, 1960). Secondly, continuous communication has given access to numerous documents and cartographies useful for the diachronic study of the urban development of the historic centre from a descriptive perspective in the formal sense. The location administration had two main expectations from this collaboration: to promote private investment by increasing building capacity and to preserve local identity, which we suggested to do by enhancing the type-morphological structure.

The research is structured in four main study phases. First, the analysis of the evolution of the urban fabric of the historic centre to trace the permanences and permutations in the urban layout. Subsequently, the identification of formal clusters in today's urban fabric, which are useful regardless of the functional classification into built protection zones. Thirdly, the analysis of each cluster through a study sample with the definition of a flexible urban design. Finally, as a result, the setting up of a synoptic matrix for the definition of urban guidelines. The current image of the city of Rimini, especially of the historic centre, is the result of the overlapping of several processes that define the territory as a palimpsest being progressively reworked (Corboz, 1983). From this assumption, the analysis of the evolution of the urban fabric has revealed the presence of elements that remain in the different spatial configurations of the city through time. The structuring components of the current urban form derive from the composition of the street layout, the shape of the wall system, and urban expansion in three main directions. The street layout is a legacy of the Roman settlement, in fact it presents the typical cardo-decuman formation (Gobbi & Sica, 1982), i.e. two perpendicular streets at whose intersection is the main market. The streets, therefore, dictated the urban development in four main portions with development in closed blocks. The wall system also derives from the Roman foundation, but these have undergone several expansions over the centuries, especially during the Renaissance when they were enlarged to contain new buildings of power and worship (Castello Sismondo and the Malatesta Temple by Leon Battista Alberti). However, the last arrangement of the city enclosed by walls is represented by the first cartographic evidence of Rimini: the Gregorian Cadastre of 1811. From this date onwards, the expansion of Rimini took place in three main directions (north, south and west) in which the three extramural districts of historical interest (Borgo San Giuliano, Borgo San Giovanni and Borgo Mazzini) were formed. From the reconstructions and cartographies it is possible to read the changes in the city that evolved from a core surrounded by walls to a centre surrounded by extramural districts (Fig. 1). Today, the normative boundaries are considered to coincide with the historic core delimited by the path of the ancient walls and the three districts outside the walls. The street layout, the system of the walls and the three expansion districts were key components for the identification of formal clusters within the current urban fabric (Fig. 2). The clusters are defined as aggregates of buildings with similar morphological characteristics (e.g. a grouping of typologies belonging to the same matrix, such as the courtyard house). The grouping into clusters does not depend on the function or on the regulatory zoning but on the analysis of the evolution of urban fabrics that has defined the structuring elements of the city. Thus, the compact and dense urban fabric with blocks and stratifications (Identified as Cavour) owes its configuration to the road system of the Roman foundation. Just as the district of special buildings (named Alberti) and the urban fringe fabric (Tiberio) that is morphologically generated by previous elements (such

[4]It should be specified that after the construction of the railway that divided the territory and the city into two parts, there was a break in the continuity of the landscape and also of the management of the two urban halves. In this paper we deal with the historic city and the expansion towards the hinterland.

as walls, rivers, etc.) are morphologically generated by the presence of important landmarks of power and worship and by the shape of the walls. The last two clusters refer to the expansions of the 19th century: the districts outside the walls are made up of urban fabric with buildings in line and row houses (Mazzini), regular patterns with irregular skylines (San Giovanni). For each morphological cluster, a sample was identified in order to be analysed in depth and in order to set experimental guidelines which can then be extended to the whole cluster because of its morphological similarity. In particular, the analysis focuses on the study of urban transition (Fig. 3), in order to identify permanencies and permutations. The result of each analysis allowed us to conduct planning considerations and to hypothesise possible regeneration steps and development guidelines, through the use of the project as a research and forecasting tool. In order to understand the kind of work conducted, one of the five study samples, located in one of the outskirts districts, Borgo Mazzini, is presented in the following section.

Toward a dynamic growth: the case of Borgo Mazzini

The analysis of the study sample called Borgo Mazzini includes an in-depth study of a research area located in Via Lavatoio. This part of the sample has the greatest evocative and representative capacity of the urban fabric arranged in line with row houses.

The analysis has been summarised in three main steps. First there is a framing description that provides general information on the area; then there is the morphological analysis with the identification of repeated and special characters through the study of transition and the drafting of a typological abacus; a design hypothesis closes the analytical part in order to return a possible scenario of urban renewal and regeneration. An overview of some limitations or critical issues of the study concludes the analysis phase of the study sample.

Urban context analysis

Borgo Mazzini is an extramural agglomeration in which buildings are arranged in rows and face three main streets (from north to south: Via Montefeltro, Via Lavatoio and Via Aurelio Saffi). Until the end of the 19th century, being located on the outskirts of the city, it was not only a place of passage and trade, but also a working and service district. Unlike Borgo San Giovanni, which was the gateway to Rimini in direct communication with Rome through the Via Flaminia (continuation of the cardo), Borgo Mazzini was the gateway to trade with the countryside (continuation of the decumano). The imprint of a workers' district can be seen in the buildings that make up the district. While near the crossroads of Rimini's main thoroughfares the buildings are five-storey fourteenth-century palaces, in Borgo Mazzini the buildings are mostly single-family houses of modest size. The façade solutions are varied, but feature poor materials such as plaster or brick. Today, the district forms a filter zone between the historic city and the modern expansion inland. In fact, the boundary of the ancient walls is marked by the presence of Porta Montanara (one of the entrances to the historic city) and the westernmost part of the district is characterised by modern buildings rebuilt after the bombings of the Second World War (Copioli, 1982).

Morphological analysis

The layout of the district changed several times with the various waves of extramural urbanisation. Starting with the 1894 cartographic representation, the urban agglomerations of Borgo Mazzini densified and compacted with the fronts on the three main roads. The relationship between fronts and streets is evident as the layout of the buildings over time tends to stick to the perimeter of the blocks, leaving the internal space jagged between property boundaries. That the streets in this district represent an important polarity is shown by the opening of two new streets in the

northern blocks. Traces of these are still evident nowadays. The research area today presents a significant morphological aggregation consisting of a terraced arrangement of building types, i.e. two or three storey terraced buildings arranged along the street. It is a residential area with sporadic commercial establishments (e.g. restaurants, bars, hairdressers, grocery shops, etc.) on the ground floor. The blocks are not as compact as in the city centre. In fact, despite changes over time, buildings have been arranged along the perimeters of the blocks, leaving the inner courtyards as service spaces. Some courtyards are used for parking cars, others are empty and still others are fenced off. There are several visible entrances open to the outside, not private. There is no real morphological hierarchy of the three streets branching off in Borgo Mazzini, as they start from Porta Montanara. The variation in heights is not significant. Most of the buildings are two-storey residential (maximum five or six rooms) with different colours, which together with the ornaments represent the unique character of each house. Although Borgo Mazzini was in the past an agglomeration full of different activities, the form of the buildings is not very specialised in terms of building types, mainly terraced buildings with a rear courtyard are to be found. The particular building of the church of San Gaudenzio and some post-war buildings (thus detached from the urban morphological context) certainly stand out, but permanent terraced houses are the most widespread type. Particularly in the analysis of Via Lavatoio (east front) the housing units are distinguished by the number of floors and the material solutions of the façade. Looking at the floor plans, however, the layout of the property boundaries is not linear, but rather the regularity of the fronts is interrupted and fragmented in the setbacks and common spaces (Fig. 4).

Dynamic growth

In recent years, the concept of 'growth' has undergone a profound transformation, becoming the subject of careful analysis and redefinition (Wu, 2015). In urban planning and architecture, growth is a controversial concept, which has often generated phenomena that are difficult to reverse to the detriment of the territory and its values (Marshall, 2011). The concept of dynamic growth, which might appear pleonastic, is functional to setting innovative planning tools able to drive the growth of the city not to a specific stage but more to frame the growth into a last lasting dynamic process. Therefore to reproduce and project urban growth, dynamic modelling is needed to quantify the spatial and temporal patterns of urbanisation (Feng, 2022). The concept of 'dynamic growth' in the context of Rimini's historic centre is used to define a development programme for the Borgo Mazzini area, to define a path more than a final stage to achieve. In order to allow the urban regeneration and development of this specific cluster, the design hypothesis (based on morphological analysis) forecasts a progressive growth of buildings' height in relation to the adjacent building. The reasoning is concerning the eaves line. Given that the maximum height of buildings in this area should not exceed 5 storeys total (so about 24 metres high), a building can grow one storey higher than its taller neighbour. This strategy could preserve the variety of façade solutions and the homogeneity of the neighbourhood skyline as well, while encouraging private investments by allowing volumetric enlargements of the existing buildings (Fig. 5).

The approach presented so far certainly shows the potential for action on compact urban fabrics in search of possible improvements. However, it presents some limitations and critical issues to be deepened and investigated. Conflicts at the administrative level involving private law may arise in order to start a dynamic growth process. If a building in an in-line urban fabric does not belong to a single owner, conflicts of interest and lengthy legal processes may arise before a compromise is reached. Furthermore, it is important to understand how to stimulate

the triggering of such growth, which means that it would be useful to find a range of incentives to allow the process to begin. In addition, it is necessary to define a time window in which to consider requests for growth. If, for example, one unit requests the technical offices to grow by one floor compared to its taller neighbour, and the latter has a growth process underway, there is a conflict in terms in the construction of the guideline. This raises the question of whether urban coding can still play a role in contemporary urbanism, being able to capture some of the positive qualities of urban character while avoiding some of the disadvantages of conventional planning (Marshall, 2011).

A rule-generating matrix

The division into five morphologically homogeneous clusters is a necessary operation to distinguish and analyse the diversity of Rimini's historic centre. In the inter-scalar reasoning, or sometimes in this trnas-scalar analysis, the samples analysis is functional to verify whether the reasoning conducted a priori can be applied more or less effectively to the existing urban fabric presenting the same characteristics. Therefore, it is possible to set up a possible preliminary matrix (Tab. 1) to define the knowledge base to reformulate and sometimes go beyond the existing rules through the setting of guidelines. The synoptic matrix reports the morphological requirements of the intervention areas (IF), the possible actions on the urban fabric with the subject that can carry out the regeneration actions (IS ALLOWED), the benefits for the subjects involved (ADVANTAGES) and finally a draft of the quantity of the operations allowed in each situation (LIMITS/QUANTITIES). Reading the matrix which regulates the Borgo Mazzini area (and the sample of Via Lavatoio) the criteria of row housing's alignment on the street is a funding principle. Given this requirement, the owners are allowed to increase the building capacity of surfaces and volumes by addition, preserving the original building typology and its imageability (Lynch, 1960). The elevation of buildings is allowed through a dynamic index that is regulated by the height of the tallest adjacent building, with a maximum height of five floors above ground. The five storeys above ground as a constraint allows for an optimal relationship with the street and the buildings on the other side. Volume additions on the façade are permitted as long as they respect a maximum projection of one metre and do not occupy more than 20 percent of the façade. Volume additions on the ground floor are not permitted in order not to occupy public land. And lastly, volumes added to the existing roof can be partial or total in relation to the outline, for residential use and can include a dormer window. The benefits are twofold. Concerning the urban quality this measure favours urban regeneration while preserving the identity of places. Concerning investors and owners, the possibility of increasing the volume or surface area of the building increases the rentability of the properties. The guidelines for Borgo Mazzini, moreover, suggests an overall vision of indicators, which are used to rule quantities and limits of intervention not referring to absolute dimensional limits but in relationship to the progressive process of regeneration, to the transitional morphogenetic process.

Conclusion

The methodology developed in the frame of the research, consisting in a set of form-based codes based on morphological analysis of the urban pattern, presents a high potential to be generalised to other contexts. As the form-based code proposed consists in a matrix summarising formal abacus, formal and dimensional criteria as well as suggested transfomation's criteria strictly based and related to the morphological analysis of the site, these elements can be easily re-formulated for other historical cities centres. The main advantage of this process is that all the recommendations, all the codes' elements, are site specific and therefore able to foster

and promote local identity. More generally, the presented approach is suitable for any consolidated urban fabric as the main requirement is to have a preexistent built environment with a recognizable imageability to inform the abacus of the form based code. In this sense the methodology can drive not only the transformations of the more representative and symbolic part of the city, such as the historical city core, but also the regeneration of the more ordinary or peripheral areas recognizing their different urban role (expansion axis, outskirts, satellite suburbs, etc.).

The control capability embedded in this methodology has to be questioned. From a quantitative point of view the strategy matrix based on morphological abacus is not able to precisely control the building expansion as it allows multiple forms of expansion quantitatively related only to the closer building and therefore variable in time. Conversely, from a qualitative point of view the mechanism of the dynamic growth controle is able to ensure a quite effective control on the qualitative aspect of the city morphological evolution. Driving the transitional process of expansion of the built units maintaining both the homogeneity of the skyline and the volumetric alignment on the street, as well as the typological pattern, the matrix based code is a powerful tool to allow multiple scenarios to occur but all of them within a common frame of given morphological relationships.

Even if the outcomes of the research, namely the coding matrix but also the morphological in depth classification and analysis, had an important impact on the municipal staff in charge for the new town plan, it is still difficult to identify possible law displays to include those guidelines into the building permission process.

For these reasons, challenging future perspectives of this study would be to develop interdisciplinary research bridging urban design with public law and with parametric design. The field of public laws can help in developing specific regulatory instruments, supporting urban codes dealing with dynamic and non absolute criterias based on morphological types, while parametric design approach would offer effective digital tools to visualise and simulate the morphological multiple outcomes of the dynamic regulation of urban growth.

On a more disciplinary side, it might be interesting to test the morphogenetic approach combined with dynamic urban code to non consolidated urban fabric, such as the urban sprawl, or even to the generative process of new urban developments to test the potential of this combined approach in driving generic morphogenetic process not only related to historical consolidated urban fabric.

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Illustrations and tables

Figure 1. Overlay of the Roman layout (red) and the layout of the Renaissance walls on the redrawn cartography of the Gregorian Cadastre. The urban permanences present over the centuries are highlighted.

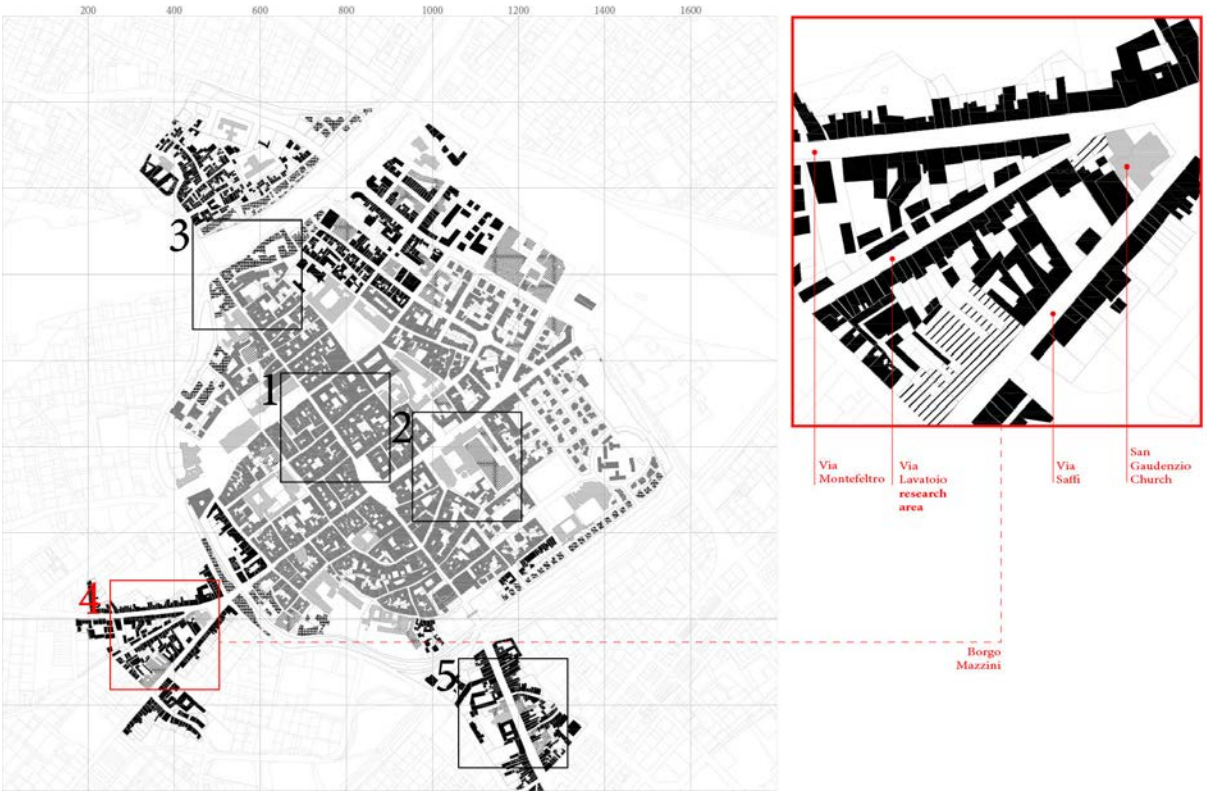

Figure 2. Historical Centre of Rimini with the identification of five morphological clusters and zoom in on the research area presented in this article. 1) Cavour - Morphologies of compact and dense urban fabric with consolidated blocks; 2) Alberti - special buildings district; 3) Tiberio - urban fringe fabric that is morphologically generated by previous elements (like walls, river, etc.) and it deals with different levels; 4) Mazzini - urban fabric with in-line buildings and row houses; 5) San Giovanni - the morphology with regular pattern with irregular skyline.

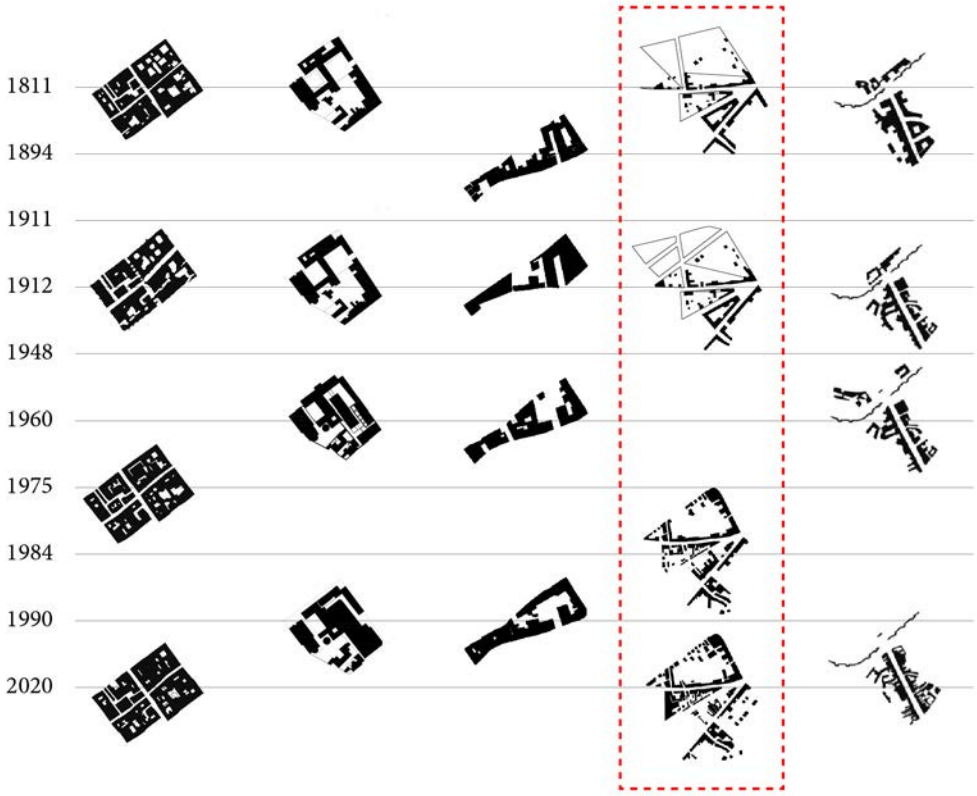

Figure 3. Formal urban transition of the study samples of the five morphological clusters in the historic centre of Rimini, with the Borgo Mazzini sample highlighted.

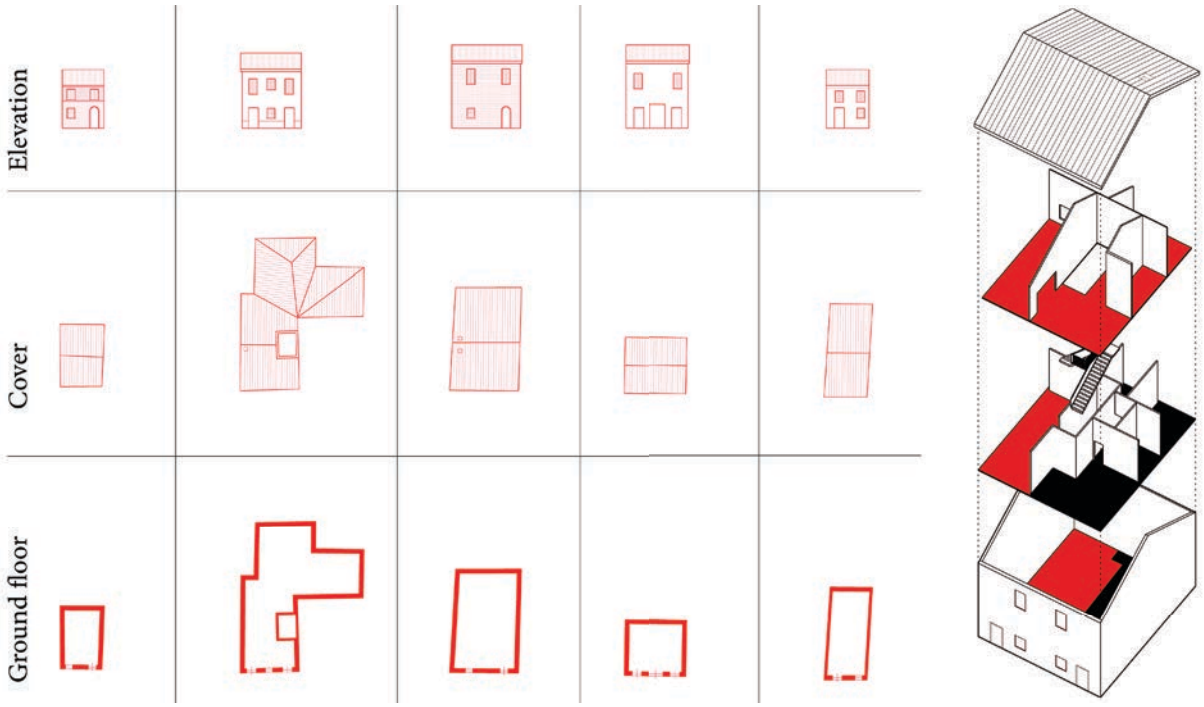

Figure 4. Typological abacus of some buildings overlooking Via Lavatoio, Rimini and an exploded axonometric composition of a typical building. The abacus includes ground floor plans, roof plans and elevations.

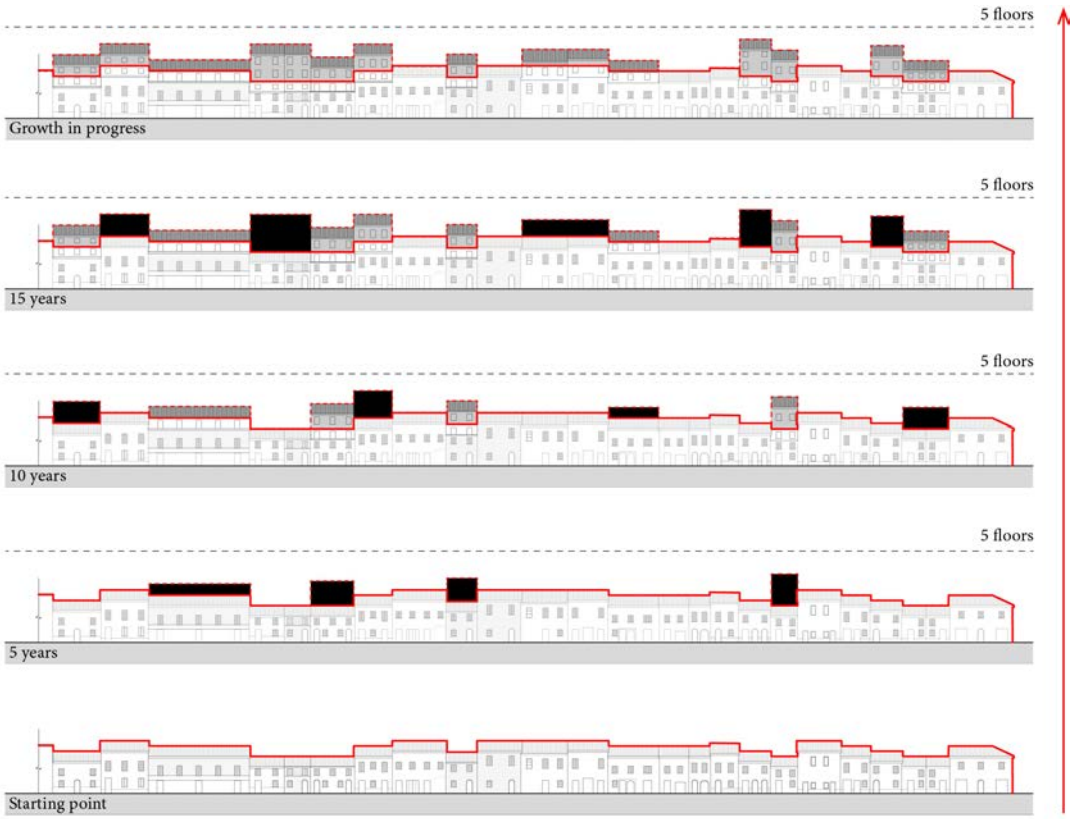

Figure 5. Diagram of dynamic growth on the east front of Via Lavatoio in Rimini. The figure depicts the current situation below and the possible configurations of volume addition over time. The continuous red line represents the current skyline, the dashed line the difference in height.

SAMPLE NAME	STRATEGY ICON	IF	IS ALLOWED	ADVANTAGES	LIMITS/QUANTITIES
MAZZINI Dynamic growth		**urban fabric with in-line buildings**	Extra building capacity: - the increase of floor surfaces and/or volumes by addition, preserving the original building typology and it imageability. **PROMOTERS:** Private owners.	for the urban quality - preserving the local identity for the investors - Gain of surface/volume	- **height raising** Dynamic index h= h neighbour +1 - **maximum height** Traditional standard 5 storeys - **volume addition on the façade** 1)Maximum protruding: 1 m 2)Coverage existing façade: max 20% 3)No addition of ground floor toward public street - **Roof outline** 1) Offsetting outline (partially or totally) 2)Residential destination 3)Dormer window addition 4)Partial removal max20%

Table 1. Synoptic table setting guidelines for the development and urban regeneration of the fabric in line with terraced houses (Borgo Mazzini, Rimini, Italy).