

C. A. Doxiadis's Pedestrian Esplanades

Deborah Antoinette Middleton PhD

Xi'an Jiaotong-Liverpool University, China.

Email: deborah.middleton@xjtlu.edu.cn

Abstract

In the early 1960's, the phenomena of the displacement of free social space and people in cities due to the reshaping of urban centers to accommodate automobiles, became a driving force propelling C. A. Doxiadis (1913-1975) to explore design variations for urban squares and esplanades. In this article, a series of urban plans for Korangi, Islamabad and Lahore Pakistan, New Eastwick Philadelphia, Louisville Kentucky, USA, Tema, Ghana, Aleppo University, Saigon, Vietnam, and Miami, Florida USA, developed from 1957 to 1972 applies space syntax and Conzenian methods to understand the genotype of Doxiadis's new urban design variants for pedestrian urbanism. Viewed holistically, the project sequence reflects Doxiadis's epistemology of design inquiry into future social spatial relationships in the city. His experimentation with a diversity of planning strategies for pedestrian squares and esplanades are found to generate a distribution of movement in ways that often downplays urban centrality forming a new genotype for the 20th century post war city.

Keywords: C. A. Doxiadis; esplanade; pedestrian urbanism; post-war urban planning; space syntax; typology.

Introduction

This paper presents a typology of C. A. Doxiadis's master planning projects incorporating squares, covered walkways and pedestrian esplanades, completed between 1957 and 1968. One indication behind Doxiadis's quest to engage in experimentation with urban spatial configurations for pedestrians in the city was his aim to resolve problems of urban social and spatial fragmentation due to automobiles and the emergence of the polycentric city, two major issues planners struggled with in the post-war planning era (Keller, 1968). The study applies mixed methodology incorporating Conzenian and space syntax with analysis illustrating the differences and similarities across the planning variations, specific to how the spatial configuration devises an accessible human-centric synthesis, while separating the pedestrian from vehicular movement. The findings reveal a rich diversity in Doxiadis's planning approaches, that results in pedestrian spaces situated deep within the spatial composition. The analysis reflects different degrees of integration indicating strong and weak urban centrality in the urban plan while vehicular access and circulation is maintained on the peripheral edge of many plans.

Following an introduction to C. A. Doxiadis and his Ekistics approach to urban community planning, the article briefly presents an overview of the literature, and the methodology used to analyze planning variations incorporating pedestrian esplanades. A description of the projects precedes the analysis, situating the cases studied in their historical context. The findings are clarified by figure ground, and syntactical graphs comparing integration, mean depth and total depth of the urban spatial layout. These precisions provide insight into the presence or absence of centrality across the

urban plan variants. The conclusion discusses how the presented projects organize pedestrian and vehicular circulation and establish a spatial synthesis with distinctive qualities.

C. A. Doxiadis' Ekistic human-centric community plans

C. A. Doxiadis (1913-1975) was an influential Greek architect and urban theorist who authored numerous papers and books related to his theory of Ekistics. His earlier writings mirrored many of CIAM's modern tenets that focused on how modern architecture could manifest a new social reality and enable the realization of modern potentialities. In one of his earliest essays titled, 'On the Form of City Squares', published in Greek in 1942, Doxiadis describes the dimensions of the modern and earlier period urban squares to be incongruous to the lived experience of the city. 'The first mistake is when we separate the type of squares according to their use, for the aesthetics of the square, and the other for squares for commercial use, railways, transportation, etc. With this generalization of categories separating squares into two types. The first ones have aesthetic purposes, the second don't have to have aesthetic purposes. The resulting separation is like a catastrophe. From the first one, we take the specific use like it would be possible for a place with people to live and move in, (a specific function), usually they are considered (the squares) as a work of art. And they lack life and the end up, to be decorative only. Skinograhies, obstacles in the city and its life. Narrowing and squeezing the unnatural movements that would be passing through them, because many times they don't even have the right location. For the second category, with the old spirit of the architecture of the 19th aristocracy of the separation of the places, the view and

Table 1: Hierarchical schema for Ekistics community classes

Community Class	Approximate Number of Families	Number of persons	Number of units of lower order	Typical Area Square Km	Typical Trip Distance
I	15-20	75-100	-	0.01	0.1 km
II	60-100	300-500	3-6	0-0.4	0.2 km
III	300-400	1,500-2,000	3-6	0.2	0.5 km
IV	1,200-2,000	6,000-10,000	3-6	1	1.0 km
V	6,000-12,000	30,000-60,000	3-10	7	2.5 km
VI	30,000-60,000	150,000-300,000	2-10	40	7 km
VII	150,000-300,000	750,000-1,500,000	2-10	250	15 km
VIII	900,000-1,500,000	4,500,000-7,500,000	3-10	1750	40 km

the service (of life), gradually the good aesthetic is gone, and it was enough to just to say it is a square to be used for a transportation or commercial function (Doxiadis, 1942).

Doxiadis began to hypothesize that the formation of a community is associated with a basic dimension: an optimal settlement size, defined by a person's walking range, as well as the proximity of people and services. In *Ekistics: An Introduction to the Science of Human Settlements* (1968) he outlines a comprehensive approach that will enable urban expansion encompassing the individual unit of habitation to the structure of cities and region. The Ekistics approach applied nested hierarchies of spatial scales structured by a spatial schema covering fifteen categories. Each higher-level community incorporated formations of all lower order communities. The organizational structuring ratio between successive hierarchical levels, referred to as the Ekistic logarithmic scale, organized area footprints with associated populations in a ratio of 1:7 (between 1:5 and 1:9), which for Doxiadis, was in accordance with the theoretical precepts of Walter Chrystallers' Central Place Theory (Doxiadis, 1968). Community Class IV was considered an ideal form for the human residential unit, as it was of sufficient size to support a wide range of interactions, whilst affording opportunities for residents to travel on foot across the community.

During the Delos V symposium, a "Strategy for Human Settlement" (1967), Doxiadis argued that in order to compose the spatial synthesis of a city, urban plans must configure a network of movement and web of vistas combined with the locational proxemics of interdependent activities and functions. He presented a plan of action for a continuous territory of rationally organized pedestrian open spaces and activities based on planning units. (ACE, 1967). His approach suggested that by unifying the structural system based on rational units, urban plans could achieve outcomes of social co-presence and social density thus resolving the problem of social and spatial fragmentation (Keller, 1968).

A Typology of Pedestrians in the City

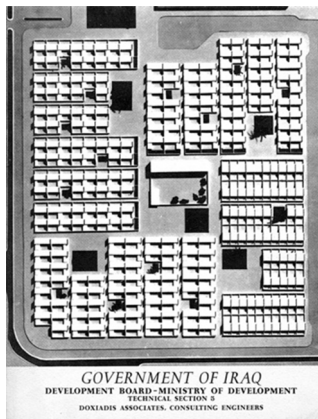
Research visits to the Constantinos A. Doxiadis Archive in Athens, Greece by the author from 2009 to 2014, conducted a search for Doxiadis's human-centric synthesis in both urban and architectural projects across all scales and geographical locations. A timeline

establishes the generative transformation of the planning ideas presented in Table 1.

This study extends an earlier survey by the author during visits to the Constantinos A. Doxiadis Archive in Athens undertaken between 2009 and 2014. It combines Conzenian and space syntax methods to better understand the effect of urban squares and esplanades on the spatial configuration and topological structure of movement. The research aims to distinguish through a spatial configuration approach three significant aspects of Doxiadis's urban plan that (i) organize the separation of pedestrian and vehicular circulation, (ii) reveal how the spatial layout forms a spatial center and/or define catchment areas with a hierarchy of movement and a separation of functions, (iii) indicate how the circulation system is characterized by spatial syntactical relations (integration, total depth and mean depth).

Hillier (1993) suggests that higher levels of pedestrian movement maybe directly correlated to better street connectivity and integration, with co-presence of commercial and public functions and buildings. Research applying the measure of integration is an efficient method to measure the effectiveness of urban spatial layouts in generating movement at the topological plan level (Hiller & Hanson, 1984; Hillier, 1993). The hierarchical sequence of relational connectivity of road segments (within the urban circulation network) describes the intensity of integration, as revealed on a graph and in a data table, produced by algorithms in the depth-map software. According to space syntax theory, graphs of road networks and segments are used to discretize the spatial system configuration network; creating an axial-line map (Hiller and Hanson, 1984, Hillier, 1993). Syntactical measures of mean and total depth of the circulation network are interpreted, indicating the presence of integration cores or isolated movement patterns within the urban spatial configuration, at the local and global scales (Penn et al., 1993).

Griffiths (2010) suggests that Conzenian and space syntax methods may be viewed as complimentary, together they identify relational structures within the urban and architectural spatial configuration as they relate to socio-economic and cultural forms of spatial



(i)



(ii)



(iii)

Figure 1: Gossip squares in early community districts in Iraq and Pakistan.

(i) Residential sector in the Housing Program of Iraq March 1957, (Archive # 25319)

(ii) Community Class IV in Islamabad Pakistan, 1960 (G6-Class IV-D-PA-2226 Archive # 28151)

(iii) Residential Community Class IV, The Development of the Korangi Township in Karachi December 1959 (Archive # 25310)

use. In this study space syntax axial analysis is used to examine how the connectivity of streets influences integration within the spatial layouts. Conzenian figure ground methods as used in this study, provide insights into the organization of building masses (solids) and potential open spaces (voids) that may support the presence of lively social spatial relations and the presence of porosity in the urban fabric. As land (territory) is subdivided into a hierarchy of large blocks, plots within blocks, and building unit massing.

Squares, walkways and pedestrian esplanade

In Doxiadis's community plans for Baghdad, Korangi, and Islamabad, a system of squares situated in residential blocks and connected by narrow walkways are used to distribute movement. These narrow walking paths are an early form of the simple esplanade (plaza) that connects the squares and surrounding residential blocks by a series of branching walkways (Simeon, 1962, Wedgwood, 1965). In the Baghdad plan (Fig. 1 i), a hierarchy of spatial centers with gossip squares (Pyla, 2008), a scheme that evolved in Islamabad (Fig. 1 ii) and Korangi (Fig. 1 iii) to reflect a spatial synthesis into a more distributed center. Pedestrian circulation occurs in the linking system of convex spaces, which reflect a structure of a hierarchical Ekistics system; while the spatial layout is organized to create a discrete center at the heart of the district module. In the post-colonial New University of the Punjab campus in Lahore, Pakistan (1957-1959), a covered walkway plays the role of a central axis. It pierces a bounded collection of convex spaces, each with their own distinctive perimeter of circulation paths. Staircases lead to a network of terraces on the upper story of the academic buildings. Doxiadis's design expresses the course of the circulation system in such a way for pedestrians to grasp the overall design, and its compositional rules informing the structural relationship of open spaces and buildings. (DOX Archive



Figure 2: Conceptual view of Korangi market Sector 36 (DOX Archive # 25310)

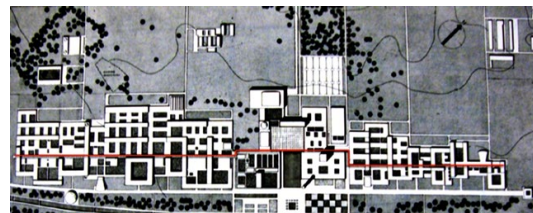


Figure 3: Plan of academic blocks connected by the pedestrian walkway in the University of the Punjab New Campus, 1957 (DOX Archive File # 28628 p. 51)

File # 28628). As an aesthetic element, the walkway establishes the feeling of engaging in continuous flow, rhythm and scale with the space; creating a sense of the composition and the principles informing it. As a functional element, the main covered walkway creates a connection to all the faculties and academic groups, enabling pedestrians to move through the spatial system without leaving the complex of academic buildings. Spaces of common use and interest are attached to either side of the walkway, where the moving pedestrian encounters the phenomenal experience of transparency, and the layering of

architecture and garden landscape. As a compositional element, the main covered walkway also divides each faculty zone into two distinct parts of front and rear. This project was followed by the new Islamabad master plan (1958-1960) and numerous smaller university planning commissions.

The proposal for the main Islamabad commercial area was devised as an interlocking system of open convex spaces that spatially embraced the human scale in their dimension (Khan, 2006). A linear pedestrian esplanade circulates within housing clusters, parks and open spaces (Fig. 5), unifying a large suburban community. Trees lined a two-and-a-half-mile length of the esplanade, bisecting each sector to be perceived as a linear pedestrian space. Residences are connected to the esplanade spine via an independent system of walkways also running perpendicular to the cul-de-sac streets. A series of shops and focal points are situated along the esplanade positioned at the junctions of neighborhood walkways. Major functions such as commercial, educational and cultural buildings and services are located on the esplanade connector, creating an axis of internal movement and interest for the community. Establishing pedestrian walkways in Islamabad was problematic functionally and visually, due to their length. Doxiadis's desire was to have the system of pedestrian walkways interface with larger building masses, to respect the whole architectural character of the building. This required greater attention to set-backs in the central area strip, and between sectors F8 – F6, and the scaling of the central area strip, to anticipate increases in relative proportion to the distance from the diplomatic enclave and administrative sector (DOX-PA-204). The street in his designs is used as an organizational device that brought an ordered perception to the city through visual transition and experience of movement. Cars are limited to specialized areas and people are free to walk between shopping centers and play areas for children. Cul-de-sac and parking lots were positioned to reach deep into the sector to interface with the system of pedestrian walkways. Doxiadis' urban plan for Islamabad went through multiple drafts to resolve



Figure 4: Doxiadis Associates sketch of view towards academic buildings from the covered walkway. (DOX Archive File # 28628)

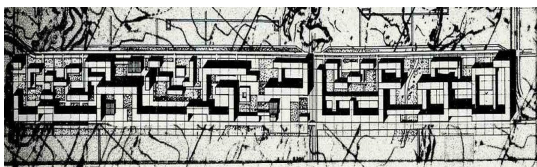


Figure 5: Detail of pedestrian zone (Islamabad Public Buildings and Civic Center Areas Proposed Layout No. 37, DOX-PA 204)

urban planning problems of pedestrians and modify traffic patterns.

In 1959, Doxiadis collaborated with the Reynolds Metals Company to develop two projects; the first was for the Louisville Riverfront (Fig. 6), a project presenting a comprehensive and bold modernist vision of an American town center. The second was for the first urban revitalization and renewal project in the USA, New Eastwick development in Philadelphia (Fig. 7). In both projects several neglected urban blocks from the nineteenth century were cleared to establish new pedestrian oriented urban planning compositions. The Louisville Waterfront proposal included, four mixed-use towers of residential, office and retail space situated within an urban landscape of restaurants, small shops.

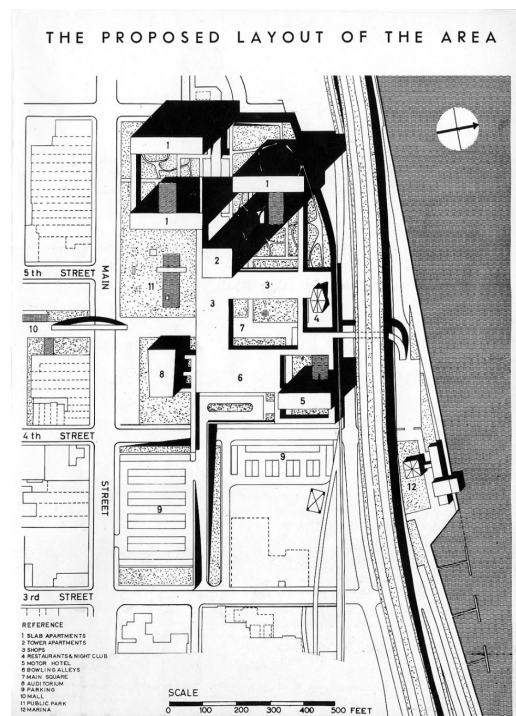


Figure 6: Louisville KY. Riverfront Plaza (i) Aerial view of completed project 1964. (ii) Plan Louisville Riverfront Plaza (DA Monthly Bulletin, No. 33, July 1961)



Public spaces included a theater and museum building, a marina, a botanical garden, and a series of plazas, courtyards, and platforms overlooking the Ohio River. A multilevel parking garage holding 4,000 vehicles was constructed below the plaza, enabling multiple pedestrian access points to the development (Madryga, 2009). The multiple terraces and plazas create a cascade of pedestrian and social spaces on the site.

In the joint DA-Reynolds proposal for the Eastwick Redevelopment Urban Design Competition, organized by the City of Philadelphia Redevelopment Authority. A plan was presented for a 520-acre tract to be divided into 16 sectors, with a pedestrian esplanade forming the backbone of the synthesis. The plan prohibits vehicles to enter, uniting human sectors with green landscape, paved walkways and a central esplanade of a two-and-a-half-mile length (DA General Pamphlet Collection 9). Residences connect to the esplanade spine via an independent system of walkways, also running perpendicular to the cul-de-sac streets that directs pedestrians to a central esplanade which bisects each sector, function to preserve human scale of the neighborhood (Wedgewood, 1962). The plan is organized as a tightly knit composition of building groupings within an area defined by a boundary edge separating the residential units from the central esplanade. A series of shops and focal points are positioned at the junctions and along the esplanade fronting buildings. Major commercial, educational and cultural buildings, and services are located on the esplanade connector, creating an axis of internal movement and interest for the community. The initial community design was modified to vary set-backs in order to generate visual expression, sightlines, and compose staggering shifts in the small residential house groupings and larger apartment masses (Simeon, 1962, Wedgewood, 1962). Public transit alternatives to the car, and lack of spatial structure to accommodate public buses is notably absent in the design.

The Eastwick plan is similar to the larger project layout of the Tema Accra, Ghana commercial center, designed for the exclusive circulation of pedestrians by Doxiadis and the DA team. The plan is a figural composition relating to axis and boundary edges, with a central square that defines the spatial center. The composite grouping of spaces, streets, and architectural program, generatively structures a network of modern squares connected by pedestrian only roads and arcades (see Fig.8 iii).

Doxiadis considered the social success of an urban settlement to emerge from the complex uncoordinated interaction of countless different routes and experiences in a suitable environment. The design strategy consolidates a pedestrian intensive zone, while shifting automobile traffic to the exterior of the commercial shopping district. The sequence of open areas, covered walkways, and semi-enclosed spaces are a successful catalyst for social activities that still survives in Tema Ghana today (d'Auria, 2010). The Accra commercial zone was complimented by the Kwame Nkrumah commercial center that composes an elevated esplanade plaza (Fig.8 i). The intensity

potential of this commercial area was translated into a functional program supporting education, culture, entertainment, green spaces, sports facilities and hotels. The central and peripheral parts of the groupings are designed to generate different intensities of activity

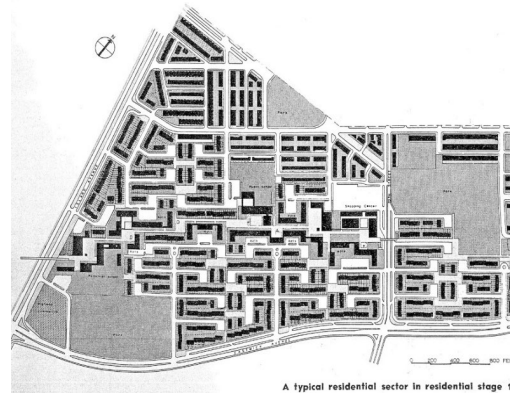
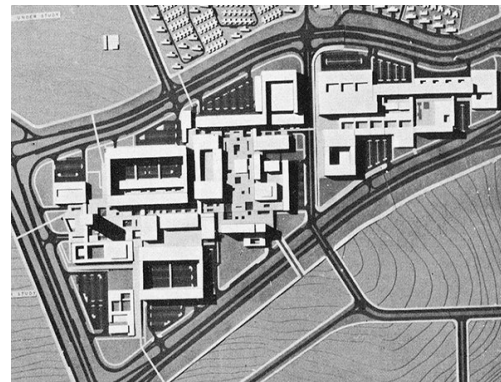
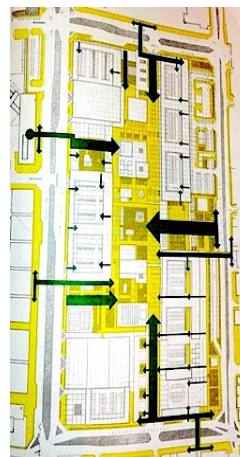


Figure 7: New Eastwick Redevelopment Plan (1959-62) (DA Bulletin No 51 January 1963 Archive # 35409)



(i)



(ii)



(iii)

Figure 8: Tema Ghana (i) Kwame Nkrumah Center (ii) Detail of the urban square spatial synthesis (iii) Parametric squares as urban synthesis (DOX-GHA-60 10.7. 1962 GHANA Vol. 24 Archive # 24443)

(commercial and recreational) over a 24-hour period, in order to give life to the internal perimeter through the concept of reflection and radiation (DOX-GHA, 16-22, 1961). The esplanade is a dynamic interplay of spatial voids and masses that are a catalyst for views and social gatherings.

In the Aleppo University campus master plan (1964), Doxiadis works with the dual design problem of creating a plan that enables isolation and full participation. The problem of situating and moving the pedestrian was framed as having three parts; the need for the moving pedestrian to engage with others socially on campus, the need for an individual to safely think while walking, and the need for the scholar to be centrally located while accessing quiet spaces for deeper thought and contemplation. Building groupings and circulation systems in the Aleppo campus plan are aligned to axes, to establish a sense of orientation and security. Doxiadis's aim was to organize space functionally and aesthetically with modular elements capable of repetition and combination (Doxiadis, 1969).

A number of planning principles were developed by Doxiadis, such as the separation and functional interrelation of various activities, in ways that reflect order and coherence across all scales and effective groupings. In order to avoid the isolation of different building groups and sectors of the campus, the separation of pedestrian and vehicular circulation was imperative. The result was a unified plan for a tightly knit complex with continuous movement to promote community spirit within the Campus. Additionally, he emphasized that the spatial plan should structure requirement in ways that allow for expansion and flexibility, and enable a dynamic composition that will continually harmonize changing demands (DOX-SYR-A13).

In the Miami Bayfront Development Plan (1966-68), the network of esplanades aim to improve the beautification of the waterfront and park by creating a visual break from the endless expansion of urban blocks with a stronger connection to the downtown area (Fig. 10). The project design objective was to structure functional, visual and aesthetic continuity between the Government Centre and the Bayfront, while maintaining a continuity of form in space, and accommodating a mixed-use functional program with the surrounding downtown oriented low buildings. Doxiadis's design for the esplanade creates a upper terrace level that connects to the Miami transportation center, an intensive development with over three levels that incorporated the expressway structure, rapid transit and rail stations, with parking functions, and a mixed-use development scheme (DOX-USA-MM4; DOX-USA-MM9). The structure bifurcates to a lower level inscribed as an orthogonal open landscape of grassy lawns bounded by walkways that lead to several functional buildings. The ensemble simulates the wall city group form used by Kenzo Tange and the Metabolists, to separate pedestrian spaces and distinguish the center from the endless monotony of the suburban block fabric. The pedestrian level at (+18'), establishes the main connecting link to the downtown and is the dominant design element. Level (+45)

connects the buildings on both sides of the east-west rail and road right of way. Functionally, the proposed plan improves pedestrian access and integration to the Bayfront Park that is separated from automobiles (DOX-USA-MM4, DOX-USA-MM9). The scale and extent of the esplanade in the Miami project was increased to dominate the urban ensemble. It preceded Doxiadis proposal for the Detroit Michigan Urban Center (1969) (Fig. 11), which similarly places emphasis on the esplanade as the social center of public life in the city. The Detroit Urban Center project scheme also featured a large elevated pedestrian esplanade faced by group

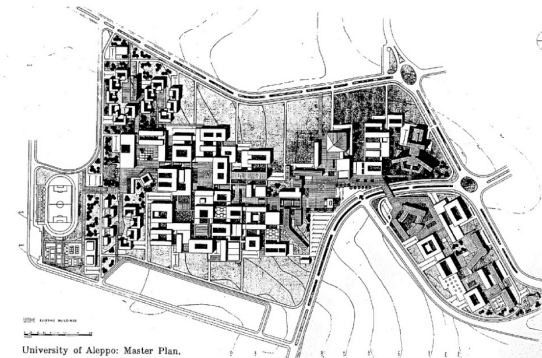


Figure 9: University of Aleppo Master Plan (DOX-SYR-A13 1964 Archive # 24868)

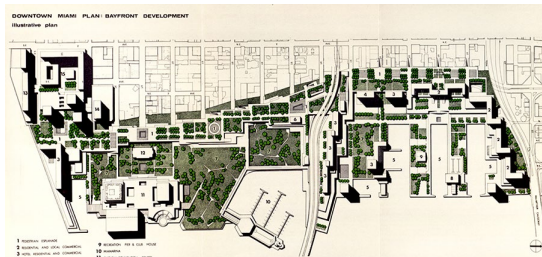


Figure 10: Downtown Miami Plan Bayfront Development Landscape Illustrative plan (DOX-USA-MM4, DOX-USA-MM9) Downtown Miami Plans 1966-1968 Ref. 23489)



Figure 11: Detroit Urban Center concept rendering of the pedestrian esplanade. (DOX Archive #15218)



wall form structure, and automobile traffic routed underneath. The composition preserves urban pedestrian connectivity and movement in the city, while enabling urban transformation of building scales and functional integration into the composition.

In Doxiadis' Saigon Vietnam (1972) proposal (Fig. 12), the design approach is structured by an orthogonal spatial grid that expands on the concept of the Eastwick system of cascading housing blocks separated by a linear spine. The project is positioned on a peninsula surrounded multi-lane expressways and the river. It is an isolated development, where pedestrian explore the urban fabric and circulate between district zones by crossing bridge interface points that span the highway or interior system of water canals. The composition of the district fabric is homogeneous with a logic of community classes connected by narrow foot paths. Public space occurs at the formations of large parks situated on the periphery of the district, or at evenly distributed cultural buildings and open spaces positioned on intersection points of the circulation paths.

These projects highlight a transition in Doxiadis' design thinking on the form of public space in the city. The esplanade gains prominence in relational construction of the urban system, that correlates the particularities and elements of orthogonal spatial Ekistic units, with building massing and vistas, that visually unifies the appearance of an urban physical object. Through the above series of project, Doxiadis is searching for a methodology and formulating a typology of pedestrian oriented solutions that establish open spatial relations with rhythm and scale, inside of a similar Ekistics scaled world. The planning variations are not linear but articulate continuity, enclosure, partitions, and diffused centrality.



Figure 12: CCV Saigon, Vietnam 1965 (DOX Archive #24247)

Conzenian and syntactical analysis of planning approaches

This section examines the configuration of space and its distribution using Conzenian and space syntax approaches. The analysis of spatial patterns assists us to comprehend the spatial structure of the urban district. visual transition and experience of movement. Figure ground is used to illustrate a typology of spatial blocks, esplanade distribution and road pattern in five projects, Korangi, New Eastwick, Aleppo, Miami, and Saigon (see Table 2). Doxiadis's early planning formations of urban blocks in Korangi is structured with an urban grid, with districts arranged according to Ekistics Community Class IV. The pedestrian distribution is formatted as loops with convergence to a central spine that establishes the main esplanade. The road pattern, which does not bisect the urban district, denies surface parking for vehicles and limits access to the community class formations. Siagon presents a ring of vehicular access with strongly controlled accessibility to the core of the settlement. Pedestrian segment paths maintain a consistent metric width and length ratio, advancing a clear separation of the administrative and residential blocks.

The VGA analysis of the Miami Pedestrian Esplanade (Fig. 13) reveals the location of the integration core (shown in red and orange) to be situated at the highway overpass. This area introduces higher commercial towers with an articulated movement structure towards the bayfront boat harbors. The Transportation Center (dark blue) reflects a low level of integration, highlighting its separation from the integration core where the majority of pedestrian movement and building functions occurs. Global and local topological patterns of axial line connectivity and integration are indicated by red lines in Table 3 to indicate centrality and the presence of an integration core. Syntactical analysis in the Segment T1024 Total Depth analysis is reversed to show blue, for the core, but highlights the presence of distributed local sub center as seen in the Korangi and New Eastwick. A typology presenting relational constructs of design problem, configuration approach, and visual appearance is presented in Table 4.

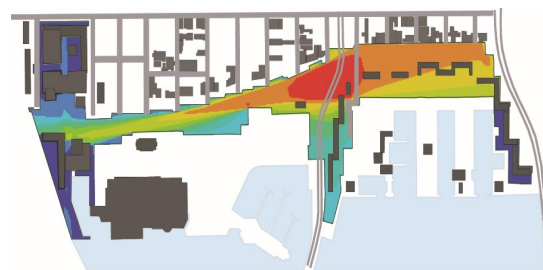


Figure 13: Miami Bayfront Visual Graph Analysis showing integration core. (Middleton, D.)

Separation of pedestrian and vehicular circulation

The exterior perimeter structure for vehicle circulation and access is mirrored in a majority of urban district and university projects (Table 2). In the Korangi plan the interior spatial configuration is strongly bounded by a roadway that enters into the residential territory mid-block segment, with the vehicular road running perpendicular to the esplanade area and terminating in a drop off zone. Notably there is an absence of parking spaces provided in the plan.

Table 2: Analysis of design variations for pedestrian and vehicular spatial distribution. (Images by author, Middleton D)

	PE distributed layout	PE convex pattern	Road pavement pattern
Korangi CC IV 1958			
New Eastwick 1959			

Table 3: Global - Local Topological Patterns
(Images by author, Middleton D.)

	Figure-ground	Axial angular integration HH	Axial angular integration HH3
CC IV Korangi Pakistan			
	Segment T1024 integration	Segment T1024 TD	Segment Metric MD core
New Eastwick Philadelphia			
	Segment T1024 integration	Segment T1024 TD	Segment metric MD core

This structure evolves in the New Eastwick redevelopment plan with parking lots distributed equally in a branching system in the plan. The Eastwick project attempts to generate a pedestrian friendly interior space that would not be visually defined by a grid iron organization of district terrain. In the Aleppo university masterplan, the system of a perimeter vehicular circulation is applied with slimmed down parking areas that are structured by a branch system. The alternative approach applied by Doxiadis to structure vehicle access, is the underground parking structures, as seen in the Louisville Riverfront, Tema Accra Ghana, Miami Bayfront, Detroit urban schemes. One issue inherent to the esplanade type in Doxiadis's design variations, is the inability of this spatial form to adapt to zoning and density changes over time. It is an isolated pedestrian zone, poorly integrated with vehicular accessibility and public transportation for all cases.

Spatial layouts and the formation of urban centers and catchment areas.

The typology of designs by Doxiadis are generated through a series of experimental method to adjust the format of circulation in the Community Class hierarchy. Korangi Pakistan and Aleppo University projects have strong integration cores reflecting the presence of centrality in the urban layout (Table 3), esplanade with the presence of multiple small urban squares connected as a sequence. These urban squares have a similar configurational pattern connecting to the urban district (Fig. 14 and 15).

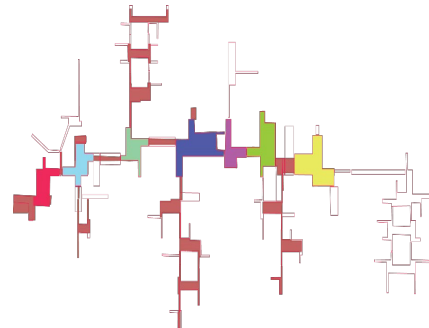


Figure 14: New Eastwick system of a distributed squares and linear esplanade. (Drawn by author, Middleton D.)

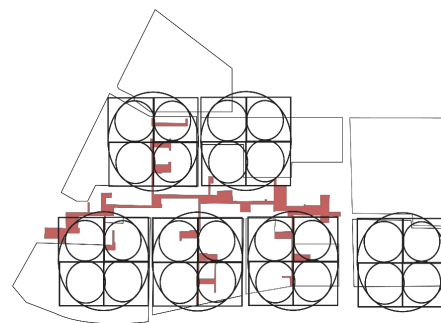


Figure 15: Esplanade and hypothetical Ekistic community class formations New Eastwick. (Drawn by author, Middleton D.)

**Table 4: Summary of Doxiadis' esplanade design approach**

Project	Type	Design Problem	Configuration Approach, Rhythm & Scale	Visual Phenomenal
Korangi, PK. 1958	Urban district	Separation of pedestrians and traffic, mixing econ. social class zones.	Esplanade with gossip squares. Hierarchy of urban blocks with tree formation of movement Unicentric	Linear esplanade Extroverted, enclosed with green edges
New University of the Punjab Lahore PK. 1959	University campus	Pedestrian oriented (thinking while walking); preservation of traditional patterns.	Nested squares and linear walkway, dimension of campus is 1.5 miles square. Change, growth of program over time, shape social generator. no centrality	Introverted, orthogonal and diagonal viewsheds
Islamabad, PK. 1959	Capital urban master plan	Sector commercial center and pedestrian zone.	Interlocking linear configuration. no centrality	Introverted
Tema Ghana 1961	Urban commercial center	Connectivity between blocks, need for distinctive cultural identity.	Urban squares in parametric layout, urban hierarchical center with diffused polycentric district market	Extroverted permeable scaled viewsheds
Eastwick Urban Renewal 1961	Residential district	Accessibility across the urban district; pedestrian movement.	Enclosed linear esplanade, square groupings along distributed central spine, branch formation of secondary movement	Linear Introverted limited viewsheds
Louisville KY. Riverfront Plaza 1961	Plaza mixed use	Unify static fragments in the city.	Unicentric elevated public plaza inscribed squares with parking below.	Open, extroverted Permeable, vista to urban natural focus
University of Aleppo, Syria, 1964	University campus	Distributed spatial elevation change	Articulated esplanade on grid structure with branch formation of secondary movement.	Balanced open/closed synthesis, extroverted
Saigon, Vietnam 1965	Urban district	Territorial organization	Monolithic fabric with shallow esplanade, Central Administrative district.	Nested non-hierarchy Introverted, enclosed
Urban Detroit Esplanade, 1964	Urban Center	Ceremonial civic axis	Elevated esplanade underground expressway wall group form	Extroverted permeable linear perspective
Miami Bayfront, 1966	Urban mixed use water front	Recreation zone and higher density residential	Wall group form and unfolding linear esplanade integrating green space. Limited to no centrality	Extraverted permeable

Conclusion

Bachelard was one of the first philosophers to analyze the development of the modern science in a complex historical way. In 1931, he characterized the new scientific spirit by the intellectual models following the relations and effects of inquiry, which in turn he viewed as becoming the new knowledge and scientific object. In his view, it was not the origin of causality that formed knowledge, but the historical movement of the inquiry process and the subsequently emerging new forms. New forms give rise to the problems generating and constituting new concepts. The new science raises problems rather than producing clarity, redefining concepts in experiments, re-calculated to the new theories and suppositions that open the way to problems (Bazac, 2017).

In *Ekistics: An Introduction to the Science of Human Settlements* (1968), Doxiadis elaborates on how Ekistics was a new comprehensive scientific methodology with a logarithmic approach to order spatial territory at the urban and regional scales. The HUCO projects research investigating locational proxemics for the situation of

interdependent activities and function was a focus of this new approach. The prescriptive methodology sought to apply logarithmic scales and kinetic fields to generate a system of movement and spatial form that would remove the arbitrariness of situating pedestrian circulation and associated functional services. Echoing the problems outlined in Doxiadis's (1942) writing on the problems of modern squares.

The rapid loss of the traditional neighborhood and settlement scale (and their associated neighboring behavior), was increasing urban social and spatial fragmentation (Keller, 1968). At the local scale, urban city centers and adjacent stable neighborhoods were undergoing fragmentation as social and political functions required more space to expand transportation, parking and services. The loss local shopping spaces in the dynamic growing city center resulted in the formation of a random pattern of emerging poly-centers, with larger shopping centers located on the urban periphery (Keller, 1968). Resolving the problem of fragmentation of urban and social spaces was the driving force propelling Doxiadis to define multiple diverse types of human communities

and social habitations. His search for the generative structure of free social space in the city aimed to support social interaction and pedestrian movement, while establishing a new Ekistics planning methodology that would scientifically frame human dimension and walking range. By revealing the structural relationships between functions and movement that was seen to underline the formation and maintenance of human communities, a correlation between economic, psychological, cultural and ecological resources could be established in tandem with developing an understanding of the optimal distance and spatial configuration for the distribution of units of community facilities over a city (Doxiadis & Papaioannou, 1974). The concept of roving neighborhoods are linked to his work on the subdivision of large urban area into a series of interlocking service areas going from the most inclusive and complex unit, to less complex and smaller ones organized as a service hierarchy. Doxiadis emphasized the inherent problems relating to the cutting points between levels of a service hierarchy and their relation to the arbitrary organization of distance and cut-off points between levels and assumptions about the ways in which people should be using various facilities (Keller, 1968).

The Ekistics approach subsequently incorporated comprehensive surveying of population demographics, and in-situ formations of cultural traditions, history and religious life. The Human Community Research Project (HUCO) organized by the Athens Center for Ekistics (ACE), aimed to establish a spatial framework and parametric schema to guide the organization of the city according to the pedestrian kinetic range of movement. Their research was based on evolving the understandings of how man's perception of the phenomenal qualities of open space could be reframed by rational scientific understanding. Rather than limiting the design of cities to only accommodate mass housing schemes, Doxiadis viewed the qualities of this structural urban system to be adaptable to the rapidly evolving state of transportation and land use. It was his belief that cities and their regions are vehicles to enable the expansion of larger economies that would in turn arouse larger societal transformations.

Doxiadis's design variations for pedestrian esplanades are experimental articulations emerging from a methodology emboldened by Bachelard's new scientific spirit. His urban forms are rational spatial arrangements composed with three types of spatial elements, spatial voids, walkways-paths and building masses that evolve from spatial distributed chains of squares into a linear system of rectilinear open and closed convex spaces. In the Tema Ghana projects, Doxiadis urban planning methods continued to transform using parametric design approaches to form a topological surface of articulated plazas and urban squares (Figure 8). Early dual design problems of separating cars and pedestrians increasingly became more complex as Doxiadis began to explore parametric scalable spatial forms that would compose a balanced unity or synthesis.

This survey celebrates Doxiadis work that began in 1957 to redefine the social spatial connection between man and the spatial complexities found in cities by developing pedestrian oriented plans. The composition of an articulated linear pedestrian esplanade aimed to create a new type of urban centre that would not be influenced by the process of fragmentation occurring in pre-war city centers. Doxiadis also stated that his aim in planning many of the above communities was to concentrate on articulating an integrated web of vistas and movement in order to provide a rich backdrop to the manifestation of social co-presence and social density in urban open space, and afford views of architecture and buildings. The continuing development and evolution of configurational strategies intended to unify pedestrian and vehicular spatial structures in the city and campus.

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Note on the Contributor

Dr. Deborah Middleton is Associate Professor in Architecture at Xi'an Jiao tong-Liverpool University and lead of the Cultural Innovation and Critical Practices research lab. She is active in teaching architecture design studio as well as courses in Urban studies, and Architecture history and theory. Deborah received her doctorate degree in History and Theory of Architecture from Georgia Institute of Technology with prior degrees in Environmental Studies from York University (M.E.S.) and Sociology and Art History (B.A. Honors) from Carleton University in Ottawa Canada. Deborah's research applies space syntax methods and emerging technologies to investigate design thinking, spatial cognition and new environmental design approaches to urban planning, that span scales from the architectural interior and landscape to the mega structure of the city. Her design writings are published by Oxford University Press, and Springer as well as leading sustainable design research journals. She is active in international conferences and serves on scientific committees with the Environmental Design Research Association and (IHIT) International conference on Human Interaction with Emerging Technologies and Artificial Intelligence.