Transformation of the Urban Tissue and Courtyard of Residential Architecture: with a Focus on the Discourses and Plans of Paris in the 20th Century

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Abstract
This paper includes a critical review and an exploration of changes in the urban tissue of Paris and the characteristics of architectural forms in collective housing based on discourses and projects of the 20th century. Such discourses have addressed openings and closures of systems created by relationships of basic urban tissue components such as streets, plots, blocks, and buildings. What is clear is that the residential courtyard as intermediate space contributes directly to establish and change the relations between architectural layout and urban context. Considering social, architectural and urban objectives about open space in urban residences and situation changes of the 20th century, the roles and features of courtyards are categorized into three axes — hygiene, community, and urbanity. The interconnection of hygiene, community, and urbanity resulted in the emergence of a new building type to define the role and value of the courtyard.

Keywords: urban tissue; courtyard formation; urbanity; residential architecture; urban regulation

1. Introduction
A city can be understood as an integration of many elements undergoing continuous change that experience creation, growth, decay, and regeneration over time (that is, over several generations). Urban tissue continues to play the role of a living foundation resulting from the interaction of many combined factors over a long period; reflecting the conditions of various periods. It generally exhibits not only physical properties, but also reflects the lifestyle of city dwellers and the social environment, including politics, society, economy, culture, and the interaction of these factors (Muratori, 1959; Kostof, 1992).

Change in the physical form and pattern of urban space occurs according to a collection of microscopic and subtle architectural actions, which contribute to the representation of place identity and the social life of the period. To control order and beauty within urban space, a unified urban space and the regular appearance of buildings are regulated according to a planned city management system and the enactment of regulations and ordinances. Formation of urban tissue is based on the effect of ideological flow and the historical accumulation of urban components, because social, political, and economic causes change over time.

Urban change cannot be regarded as disconnected from urban tissue; both result from an area's history and residents' lifestyles.

The main objective of this study was to identify the features and the meaning of changes in the urban tissue of Paris and the characteristics of architectural forms in collective housing complexes through discourses and projects of the 20th century. We have investigated the significant projects, both realized and unrealized, which are repeatedly cited within the main French architectural journals (AA-L'architecture d'aujourd'hui, AMC-Le Moniteur Architecture, Techniques & Architecture, and so on), the Arsenal Pavilion Gallery exhibition catalogues, the publications by IFA (Institut français d'architecture), the publications of administrations such as the Paris Project, Projet urbain, Ville-architecture, conferences, various research journals, architect's monographs, and so on. The number and variety of these sources demonstrates the momentum of debates on this period. In this context, we intend to analyze and emphasize various aspects of the production of urban and architectural form: firstly, to show the diversity of conceptual perspectives in terms of making a piece of the city, and, secondly, to demonstrate the discrepancy between doctrinal expression and complex reality.

To understand the historical background, social factors, and architectural discourses of the main junctures influencing changes in Paris's urban tissue, we examined research surveys of the city and various architectural methods associated with urban design. In particular, changes in Paris during the 20th century were analyzed in terms of a focus on system openings...
and closures created by the relationships of basic urban tissue components such as streets, plots, blocks and buildings, and the homogeneity and heterogeneity of context formed by those components, as well as the void/solid relationship. That is, changes in relations between layout and city and the way such changes have been incorporated to form and regenerate urban tissue may be understood by an examination of the courtyard as an architectural element, a changing aspect of the block (that is, a basic element of urban form), and the influence of layouts and architectural forms of various projects.

As good order and a unified image of the streetscape represent the urban characteristics of Paris, can the urban tissue of Paris be regarded as a homogeneous aggregate controlled by regulation?

2. Hygienic Ideology and the Open System of Courtyards and Blocks

Since the mid-19th century, the importance of hygiene has been emphasized in many fields. It has been a determining factor (reflected gradually) in the production of housing, despite changes in urban regulations (Guerrand, 1966). For a long time, specialists continued the discourse regarding hygiene and comfort in architectural product systems; a new architectural style was created to establish a relationship between public and private space. This development provided the opportunity to consider social uses and urban functions of the courtyard, along with regulations. The issue of hygiene played a dominant role in city discourses for more than a century, and it was considered actively in several revisions to urban regulations.

As the façade of unity and order has been maintained for many years in the urban scape of Paris through strict enforcement of urban planning regulations, the city has developed a consistent image, as if a stage for a play. Strict regularity and unity were reinforced primarily during large urban remodeling projects of the Haussmann period. Disguised by the homogeneity of the urban scape for many years, the courtyard was not a target of regulations; rather, it existed as a hidden and closed space — more private than public. To accommodate new social uses and to introduce more daylight into a house, the courtyard was enlarged gradually according to a more open design, so it had a pronounced influence on changes in the urban tissue in Paris.

The minimum size of the courtyard was specified initially in urban regulations of 1852 as greater than 2 m² in area and 1 m in width for a small courtyard (courette) and 4 m² in area and 2 m in width for a larger courtyard. In legislation of 1872, these specifications were applied flexibly, depending on the proportion of building height and courtyard area. For example, the specifications for a courtyard facing the main rooms of a building less than 18 m in height differed from the requirements for an area measuring at least 30 m² with a width of 6 m and building height over 18 m (Moley, 1999: 79–80).

While the minimum size of a courtyard and open space within each plot were regulated according to the changes in the internal shape of urban tissue, the external changes can be understood in terms of the regulations concerning the façade facing public space. Construction of public space during the Haussmann period subordinated architecture to urban order. That is, façades built in the Haussmann period were associated more with public space than with individual building elevation. In contrast to haussmannisme, a picturesque vision of urban space emerged in the late 19th century. Bow windows, small towers, and watchtowers changed the façade, and the urban scape was transformed by pursuing individuality in architectural style and increased use of ornaments and materials.

The regulations of 1884 allowed small protrusions and curves on the top of the urban outline. Regulations of 1902², established by architect Louis Bonnier, provided an important basis for changes in urban tissue.

The regulations of 1902 aimed for openness to provide a picturesque vision, and the minimum area of a courtyard was adjusted because of criticism over unsanitary conditions. Details of regulations were promulgated in the form of a table, which provided the different minimum standards for increased courtyard sizes according to the proportions of height and area separately for central courtyards and for that on the kitchen side. As a result, revised regulations influenced the discourse around reformism, which gave birth to the design of the embossed building that looked like a comb; its courtyard opened toward the street. This design was applied broadly to low-cost flats (Habitation à bon marché: HBM) architecture, which influenced the conceptual background for Modern architecture.

A courtyard opening toward the street was conceived by Eugène Hénard in 1903. He proposed a picturesque city (ville pittoresque) formed by a "comb teeth-shaped boulevard (boulevard à redans)," which would break up the order of a street with an irregular façade. He presented many projects forecasting innovative urban change in Paris to give the city a futuristic appearance (Hénard, 1904). To construct the boulevard and replace the ancient fortress of Paris, he planned buildings within rhythmic streetscapes; his design included an intermittent building line and a diagonal pose for protruding buildings instead of a continuous connection of buildings along the street.

According to Hénard, the "principle of broken building line[s] would create [a] new city. This new city would have absolutely no horrible monotony of castle[s]." He argued that "architecture would evolve along the public street following [a] more flexible and picturesque rhythm" (Hénard, 1904). The open courtyard emerged from this development, which
was applied universally to projects contributing to formation of the urban scape. In addition, investigations regarding the potential autonomy of architecture became prevalent.

Under the revised regulations of 1902 and the influence of Hénard, residences on Franklin Street in the 16th district (arrondissement) of Paris were designed by Auguste and Gustave Perret. Open courtyards on the street side were planned; the maximum density of a small plot was achieved by the setting back of the central part of a building to secure maximum building height, according to an interpretation of revised city regulations. Courtyards were planned on second levels to expose more rooms within houses to fresh air. Some regard this building as the first example of the system that revealed the morphological autonomy of architecture by separating blocks from buildings (Bressler, 1998: 141).

Opening blocks was also tested in this period, and the most innovative solutions for residential architecture at that time were presented at the design competition held by the Rothschild Foundation. Tony Garnier proposed the x-shaped residential complex on a triangular block of Prague Street (1905, 12th district of Paris); it attracted attention even from the next generation because of its daring building arrangement and unique interpretation of public space boundaries. Applying the principle of arranging buildings to accommodate open courtyards and optimal natural lighting, he planned buildings without regard to the direction of streets.

3. A Question about Traditional Urban Tissue

3.1 Radical and Eclectic Implementation Plan

Attention to hygiene gradually escalated with the emergence of more serious social problems in Paris where poor living conditions and closed urban forms continued in the late 19th and early 20th centuries. As a result, active social and urban planning discourses influenced the transformation of urban tissue. The housing and hygiene department of Paris carried out a large-scale site survey of the area to track infectious disease mortality from tuberculosis, which was linked to poor hygiene, for 10 years (1894–1904). Though the survey results did not lead directly to a refurbishment plan for environmental improvement, 17 areas that had deteriorated were designated for demolition and reassigned as development sites to improve the urban environment after World War I. Various plans for this were suggested by the Paris Planning Commission in 1937, as well as by many architects including Maurice H. Rotival, Le Corbusier, Albert Laprade, and Robert Auzelle.

A comparison of two plans (those by the Paris Planning Commission and by Le Corbusier) for Faubourg Saint-Antoine, the sixth degraded area identified during the period cited above, revealed conflicting positions regarding the formation of urban tissue. The Paris Planning Commission proposed keeping the main framework of the existing urban tissue while maintaining a reasonable scale of the city by setting up blocks as basic urban planning elements (1930–1940); a basis for the plan was connectivity of roads. Block-oriented urban planning provided the management base for urban environmental planning at that time, so urban form was determined by streets constructed with fragmented blocks.

In contrast, drawings for the Paris International Exhibition of 1937 show that Le Corbusier attempted to eliminate traces of the ancient city by destroying and tearing down all existing urban tissue. He expressed his ideas for a new contemporary city by planning highways running from west to east on emptied sites and long, flat residential buildings as central objects of architecture surrounded by a park (large open space). This plan incorporated functionalism, the essence of the urban planning theory espoused by the Athens Charter (1933). This doctrine is known as declamatory planning — radical urban planning featuring a new urban form without the restraints of past urban tissue applied to a specific site.

In urban management planning for improvement of the environment, emphasis was placed on how to implement readjustment of town lots to provide sufficient daylight and ventilation for residential space, and how to open architectural and urban forms by providing enough external space and breaking up the closed block system. In terms of implementation methods, architects including Auzelle and Laprade took the position of "modernizing [the] inside of housing without changing [the] outside too much" (Laprade, 1937), insisting on local and central improvements by block unit without total clearance of the degraded areas. Directions for improving residential environments and adjusting urban tissue were described clearly in the "explanation of [the] demolition process of old buildings for town planning of degraded block[s] and high density block[s]" by Auzelle (1943). This approach was a conservative proposal to minimize the side effects of expropriation while maintaining block shape and traditional street relationships (solving hygiene problems by extending roads through centres of blocks and planning connected courtyards).

During this phase, new urban tissue characterized by hygienic and reliable residential complexes emerged around the periphery of Paris. Thiers Fortress (Enceinte de Thiers, 1840–1845), which lost its defence function after World War I, was demolished, and roads and sports facilities (for example a football field, park, and fairground) were planned for this 444-hectare area on the outskirts of the city.

Simultaneously, building masses were constructed for better ventilation and entry of daylight; public facilities were located on the ground floors of buildings to solve social hygiene problems of the period. With
internal roads planned along different geometric paths in relation to the main streets (perpendicular, diagonal, or parallel), an internal flow of blocks was planned. Courtyards were designed to open inside blocks, the eclecticism of the different designs, which were planned to run along the street, aligned with the building line and surrounding the block exteriors, embodied a compromise with traditional urban form. Along the Maréchaux Boulevard, HBM buildings and open courtyards created heterogeneous urban tissue of high density. A block included combinations of building types that were U-shaped, embossed, flat, and towering, as well as various public gardens and courtyards.

3.2 Infiltration of Principles of Modern Urban Planning and Object Architecture

Some degraded blocks which had been built before and during World War II but which remained after the war were blamed for city problems. Bernard Lafay, a city council member, announced an innovative plan to transform Paris with the help of architect Raymond Lopez. The proposed plan would divide Paris into distinct central Paris and peripheral Paris. The redevelopment would include different directions for urban planning based on the city's inner ring road (rocade Lopez), which separated the core from surrounding parts. While the core would provide an area for protection and conservation of famous cultural properties, the periphery was an area where development could be carried out more freely. As a result, designs for both areas incorporated daring goals of modern urban planners.

In 1957, a large-scale survey was carried out to discover which parts of the city were suitable for redevelopment. As a result, degraded buildings with fewer than four stories that had been built over 100 years previously were targeted for demolition. The plan known as "R. Lopez 1957" was completed. It assigned a 1500-hectare area for redevelopment (that is, one fifth of the entire area of the city of Paris). According to the Athens Charter, the guideline that "distantly placed skyscrapers should free land for large green area[s]" (Le Corbusier, 1957: 57) was applied to the redevelopment area, and the creation of a large open space was proposed with the demolition of traditional blocks so that flat and towering skyscrapers could be arranged freely. This concept was reflected in the General Urban Plan (Plan d'urbanisme directeur: PUD) of Paris². Related discussions left traces of rapid change throughout the city's urban tissue. Arguing for the necessity of redefining the city's urban framework, the PUD established objectives pertaining to hygiene and function. It ignored the traditional urban tissue system and reconfigured the relationships between buildings and streets.

Pursuing reformation of the urban scape, the 1959 PUD of Paris expressed the "modern urban concept" and included technical and economic considerations of the period. An urban system was "determined not by street but by order of buildings designed with consideration for function" (Préfecture de la Seine, 1960: 13). Buildings were not connected to neighbouring ones, and they were arranged freely as independent objects without consideration for existing urban tissue. There was no requirement that they should be aligned with a setback line along the street.

In addition to the implementation of this plan, the "reconquest of Paris" featured "complex-type urban planning (urbanisme d'ensemble)," which began with the implementation of large-scale redevelopment projects from the 1960s to the early 1970s (Lucan, 2001: 87-88). Several complexes were constructed on the fringes of Paris by completely removing existing traditional urban structures, in accordance with the latest planning concept. A representative large-scale radical project was Front de Seine, a mixed-use complex (15th district). With Henri Pottier, Michel Holley, and Michel Proux, Raymond Lopez developed a master plan for a complex formed by multilevel continuous structures (1959). He used three-dimensional flow planning to vertically segregate pedestrians and vehicles (cars on the ground level, pedestrians on the artificial deck) and to separate urban function, so two-story commercial facilities, offices, additional multipurpose facilities, and 20 apartment towers up to 85 m tall were built on the artificial deck.

Though a maximum infiltration of modern urban planning ideas and heterogeneity in urban context led to rapid change of urban tissue and the emergence of mixed-use complexes characterized by vertical and multilevel urban structures, the trend did not last long. Destruction of urban form and loss of continuity in the city’s design history was criticized harshly, and Paris entered a new phase of self-reflection regarding modern urban planning.

4. Return of the Block and Review of Traditional Values

Criticism regarding the morphological logic of bureaucratic urban planning and the reevaluation of historic contributions to urban form during the "Thirty Glorious Years (Trente Glorieuses)" after World War II served as a momentum for architects, urban planners, landscape architects, and researchers to pay attention to urban form. The mid-1970s was viewed as a repulsive period by the previous generation. Intrinsic continuity within the flow of time was emphasized.

Urban morphology and architectural typology in Italy after World War II contributed to new discourses about urban architecture and urban form in France during the 1960s (Cohen, 1985: 23–24). Interest in these concepts spread with the conception of "building city on city (faire la ville sur la ville)" in the 1970s. Within the architectural field, there was an increasingly loud call for self-examination about urban development systems during the Grands ensembles period, which
caused a change in research directed toward the depth of old urban tissue and historic form.

The reversal in attitude toward urban planning led to an interest in the traditional urban form of Paris, which had been regarded negatively in prior years. The thought that tradition is not a target of exclusion but a positive objective of rediscovery and examination became widespread. Momentum grew for the idea of returning to old things and reevaluating cultural heritages, and a movement emerged to recover the traditions of Paris. François Loyer and APUR (Atelier parisien d’urbanisme) collaborated to carry out a review of the urban scape, buildings, and cultural properties of Paris during the 19th century. They attempted to find new possibilities for established urban tissue and to learn lessons from history. Though some criticized it as simply a return to the Haussmann period, the new urban management plan was prepared institutionally as the Land Occupation Plan or POS (Plan d’occupation des sols), established in 1974 and enacted in 1977.

The POS helped Parisians rediscover the value of the block by appreciating the connectivity of roads, securing continuity of 19th century landscapes, and reflecting the principles of building alignment with the setback line along a street, adherence to 19th century height patterns and abutting building boundaries, and consideration of the existing road systems. It included guidelines about floor/area ratios to correspond with urban tissue features, reduction and zonal restrictions of building height, building layouts and shape control to guarantee consistency of road systems, and proportionally appropriate façades to correspond with the scales of existing roads. Terms for the main elements of Paris were redefined, including components of urban tissue such as the block, plot, street, and plaza. City and architectural themes since 1977 can be summarized as "return to street — consideration of street connectivity," "return to city — continuous landscape of [the] 19th century," and "return to urban block — rediscovery of urban block." Cultural and social change emerged in parallel with changes in the interpretation of urban situations and research was conducted to determine how architectural change and established urban tissue would interact, how a collective form of architecture should be selected as appropriate for diverse urban tissue.

In research on urban morphology and architectural typology, what were the contributions to new urban form from the focus on solid and void? It is important to note that the interest in morphology and typology drew attention to the microscopic urban context and raised awareness of the coexistence of architecture and the city through rediscovery of the value of traditional elements. (Devillers, 1974) Based on the relationship between the city and architecture, building typography and urban form became the focal points of analytical research. Architects could reconfigure this relationship

and obtain a new understanding of the existing urban context through analysis of structure and the gradual development of plots, relationships with streets, entrances and inner circulation, façade openings, outdoor space, landscapes and urban facilities, building lines, and the urban scape.

Hautes Formes Housing (1975–1979, 13th district of Paris), designed by Christian de Portzamparc, has been recognized as the starting point of progress in urban architecture. (Lucan, 2001: 263-266) The architect attempted to introduce urbanity by arranging fragmented buildings according to the situation and planning a street that would cross an urban block with a courtyard at the centre. This project inspired a new discussion about the relationship between architecture and the city based on an examination of urbanity in a residential complex, which provided a clear solution for understanding and interpreting complex urban tissue. Spatial structure consistent with the urban context and characterized by architectural independence promoted rediscovery of courtyard space, which was considered a product of older designs. Further, extensions of streets to cross blocks were linked to an active relationship between the city and dwellings, thus expanding the range of social use to the central courtyard.

Ultimately, dreadful urban environments no longer appeared as a result of radical urban planning. Urban tissue was adjusted, carefully transplanted, and gradually changed by prudent urban planning to connect the past and present in a suitable context.

5. Complexity of Urban Tissue and Pluralistic Approach of Architecture

Mosaic management of urban tissue based on the new understanding and interpretation of the urban context could transform each part of Paris in a diverse way and fill fragmented space in a positive manner. Each section of the city was approached carefully in accordance with the existing urban context and the distinct characteristics of each location; additionally, restrictions on the scale and planning range of new construction caused changes in architectural production conditions. Therefore, intervention was carried out according to one of two methods.

First, intervention was carried out in the special district designated by the Urban Development Zone Plan (Plan d’aménagement de zone: PAZ) within an Urban Development Zone (Zone d’ aménagement concerté: ZAC). This plan facilitated large-scale development of a specific district by providing exclusive site-specific regulations. The participation on various bodies and controls of the complicated project operation system enabled the formation of a new urban tissue. The organization of overall space was managed through consideration of temporal continuity, spatial connectivity and a combination of the traditional and the contemporary, which resulted in a unified diversity.
Second, intervention took place in districts to which POS was applied. Emphasis was placed on harmonious landscapes through controls of building boundaries. Thus, urban residences constructed since the 1980s were formed and adapted according to site. They expressed modernity in spatial arrangements, embracing urban continuity as if weaving fabric within the various sites. At the same time, building shapes and experimental use of techniques and materials were characteristic. This trend of respecting urban continuity, caused adjustments to certain elements and to the vision of urban form in ZACs after the 1980s. Urban form in ZACs became more complicated, and the scale of projects was downsized from those of the previous generation. To design new residential complexes, the block was reinterpretated through diversity expressed by many architectural shapes within a restructured district.

Management of ZACs and other large sites included new plans for consistent management of a neglected site or a large relocated industrial facility over time; establishment of order based on the formal depth of urban tissue within a complicated urban structure; and consideration of the complex effect of urban form remains from different time periods.

The first case described above targeted common features such as consistent urban public space, regularity, unity, order, homogeneity, continuity, and the combination of néo-haussmanisme and contemporary images. Representative cases include the ZACs of Montmartre ZAC (18th district), Amandiers ZAC (20th district), and Montmartre ZAC (18th district). Each of these, attuned to different sediments of their respective urban layers, attempted to find solutions for partially broken or scarred blocks by reinterpretating retrospective images of the city and reflecting their localities in something other than conventional images (Lortie, 2003; Jacques, 2002).

Regarding urban scapes, a doctrine originating from the emphasis on urban continuity and references to traditional urban form held a dominant place in architectural projects until the late 1980s. Lucan (2002) noted that, after this period, diversity of urban tissue led to pluralism of architecture, signifying a belief in the traditional system and crisis of reference (modèle néo-haussmannien). The features of this period, which were linked to reinterpretation of old urban tissue and eclectic modern architectural forms, are still valid and have taken on a more complicated complexion because of the combined understanding about mixed, hybrid, and heterogeneous urban tissue and enhancement of local identity. Referring to the old urban composition system, active examination of contemporary architectural vocabulary led to the emergence of mutually contrasting shapes throughout urban space.

### Table 1. Characteristics of Urban Tissue and Residential Architecture in the 20th Century

<table>
<thead>
<tr>
<th>Period</th>
<th>Features of Urban Planning</th>
<th>Formation of Urban Tissue</th>
<th>Types of Residential Architecture</th>
<th>Features and Meaning of Courtyard</th>
<th>Main Discourse(s) of Residential Architecture (Theme)</th>
<th>Survey of Paris</th>
<th>Related Urban Management Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late 19th century to 1920s</td>
<td>Picturesque street scape</td>
<td>Cleaved urban tissue by embossed buildings along street</td>
<td>Buildings with open courtyards (Immeuble à cour ouverte)</td>
<td>Courtyard opening toward street</td>
<td>Hygiene Urbanity</td>
<td>Field survey of hygiene conditions (1894–1904)</td>
<td>1902 Urban planning regulations</td>
</tr>
<tr>
<td>1930s–1940s</td>
<td>Block-based urban planning</td>
<td>Urban block and street on a rational scale</td>
<td>Block-building (Immeuble-ilot)</td>
<td>Courtyard with centrality</td>
<td>Hygiene Community</td>
<td>Designation of 17 deteriorated areas (1937)</td>
<td>1902 Urban planning regulations</td>
</tr>
<tr>
<td>1950s–mid-1970s</td>
<td>Complex urban planning</td>
<td>Free arrangement of buildings as independent objects, regardless of existing urban tissue</td>
<td>Flat-type apartments (Immeuble-barre) Tower apartments (Immeuble-tour) Residential complexes (Grands ensembles)</td>
<td>Removal of courtyard and preference for a park as large public space</td>
<td>Hygiene Community</td>
<td>Large-scale survey to locate potential redevelopment sites (1957)</td>
<td>1959 General Urban Plan for Paris or PUD (Plan d’urbanisme directeur)</td>
</tr>
</tbody>
</table>
High-quality shapes facilitate social interaction in a city, trends in urban architecture, and collaborative research about urbanity. Considering the social effect of urbanity, architects typically express formal adjustments rather directly by using detailed devices. This approach works well in relation to representative microscopic social spaces shared by the city and residences.

For example, a continuous public space with an open courtyard in a deep plot filled with articulated architectural volume connected to another open space was developed by Frédéric Borel on Boulevard de Belleville (1987–1989, 20th district). Edith Girard (1984) placed a courtyard at the centre of a block surrounded by façades featuring neighbouring settings; a pedestrian path crossed the entire block diagonally on Quai de la Loire (19th district, 1984). The value of another courtyard was recovered with a rectangular plan that drew attention to its surroundings by a collective arrangement of flat buildings; Renzo Piano formed the entrance on Meaux Street (19th district, 1987–1991) according to articulated architectural volumes. Further diverse architectural alternatives can be found at this complicated, irregular, and steep site.

Since a universal approach to solving certain site conditions was rejected, appropriate architectural form was sought to weave urban tissue in a way that corresponded with local characteristics and urban structure. Then consideration was given to locality and complex shape by reviewing the protection of urban tissue and degree of transformation needed.

6. Conclusion

In the historical transitions of architecture and cities, evaluation and criticism regarding the previous generation inevitably influences discourse. The next generation has their own strong doctrine which expresses a specific point of view and a new direction. The main turning points in architecture and urban planning have been related to historical events; they not only create and reconfigure different streams in spatial policy, planning and regulations, but also promote understanding about the correlation between the product basis of city formation and the main criteria of social change. Formed by accumulated traces of overlapping time layers, the historical city of Paris faced a new urban situation at the beginning of the 20th century and the entire city has experienced radical change through several stages.

We tried to reveal the relationship between changes of the urban tissue and their effects on the courtyard formation of residential architecture based on discourses and projects of the 20th century. Such discourses have addressed openings and closures of systems created by relationships of basic urban tissue components such as streets, plots, blocks, and buildings. What is clear is that the residential courtyard as intermediate space contributes directly to establish and change the relations between architectural layout and urban context.

Analyzing how it was created, destroyed, fixed, adjusted and reconfigured over time, we provided a diachronic overview of the relationship between urban tissue and courtyard formation. Architectural features and related discourses are described, as well as the various intentions and background information for changes in spatial structure.

With Haussmann's renovation in the 19th century, the traditional basis of Paris's urban tissue was provided. Ranking high in social interest from the late 19th century, hygiene problems gave birth to an open system that directly changed urban tissue and architectural form, and block renovation came into favour in the early 20th century.

The demolition of old urban tissue caused by large-scale development that rejected traditional methods of city formation resulted in a rapidly changing urban scape, which left traces of architecture as objects in the functional urban structure. The urban tissue of Paris, which experienced a turbulent transformation and adjustment based on changes to main urban space, is unfinished. Mingled fragments of various periods, traces of city formation, and changes in architectural shape have contributed to the diversification of urban architecture, which has spatial characteristics that reflect compromise and a combination of order. The formation of urban tissue extends beyond time depth and spatial boundaries, and acknowledges urban elements and the new life fabric within them. Table 1 shows the synthesis of the characteristics of urban tissue and residential architecture in the 20th century according to analyses of urban and architectural discourses.

As described in Fig. 1, architectural and social discourses about residential courtyards are represented by hygiene, community, and urbanity, and their combination or emphasis on one element is linked to the elements and features of residential courtyard planning in each period of the 20th century. The trends in courtyard design and the main features of urban tissue change were identified by examining the relationship between dwellings and cities and historical changes to void spaces in residential architecture. As
each became the centre of urban and architectural discourse for a particular period, their features were strongly reflected in urban residential architecture. Emphasis on hygiene is related to reformation of residential architecture and serial revisions of urban regulations aiming to provide sufficient daylight and ventilation to residential interiors. Emphasis on community developed in utopian projects of philanthropists, which included plans for a community complex in the previous century, influenced research regarding the "neighbourhood unit" in the 1950s. Architects who advocated functionalism mentioned that community is important to enhance collectivity and social relationships among residents. Emphasis on urbanity is based on discourses about urban architecture, urban form and architectural type, urban scapes, and reinterpretation of historical city form since the mid-1970s.

The interconnection of hygiene, community, and urbanity caused the emergence of a new building type to define the role and value of the courtyard. The combination of hygiene and urbanity is connected to the emergence of the building with an open courtyard; hygiene and community are connected to "flat-type" apartments and tower apartments, and community and urbanity are connected to block building. Each combination reflects the courtyard's role as symbolic space, simple open space, or uniting space. It is interesting that such characteristics are expressed in more complex and implicit ways in courtyard planning of contemporary residential architecture. Such features may be combined simultaneously, or they may overlap according to status and site condition; thus, diverse architectural types exist in contemporary courtyards.

A major change can be noted in the shape of the block, the basic unit of urban tissue and the focus of mainstream architectural discourses and regulations at that time. From existing urban tissue, new architectural forms were planned, and the composition, meaning, and architectural form of the courtyard have had a continuing and varied influence on the formation and regeneration of urban tissue.

The unique characteristics and attractions of Paris include the overlapping urban layers of many generations, which have left a common order with traces of each period. These layers coexist, and their differences may complement or contradict each other. Changes in urban tissue formation underscore a paradoxical harmony. The urban tissue of Paris forms a solid and diverse fabric reflecting gradual change according to the dialectical relationship of the city and its architecture.

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Notes
1 The point of view that portrays the city as an organism is very useful for understanding the properties of urban tissue (Castex al., 1977: 177).
2 Protrusion was allowed for one third of a façade, and the boundary of the topmost roof and building outline could be determined by a 45-degree line of setback, which was used as the basis for setback of the building frontage line to increase building height.
3 Examples of an open spatial structure for a block during this period: the residential flat complex of 584 units on Ménilmontant Street (1925, the 20th district of Paris) was designed by Louis Bonnier. He planned a large shared plaza at the centre of the complex, which was separated from the street by means of a nursery positioned to overcome the slope. Buildings were placed densely within the site and parallel to the street — like the shape of teeth on a comb. Another example of open courtyards with oval shapes designed by architect Chevalier can be found in residences on Rue Ernest-Roche (1914-1921, 17th district of Paris).
5 High-density HBM complexes with open courtyards were built between the two world wars, especially in the 1930s. HBM construction formed a complex and unique type of urban tissue at the peripheral area of Paris—also known as the "red belt (ceinture rouge)," referring to the band of red brick buildings surrounding the city.
6 Though this survey was aimed for the entire city except its "crystallized" centre, the northern part of les Halles, the site of a large-scale project, was included exceptionally.
7 It was established in 1959, enacted in 1961, and officially passed in 1967.
8 During the same period, L'Italie and les Olympiades — mixed-use complexes in the 13th district — were built based on the same principle of spatial structure.
9 Han, 2005: 214-216.

References
14 Lucan J. (2002) Plaidoyer pour une ville regardée du point de vue de sa complexité morphologique, APUR.