

Typological Analysis of The Transect and Its Background Theories and Approaches

Mustafa Behzadfar ^{a,*}, Mehran Alalhesabi ^b, Elnaz Amirhoaei ^c

^a Professor, Faculty of Architecture and Environmental Design, Iran University of Science and Technology, Tehran, Iran.

^b Associate Professor, Faculty of Architecture and Environmental Design, Iran University of Science and Technology, Tehran, Iran.

^c Ph.D. Candidate, Faculty of Architecture and Environmental Design, Iran University of Science and Technology, Tehran, Iran.

Received: 13 May 2017- Accepted: 02 December 2017

Abstract

Transect theory and approach have recently turned into one of the fundamental principles of urban design and planning in the urbanization systems in Europe, the United States and more recently the middle-east, its main goal is reaching the sustainable development patterns in urban areas. A consensus regarding the operationalizability of this theory and approach for creating a sustainable urban form, explains the necessity of analyzing and surveying its generalizability to Iran urbanization system. The following article tries to shed light on this new theory and approach (Transect) and to analyze and discuss its probable advances and weaknesses on controlling and guiding urban form through the typology of its lineage theories and approaches. Findings of the research show that the transect model is, in fact, a type of linear cross-section which takes advantage of nature ecological principles to lead and control of urban areas based on the urban character. Also, by reviewing the literature of the subject toward the transect model and its background theories and approaches and to defy its similarities and differences; typology was performed based on 8 criteria: philosophical orientation; elements of concern; how to use ecology as a basic discipline of theory or approach; urban design and planning paradigms; purpose of employing cross-sections; type of considered order; considered elements of the place, extent of theory or approach. Analyzing this theoretical framework shows that the transect theory has a relative improvement based on all of the typological criteria except paradigms of urban design and planning and considered elements of the place. Therefore, theorizing or expanding the theory and approach of the transect is recommended in order to solve its shortcomings and weaknesses along with attending to all of the aspects of the place and synchronizing with the paradigm of evolution as the superior paradigm of urban design and planning.

Keywords: Typological Analysis, Urban Transect Theory and Approach, Ecological Transect, Theorizing.

1. Introduction

Urban design and planning have taken advantage of numerous theories and approaches in the course of progress of their substantive and procedural aspects. Transect as a theory and approach of understanding, analysis, and intervention in urban areas is a recent one. The theory was released or “*invented*” by New Urbanists in early 21st century. Nowadays, this theory is (under different titles) the basis for designing and planning in many cities and neighborhoods in the American and European urbanization system. The extent of the application of this new approach has even included a number of cities in the middle-east. This theory or approach tries to lead and control the urban character through the use of form-based codes in different urban areas. In other words, the intensity of mutual dominance between built and natural environments become a basis for urban design and planning.

A consensus regarding the operationalizability of this theory and approach for creating a sustainable urban form, explains the necessity of analyzing and surveying its generalizability to Iran urbanization system. Therefore, urban designers and planners should judge the suitability of the applications this theory or approach in both the general context (theoretical framework) and in the specific context (local conditions – Iran urbanization

system) in addition to recognition of it. The following article tries to evaluate the authenticity of this theory and approach in its general context (theoretical framework). The authenticity of each theory or approach would be both perceived based on the impacts that it makes in the environment and through the weakness and strength of it comparing to the previous and background theories, in which they may have roots inside or as it can be in a way traced inside them. Evaluating each idea (theory or approach) is not only a mandatory and beneficial matter for selecting or employing them but then can become a basis on the further development of the theories (theorizing) and adjusting or devising new approaches.

It is evident that evaluating each idea in relation to its backgrounds, demands a close comprehension of its substance. Therefore, identifying methods which facilitate the perception and analysis of the urban design and planning theories and approaches has significant importance. Typology is one of the methods that has widely used by the experts in this field. Accordingly, the following article tries to shed light on this new theory and approach (Transect) and to analyze and discuss its probable advances and weaknesses on controlling and guiding urban form through typology of its lineage theories and approaches. Therefore the considered typological analysis is not only descriptive but also

* Corresponding Author Email Address: behzadfar@iust.ac.ir

normative. In other words, in all research phases, there is a critical point of view in which strengths and weaknesses of each theory or approach are identified according to their dealing with urban form issues. Therefore, finally, a general theoretical framework is suggested for the typological analysis of the lineage theories and approaches which is expandable and generalizable through the development of the knowledge. It can be generalizable to other urban design and planning theories and approaches.

2. Research Methodology

As it was mentioned, the goal of this research is to present a conceptual framework that identifies both its advantages and drawbacks in covering gaps in knowledge. On the other hand, this conceptual framework can be taken into account for analysis of different theories of urban design and planning. So, the typological analysis is used in this research because of the aforementioned goals. Typology is a method of classification (Araabi, 2016: 2) which includes the requirements of such beneficial structure within. The purpose of this framework is to present a model that displays the different functions of the theory and approach in the context of urban design and planning. While there are ambiguities in the concept of "typology", the quite exact meaning is the "study and theory of types and classification systems". The idea of typology does not only magnify the similarities, but it also indicates differences between the types (Araabi 2016: 2). Typology is one of the most fundamental research activities that can be generalized to other disciplines (Deming and Swaffield, 2011: 127).

Typology usually provides a "frame" for a higher level of perception which acts as a discourse. They include "a common understanding of subject area, methodologies, language and history of the development of ideas and practice" (Allmendinger, 2002: 78). Typology is an exploratory research method, in a way that identifies boundaries and limits of the impactful notions and thoughts regarding a certain discipline (Ejlali, 2009: 14). Therefore, typology is the advantageous research method for understanding ambiguities in transect theory and approach. This typology is beyond a classic classification. A type of order which is eventually presented in the form of a typology framework as a model is able to improve the transect theory and its background theories. In other words, there are other possible models. Therefore, the offered typology in this research can enhance the general understanding of the transect theory and its background theories and approaches.

As long as there are numerous ways to relate and classify the phenomena as "things", the situation leads to a question regarding the most efficient typological method (classification methods) among the rest. According to Reynolds, the efficiency of the typology should be evaluated by the exhaustiveness and exclusiveness. It should be exhaustive, in a way that all of the "things" become classified and there exist nothing that belongs to none of the sets based on the suggested framework. It should be exclusive, in a way that there is no ambiguity in the set that "everything" belongs. The third and foremost important criteria are that typologies should not be in

contradiction with other purposes of science (Reynolds, 2016: 3). Also, the answer to the question regarding the significance and meaningfulness of a typology depends on attention to its reason of use and the type of definitions that it has led to. In other words, significance and meaningfulness of criteria for typology can only be evaluated in the theoretical or applied context (Deming and Swaffield 2011: 126). Therefore, inferring typological criteria from the theoretical literature seems obligatory.

The typological approach develops a new type of knowledge by ordering and structuring the theories in a system based on the general qualities which can be integrated with other research strategies (Deming and Swaffield 2011, 126). In this regard, the following article uses a combined strategy with an exploratory approach. Lineage theories and approaches of transect are collected in a qualitative point of view based on library data and they will be classified by the typological method. It is pertinent to explain that typological classification is not based on hierarchical orders and forms; in other words, types are related to each other but they are not subsidiary (Given 2008: 900).

In the SAGE Encyclopedia of Qualitative Research Methods, four stages are considered for typology which we assign as the basis of this research. According to the necessities of the following research, and applying the demanded alterations, the process is presented in figure 1. According to this process, defying the shared and distinct aspects of transect and its lineage theories become the basis for the extraction of typology criteria which describes a typological framework in this research. Also, the process of typology is never ending; as long as they are constantly renewing through the availability of new data in the process of validating their conceptual structures (Deming and Swaffield 2011: 127). Therefore, the employed typology in this research would be repeatable in further researches through expanding related knowledge or applying different approaches.

3. Research Background

Classification systems based on the idea of "types" are used as a scale to judge the world for a long time (Foroughmand Araabi, 2016: 2). According to Reynolds, classification is the method for organizing and sorting "things" (Reynolds, 2016: 2). Scheer limits the application of typology and considers it as the theory and analysis of the architectural types (B. C. Scheer, 2013: 307). In general, typology is a familiar concept in the disciplines of urban design and urban planning. So that, different types of spaces, behaviors, processes, and products have been provided in the related literature (Foroughmand Araabi, 2016: 2).

According to some experts, the classification which includes typology is a primitive proceeding while the other group believes that it is "a necessary condition for higher levels" [of knowledge], even it is believed to be synonymously used with the highest level of knowledge.

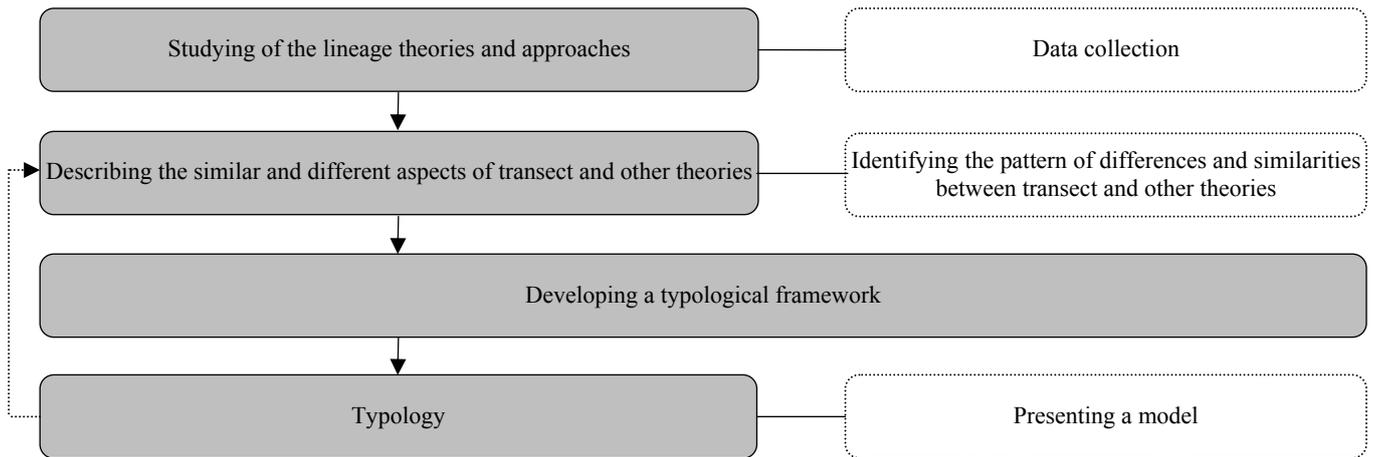


Fig. 1. The process of typology in this research

Methodologies related to typology vary in a spectrum from simple to complex ones. In its highest level of complexity, typology can be used to reveal the hidden contexts and patterns in the data (Deming and Swaffield 2011: 126–127).

According to the explanations of Tiryakian, it can be considered three basic functions for the typology:

- “It corrects misconceptions and confusion by systematically classifying related concepts;
- It effectively organizes knowledge by clearly defining the parameters of a given subject;
- It facilitates theorizing by delineating major subparts of distinct properties and foci for further research” (Tiryakian, according to Yiftachel, 1989: 34).

Space, behavior, processes, and products (Lang 2005) have been analyzed along with urban design and planning theories and approaches by the experts through a typological methodology (Daneshpour 2003; Golkar, 2011; Rafeeian, Asgari & Ejlali 2015; Foroughmand Araabi 2016). These typologies, includes the whole bulk of notions and ideas in related fields and contexts in a comprehensive manner, while the following research analyzes some portions of the existing theories and approaches with the reductionist approach. Although, the result of the research would certainly be generalizable on the other theories and approaches. In addition, this research does not attend to the concept of “theory” in order to avoid a confusion between the minor and major subjects. Also, in the article, the approaches as well as theories are set as the basis for research. Therefore, the precedent theories and approaches of transect should be identified at first.

The theoretical background of the transect is rooted in regional planning specifically in notions of Scottish biologist Patrick Geddes (Walters 2007: 110; Duany and Brain 2005: 309), Team X (Birch 2011: 22) - a group of architects associated with CIAM who published their notions and doctrines through a meeting in Doorn, Netherlands as a document called the “*Doorn Manifesto*”, it includes eight main articles (Lang 1987) - Landscape

designer and planner Ian McHarg, and Christopher Alexander (Duany and Talen 2002: 247; Bohl and Plater-Zyberk 2006: 8). It is essential to mention that the proposed subjects and topics by the Team X and McHarg are all based on the notions of Geddes.

According to Matthew Carmona and David Walters, viewpoint of morphologists, especially in the case of M. R. G. Conzen and the [Richard Patrick] Coleman’s method on analyzing the city center, old and new suburbs, and rural areas which played a role on development of the transect in its contemporary definitions (Walters 2007: 90; Carmona et al. 2010: 319). Also, Cremona declares that rethinking of typo-morphologists studies about historical development of the city has resulted in transect (Carmona et al. 2010, 319). Since the regional planning and typomorphology are two of the basic and highly effective notions on the transect and they are in effect located in higher levels compared with other theories and approaches, they are eliminated from the course of typological analysis.

4. Conceptual Framework

4.1. Geographical and Ecological Transect

Transect has two distant but the related definition in the recently performed studies and researches. In some studies, transect as “*geographical cross-section of the region*” is introduced in order to show a sequence of the different types of environment (Duany, Wright and Sorlien 2009: vi; Duany and Talen 2001: 1453; Marcantonio 2007: 18) (Figure 2). While, in other studies, transect has been employed as the method, technique, and tool of analysis (Talen 2002: 293; Bohl and Plater-Zyberk 2006, 14), sampling (Anderson, Burnham, and Crain 1985; Duany and Brain 2005: 308; Hiby and Krishna 2001; Eidous 2006) and inventory (Teymouri, et al 2001) in studies of ecology, biology and other related disciplines of science (Duany and Brain 2005; Talen 2002: 293; Berg and Bendor 2010: 439). In other words, transects are also referred to a presumptive line which builds the research pathway, and it is also a tool that is widely used in the research, education, and study of natural and biological systems (Talen 2002: 294; Duany and Talen 2002: 253).

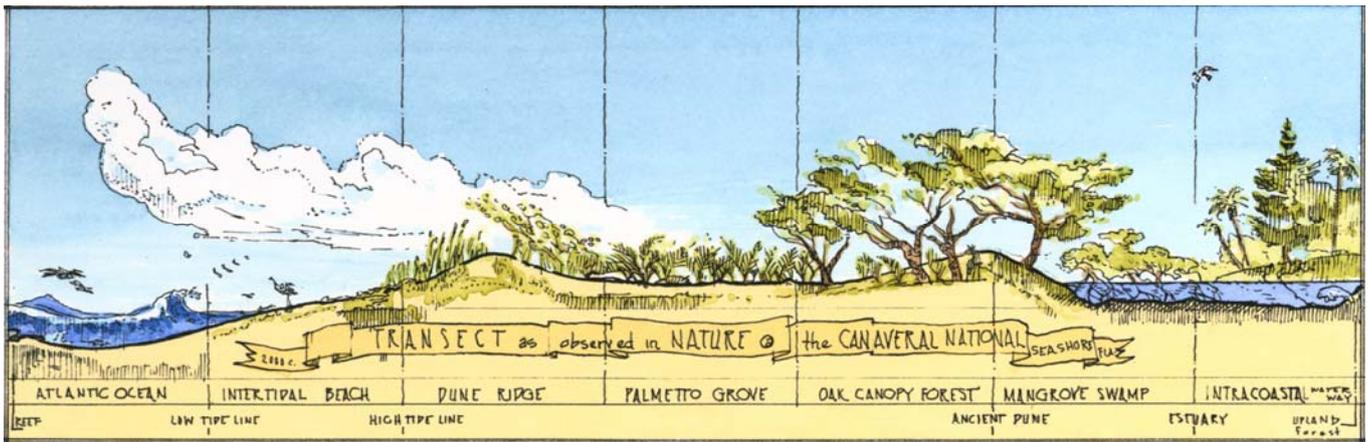


Fig. 2. Natural transect illustration by James Wassel (Marcantonio 2007, 19)

In this method, a presumptive line in the case-study area is extracted in specific distances and their specifications are evaluated (Duany and Brain 2005: 308). Also, the quality of changes in the vegetative and animal habitats in a selective area which has a linear pattern is indicated. In fact, transect are methods for illustrating the variations of a linear space by demonstrating the collected data (Gren 2006: 20) in the form of cross-sections, maps, and tables or combinations of them (van Duivenbooden et al. 1996: 145).

Although transect is a comparably affordable and fast technique for collecting data (Burnham and Anderson 1976: 325), by using this method, we can achieve a detailed perception of the environment and have an evaluation and estimation of the specifications and qualities of the elements in the similar conditions. A perception of the environment is attainable through the discovery of differentiating elements and patterns of the habitats from each other and through an identification of a sequence [spectrum] inside of that environment (Duany and Brain 2005: 308–9). The research elements are in fact the very same elements of the environment; including animate (e.g., vegetation) and inanimate (e.g., dust particles, covering the earth terrain) which they co-exist together (Duany, Wright, and Sorlien 2009: vi; Brain 2005: 230; Eidous 2006: 1211). In the studies which utilized the transect method, the elements in the environment are analyzed in two aspects:

(1) Analyzing the specifications of elements, for instance studying the physical, chemical compounds, minerals and dust along the cross-section between the center of Iran and Zagros heights, in order to check the significance of the variable fluctuations from the center to the west (Hojati et al. 2012) or to study the types of land uses in the agro-ecological zones of western Africa. In the recent instance, the goal of researchers on using the cross-section is to study the specifications of physical environment, type of the land use, describing the spatial relationships between the land, vegetation and the types of land use together with quantifying the

extracted specifications in order to provide the comparison along the cross-section and also with other cross-sections (van Duivenbooden et al. 1996: 146).

(2) Analyzing the abundance and density of the elements along the cross-section (Eguchi and Gerrodette 2009: 1620), as an instance, we can refer to the inventory of trees in the west oak jungles [in Zagros]. In this research, by moving along an assumptive line, we also subjected the inventory of the case studies which are overlapping with the direction of this line and analyzed based on the defined indices (Teymouri et al. 2001: 387).

Although in all of the performed studies, no scales was assigned and it has the advantage of applications in all of the scales, but the type, level [volume] of collected data and their precision depend on scale. The level of details based on the count of observations in the surface unit, gathered specifications and the precision in the delineation of the specifications (van Duivenbooden et al. 1996: 147).

Studies regarding the different applications of transect indicate that urban areas are either studied through a cross-section between urban core to any other part of the city and identification of biological diversity in the inanimate area or through the use of transect methodology in the urban analysis in this greater methodological context (Duany and Talen 2002: 253). One of the most applicable and efficient types of transect in ecological studies of the cities is the urban-rural cross-sections or the urban-rural gradients (M. J. McDonnell and Pickett 1990: 1232). Numerous studies are done regarding the cross-sections in the urban-rural areas with the aim of analyzing the variables while traversing between two urban-rural poles of the environment. The domain of these studies ranges from the field of ecology to medicine, and from economy to social sciences. Among the mentioned studies, we can refer to the Fordham university studies entitled “*Research Program in Urban and Suburban Ecology*”. In the course of this research, the students analyzed the changes in the habitats through a rural-urban

cross-section with a 130 Km of length from New York City to the north-south Connecticut. This research was performed based on the comparison between the animate and inanimate elements, fragmentation of the habitats and changes in the plant community through the research gradient (Mark J. McDonnell et al. 1997)

Although the application of transect in studying of urban areas is a rational and efficient method (Duany and Talen 2002: 253), a [relatively] small portion of the studies are allocated to the urban design, urban planning, and landscape. As an instance we can refer to “*Spatial and temporal dynamics of urban sprawl along two urban-rural transects: A case study of Guangzhou, China*” through evaluating the landscape measurement indices (Yu and Ng 2007), “*A method for detecting and describing land use transformations: An examination of Madrid’s southern urban–rural gradient between 1990 and 2006*” (Diaz-Palacios-Sisternes, Ayuga, and García 2014), “*Analysis and interpretation of variability in soundscapes along an urban–rural gradient*” (Joo, Gage, and Kasten 2011), and “*Gradient Analysis of Urban Landscape Pattern(Case Study from Isfahan City)*” (Saffyanian et al. 2013).

Studying and analyzing the variables along the urban-rural cross-section depends on the acceptance of human habitats typology in the form of villages and cities. Some of the studies, does not consider the typological classification of human habitats in the forms of village and city, as the most efficient and symmetric classification for the present conditions and even recommend the *Territories-in-Between “TiB”* type as the substitute subject in the previous typological model (Alexander Wandl et al. 2014). According to Steuteville, in urban design and planning, the urban-rural

classification can be efficient in the system of coding, education, and design (Steuteville 2000).

Among the studies which focus on the urban-rural gradient, the proposed model of Andres Duany for transect of the character through the cross-section of the urban-rural spectrum - which has considerable impacts on the procedural dimension of urban form - considers a different typology of the human habitats across this spectrum. At the same time, in his model, he used a different concept of the rural and urban areas (Duany and Talen 2002).

4.2. Urban Transect

There are different opinions about urban transect. In spite of the number of different viewpoints in respect to urban transect, we can study the ideas of the experts in this field in the form of two general forms of theoretical and functional frameworks. In other words, we can study the concept of urban transect from two aspects, transect as a theory, and transect as a functional framework. While urban transect as a theory includes its point of view on the urban environments, fundamental concepts, and the formation grounds, the functional framework of urban transect, aims for the analysis of the possible interactions within. It is obvious that the functional framework sets its domains symmetric to the aim of the theory. Also, the scale of environment will not interfere with describing the transect domain as the theory or practice but the theory domain and the interference of the functional framework range from the micro to macro scales which is itself one of the essential specifications of the urban transect. In Table 1 the concept of urban transect is offered in the form of the theoretical and functional framework, listed by the ideas of the different theorists who explained the subjects.

Table 1.

Definitions of urban transect in terms of the theoretical and functional framework (Source: Authors with reference to the cited material)

Theorist(s)	Theoretical framework	Functional framework
(Duany and Talen 2002)	Normative/ pragmatic theory	Methodology, design and planning approach/ regulatory code, zoning system/ tool, technique, and method of analysis
(Talen 2002)	Normative theory	Planning strategy/ analysis method/ organizing principle
(Cowan 2005)	-	Diagrammatic description of the buildings and structures/ zoning system
(Bohn and Plater-Zyberk 2006)	Conceptual framework	Model/ pattern/ a charter for analyzing the level of urban character
(Correa 2006)	-	Tools for ordering the urban form/ hierarchical zoning system
(Cremona, Marshall and Stevens 2006)	-	Regulatory Code
(Tagliaventi 2006)	-	Efficient operating system for designing settlements
(Freeman 2006)	Normative theory	A perspective for identifying damaged neighborhoods [by introducing anti-urban models]
(Bess 2006)	Normative theory/ natural law	New Urbanists exploratory and generalizable tool for describing the formal specifications of traditional urban design, and also as a basis for replacing with the rules and regulations related to the single-use based zoning in the modern era
Walters 2008)	-	Urban morphological zoning/ Modelling and planning tool
(Farr 2008)	-	Communication tool in order to illustrate spectrum of different built environments and their capacity for sustainability
(Tachieva 2010)	Theoretical framework used by the ecologists in order to describe	An organizational framework and methodology used by the planners in order to compensate for the urban sprawl and to change its course

Theorist(s)	Theoretical framework	Functional framework
(Cremona et al. 2010)	distinctive natural habitats	into the sustainable urban form Regulatory code
(Audirac 2011)	Regional framework	Spectrum of the density/ Ideal model of the metropolitan gradient/ The exquisite and applicative method for sampling from the urban form
(Baer 2011)	-	A type of product (prescriptive code) which is internally inclusive
(Coyle 2011)	-	Making possible the observation and documentation of key constructing elements of resilient human habitats
(Troglia et al. 2012)	-	System and model of zoning, evaluation, and measurement/a tool for developing and preserving sustainable places/a tool for illustrating interwoven elements of coherent urban pattern/ a new framework for interdisciplinary activities of the planning, design, and management of cities, neighborhoods and urban blocks
(Garnett 2013)	-	Regulatory scheme according to the natural development pattern of the cities, from the areas with higher densities to the areas with lower levels of it
(Duany 2013)	General theory of sustainable urbanism	Powerful taxonomic engine/ scientific method of analyzing the environment
(Wheeler 2015)	-	Ideal urban form spectrum, from the center to the rural places based on the urban intensity
(Moga 2016)	Regional framework	Developing a urban-rural spectrum across metropolitans resulted from other types of this spectrum presented learnings from the offered types of this spectrum presented historically

According to the transect research as the “geographical cross-section”, “framework of collection and analysis of the data”, urban-rural gradient is a type of cross-section which is considered to be situated between the urban (built) and the rural areas (open and natural) and indeed, it provides a link between these two types of settlements (Figure 3). Based on this gradient, the physical

specifications of the urban and rural areas - population, the density of the built environments, type of the impenetrable cover of the surface, population structure, habitual attitudes and the lifestyles - and their fluctuations are displayed along with the process of urbanisation (Haase and Nuisl 2010: 123).

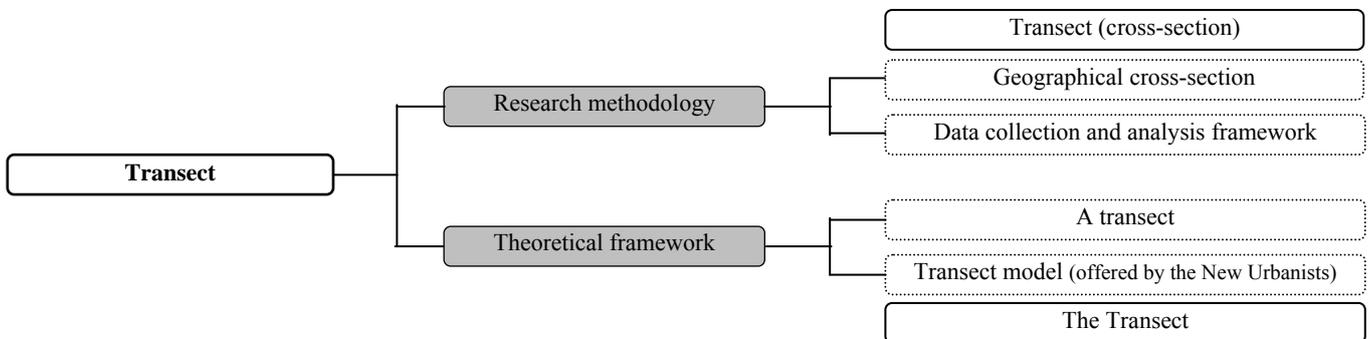


Fig. 3. Typology of the concept of transect

The transect model which is presented by Andres Duany is a kind of gradient between rural-urban areas which links the place with the character (Figure 4). Based on the explaining theory of this model the specifications of the place as the natural or built character has the most significant role on the result of the plan and the design (Duany and Talen 2002: 251). According to Emily Talen, the transect theory is a type of discovery rather than innovation or invention (Talen 2008: 32). Duany expanded this theory by the subject of human habitats to

the transect model that is used in ecological analysis and survey (Mac Antonio 2007: 18). In fact, the transect theory, generalizes the existing order in the natural systems in the urban areas and develops it into the cores of the city, and in this instance it is analyzing the density of biological types in this inanimate arena and in this regard, the city becomes an inseparable part of the transect spectrum (Talen 2002: 294).

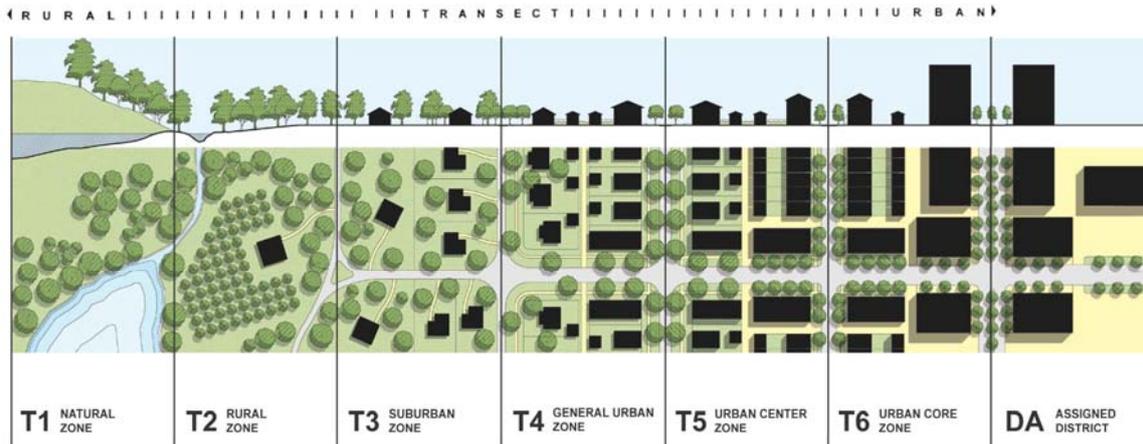


Fig. 4. Transect model offered by the New Urbanists (Dunay and Brain, 2005: 329)

Duany and Plater-Zyberk have first suggested the use of the transect concept in the framework of a regulation plan (Duany and Plater-Zyberk 1991) in the urban and neighborhood design and planning in 1991 (Berg and Bendor 2010: 439). Along with the discovery of a relationship between words during collecting a set of urban design and planning principles entitled “*The Lexicon of New Urbanism*” by Andres Duany and Stefanos Polyzoides, this concept became officially presented and published (Talen 2002: 293; Duany 1998: 76; Duany and Talen 2002: 246). They figured out that set of vocabulary that is used in the mentioned Encyclopedia is related together and therefore classifiable in the same category based on this relation (Duany, 1998: 76). The transect is most efficient notion in the theory and practice which is flourished by the New Urbanism movement and it is presented along with the smart growth guidelines (Hemert 2007: 3; Richards 2008: 3).

In the Encyclopedia transect is “*a system of classification deploying the conceptual range rural-to-urban to arrange in useful order the typical elements of urbanism. The transect is a natural ordering system, as every urban element easily finds a place within its continuum. For example, a street is more urban than a road, a curb more urban than a swale, a brick wall more urban than a wooden one, an allee of trees more urban than a cluster. This gradient when rationalized and subdivided, becomes the urban Transect, the basis of a common zoning system. The continuum of the Transect, when subdivided, forms the basis of the zoning categories: Rural, Sub-Urban, General Urban, Urban Center and UrbanCore*” (Duany 1999: A4.1).

In general, according to the viewpoints of Zyberk and Bohl, we can consider two main frameworks for the definition of transect:

- (1) Conceptual framework for a better identification of differentiating qualities of rural, suburban and urban areas from each other, and
- (2) Formation basis of the operative plans and the rules and regulations of place making (Bohl and Plater-Zyberk 2006: 6).

4.3. Explaining the Similar and Different Aspects Between Transect and its Background Theories and Approaches

In this research, criteria of typology are extracted based on the similarities and differences between the precedent theories and approaches and transect. In the table 2, the concept of each theory or approach has been presented. In the rest of the article, the grounds of similarities and differences of each will be compared to each other.

Comparison of the Geddes cross-section and the transect of the New Urbanists shows that the transect model is a normative theory further than just explaining the built and natural areas. While Geddes only analyzes things as they are by using valley section.

According to what is studied about the transect and the Doorn manifesto, a considerable conceptual (subjective) similarity is evident between this manifesto and the transect model. As it was mentioned earlier, transect model is also trying to classify development based on the urban-rural character in which density has an important role. Alike, McHarg, Duany has also have a focus on the necessity of using a macro, regional framework for directing the development.

Table 2.

Background theories and approaches of transect theory (Source: Authors with reference to the cited material)

Theorist	Theory/ approach	Year	Definitions and tenets of theories or approaches
Patrick Geddes	Valley-section	First approach in 1990	<ul style="list-style-type: none"> ● Using the ‘people’, ‘work’ and the ‘place’ along with ‘organism’, ‘function’, and the ‘environment’ to analyze a region (Geddes 1915: 198). ● Transect as the basis of the idea and research methodology (Duany and Talens 2002: 247). ● Using this model to display the changes in the rhythm and the earth terrain, including snow-covered heights to seas, from high places to low places (Duany and Talen 2002: 247). (Figure 5.)

Theorist	Theory/ approach	Year	Definitions and tenets of theories or approaches
----------	------------------	------	--

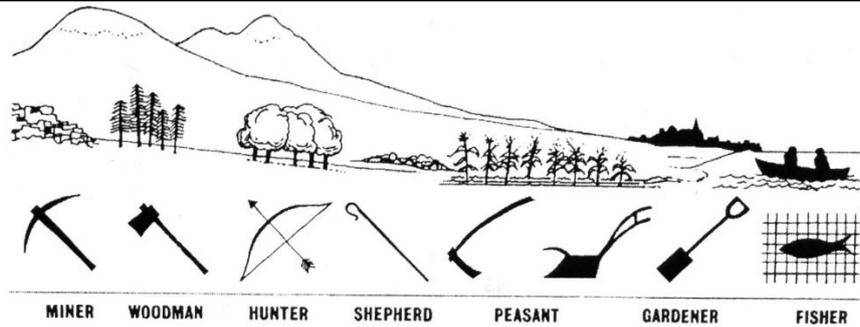


Fig. 5. The “valley-section” presented by Geddes; describes the relationship between the geographical location and type of the regular job (Birch 2011: 23)

- Assigning the probable job in any zone of the “valley-section” through the different levels of nature dominance in the same zone (Duany and Talen 2002: 249).
- Defying the main role of the cities based on the dominance of nature and therefore the job types (Talen 2002: 295).
- Connecting the geographical condition and the pattern of habitats in order to identify the existing cities and to propose plans for new cities (Talen 2002: 295).
- Describing the “Region-city” Theory (Thompson 2004: 115).
- Based on the manifestation of the region in the city and the influence of the city on the region (Thompson 2004: 115)
- An integrating model of the physical conditions with major professions like mining, hunting, and fishing and with the human settlements (Thompson 2004: 116)
- The mutual influence model of Life and environment (Thompson 2004: 115)
- A type of social ecology (Thompson 2004: 116).
- Describing the type of using the natural resources and indeed a functional relation between the environment and human activities (Duany and Brain 2005: 312).
- Evaluating and describing the place based on its situation space in the valley to mountain spectrum (Walters 2007: 110).
- Analyzing the environmental and social specifications of each specific place instead of using formal and void solutions as a basis for the planning and refuse to increase the urban planning activity due to cliché and null typologies, e.g. Persian boulevard or English Garden River (Walters 2007: 62).
- Geographical cross-section which holds time continuum (Batty and Marshall 2009: 557).
- Descriptive model of the growth in cities in the terms of their physical and economic development (Batty and Marshall 2009: 557)
- Describing correct or incorrect social specifications in relation with the natural sources through the valley-section as an analogy of the “Moral geography” (Hysler-Rubin 2011; Cresswell 2005: 128).

Team-X	Doorn manifesto	1954	<ul style="list-style-type: none"> • Presented based on the Geddes’ “valley-section” (Birch 2011: 22). • Suggesting a four-dimension analysis method for planning with houses, streets, districts and the city (Birch 2011: 22). • Selection of constructing elements of the community from a hierarchy/ level according to each specific community (Smithson 1968: 76). • Use of terms without real manifestation for different types of the community (Street, district, etc.) describes the various types of community due to the urgency of a redefinition symmetric with different conditions and societies (Smithson 1968: 76). • The condition of being a ‘habitat’: it is the formation of a housing within the community, symmetric with the conditions that it is compatible with. (Smithson 1968: 75). • Presenting four type of communities: 1.detached houses and farms; 2.village; 3.towns of various sorts (industrial/admin./special). (4) Cities (multi-functional). (Smithson 1968: 75) (Figure. 6)
--------	-----------------	------	---



Figure 6. Displaying the different design scales a cross-section, Team-X. Doorn manifesto (Birch 2011: 23).

Theorist	Theory/ approach	Year	Definitions and tenets of theories or approaches
			<ul style="list-style-type: none"> • Displaying their relationship with their situation environments in a cross-section format (Smithson 1968: 75). • Focus on the access and accessibility of advantages of different transport types and increasing the density proportionate with the population growth in each and other communities (Smithson 1968: 75). • Focus on the necessity of analyzing the suitability of the suggested solutions through the viewpoint of architecture. (Smithson 1968: 100).
Conzen	Cross-section of the historical course of the city	1960	<ul style="list-style-type: none"> • Studying the historical passages in maps and constructed buildings in different dates commencing from the industrial revolution in the form of a cross-section. (Walters 2007: 110). • His study revolves around the idea that the “<i>Urban Landscape</i>” is constantly changing and adjusting itself in reaction to the necessities of a given time (Whelan 2014: 153). • According to Conzen, the ‘<i>Townscape</i>’ is a type of a text that store a number of works that were created in a certain time-period can be partially or totally extinct. The succession concept forms based on this idea (Conzen 1968: 116). • A spectrum (in the form of a cross-section) which Conzen delineated for this purpose, had a focus on the process of creation and development of the zones through the history (Talen 2002).
Ian McHarg	Designing built environment incompatible with natural environment	1969	<ul style="list-style-type: none"> • Importance of the regional context on identifying cities and social values regarding the natural environment in urban design (Spiren 2011: 601) • Importance of the regional and native ecology in urban planning (McHarg and Steimer, 1998 according to Duany and Talen 2002: 249). • Focus on identification of social and natural phenomena of the “<i>place</i>” (Duany and Talen 2002: 249). • Overlapping the maps of social and natural factors in order to identify their mutual relationship (Spirn 2011: 604). • Showing the successive stages of the urban development by analyzing environmental “layers”, including physical, biological and social layers (McHarg, 1967: 105 according to McHarg and Steimer, 1998: 207). • Using physiographic in order to face the untamed urban growth and to protect natural resources and to provide the enhanced development pattern in “<i>Plan For The Valleys</i>” which is produced for the Baltimore region (McHarg 2010: 8). • Using the transect method in order to allocate natural resources to the impermissible development (McHarg, 1969: 14- 15). • The necessity of taking advantage of a major regional planning framework for leading the course development (Duany 2002). • Surveying the physiographic region in the basin of the river as the most impactful design and ecological planning aspect as the connecting framework between the past, presenting and expectations of the future, and on the other hand, multi-scale ranging from the scale of a garden to the whole region together (McHarg, 2010: 128,151). • Simple display of the earth topology, geology, soil, hydrology, vegetation, current condition, land use and potentially ideal uses of the land in specific sites through using transect in physiographic locations (McHarg 2011: 128,151). • The potential of comparison between the patterns of different areas of the river basis by the use of mentioned method (Spirn 2000: 105). • Using transect in order to display the adaptive responses of the plant, animal species and human traditions to the natural conditions of the environment (Spirn 2000: 110-111).
Christopher and Alexander	Nature of Order	1977	<ul style="list-style-type: none"> • Focus on the point that patterns does not have any separate meaning in isolation, their significance develops in a system of bigger patterns which brings meaning and significance to it (Alexander et al. 1977). • Suggesting patterns with scales ranging from the whole region to the interior (Alexander 2009: 7). • Achieving a coherent whole in the case of following the patterns (Alexander 2009: 7). • Offering a pattern of hierarchical order from different types of environment (Alexander 2009: 7). • Introducing the idea of place making as a critical principle of “<i>Nature of Order</i>” (Alexander 2002a; Alexander 2002b; Alexander 2005; Alexander 2004). • Developing bottom-up place making approach by proposing the “<i>generative model</i>” (Alexander 2002a; Alexander 2002b; Alexander 2005; Alexander 2004). • Referring to the process rather than the focus on the form or the plan (Mohajeri and Ghomi 2009: 53). • Focus on “<i>the Idea of Wholeness</i>” in the Nature of Order as a part of a continuous and interconnected chain (Alexander 2011: 63).

Theorist	Theory/ approach	Year	Definitions and tenets of theories or approaches
Coleman	transect of different scales of neighborhoods	1978	<ul style="list-style-type: none"> • Presenting cross-section based on different scales of neighborhoods (Coleman 1978). • Defying the scale of each neighbourhood based on the geographical region that used by the settlement: “<i>immediate neighborhood</i>” a number of small houses surrounding a housing unit, “<i>homogeneous neighbourhood</i>” regions with similar land purchase prices, “<i>institution-oriented neighbourhood</i>” is an area that is formed between the residents of the neighbourhood based on a local institution like an elementary school, a church, a police station or a political unit and “<i>regional neighbourhood</i>” which is the suburb, county or an area in a big city (Downs 1981: 13).

While studying the basis of Potomac River in the United States, McHarg checks the idea of “*multiple land-uses*” which has a focus on the interconnectivity between the land uses and the quality of compatibility between them (McHarg 2008: 105-127, according to McHarg & Steiner 1998: 207). The concept of transect is equivalent to the idea of McHarg in this sense.

Both theories defy the land-use based on the type of each of them but the connection between the rural and urban environments occurs in different forms. The ultimate goal of the transect theory, is to reinforce the quality of both rural environments (with the dominance of natural environment qualities) and urban environments (with the dominance of built environment qualities). McHarg had a more focus on the natural environments, even by putting limits on the development of cities by proposing the cluster development type in order to protect the farmlands and natural ecosystems. In other words, while McHarg opposes city and the natural environment, Duany borrows the existing order in the nature to guide and control the urban areas.

The other part is related to the similarity of the transect to the notions of McHarg in the context of analysis. McHarg has used numerous cross-sections in order to display various types of natural environment diversity and their allocation order to the built developments.

Duany like Alexander evaluates the connection between different zones with each other and in a system beyond to find the results of transect theory. According to him [Alexander], since patterns include a variety in a spectrum from the regional to interior building scales, in case of following the patterns for designing, we can reach for a coherent environment. This is the aim which Duany has offered for his proposal of the transect model.

Pattern language has a hierarchical order, in a way that it is shaped based on the internal relations of patterns. Each pattern is connected with other patterns with larger and smaller scales. Although both Transect and Pattern Language are based on an internal communication between the elements in different scales, unlike the Pattern Language, Transect approach is not based on a hierarchical order.

In his, Nature of order, Alexander proceeds in the model of the place making from the bottom-up; similar to what Duany does after by presenting a set of regulations based on the transect. On the other hand, roots of the hidden concepts and notions in the transect theory can be seen in the “*idea of wholeness*” - which is delineated in the Nature of Order. He proposed this idea in regard to the elements which are explained as “*a part of continuous*

and interconnected chains” (Alexander 2009: 63). He also considers a number of fifteen fundamental qualities for the structures that he refers as “*more lively*”, including strong-center, thick-boundary, levels-of-scale, alternating-repetition, local-symmetries, positive-space, roughness, gradient, contrast, deep-interlock and ambiguity, echoes, good-shape, inner-calm, void, not-separateness (Alexander 2009) in which can be identified in a way or in another in different concepts and ideas of the transect theory.

Also the affinity between the Duany’s idea and the urban morphological analysis in the Europe and the studies of Conzen on the cross-section of the historical passage of time in the city (1960, The University of Newcastle upon Tyne), paved the way for a method of formulating rules based on the hierarchy of the geographical zones of the urban/rural characters. Conzen studies the historical passage in the maps and built places in different time periods starting from the rush of the industrial revolution in the form of the cross-sections. The cross-section that Conzen prepares for this purpose is similar to the results of the transect, indeed with a focus on the process of the formation and alteration of the zones through the course of time. Also, in general, the operative aspect of the transect on preparing rules and regulations based on the urban morphological analysis, and it is indeed taking advantage of this fundamental tool in order to assign different levels of urban character and urban zones in different scales (Mir Moghtadaei 2014).

Also, according to the focus of the Walters (2007) on the impacts of the Coleman studies on the formation of the transect model, but due to the different classification of the neighborhoods compared to Duany’s transect model - urban character - there exists no direct relationship between them, although they settle in a certain type based on some of the indices.

5. Transect Typology and its Fundamental Theories and Approaches

In spite of differences and similarities between transect and its background theories and approaches, they are classified in the form of 8 criteria. Some of these criteria are collected based on the existing studies and researches, and some others are formulate based on the specifications of these theories and approaches. These criteria and their related types include:

Philosophical orientation; which implies to the descriptive (describing what it is) or normative (what it should be) nature of the theories. A large portion of existing typologies regarding the theories of urban design and planning have taken advantage of this criteria.

According to the fact that the points of similarities and differences between transect and the background theories and approaches, is considered as the fundamental of the typology.

Elements of concern; describes the substantive or the procedural essence of the theories and the approaches in which the first has a focus on the product and the latter has a focus on the process of conduct and control of the public areas.

Application of ecology as a basic discipline; Reviewing the mentioned theories and approaches shows that, although all of the studies are somehow related to the field of ecology, the role of ecology is different in each of them. Therefore, according to the existing subjective basis, there are three types for this criteria: ecology in city (focus on the existing natural areas in the cities), ecology of city (researching the city as an ecological social system), and ecology for city (cross-disciplinary collaboration of the ecologists, other research experts and citizens for developing more sustainable cities) (Pickett et al. 2016; McPhearson et al. 2016).

Purpose of employing cross-sections; Some of theories and approaches only uses the cross-section as a formal regulating basic without semantic significant, some other aim to develop a spectrum congruous with this cross-section.

Urban design and planning paradigms; Marshall considers three different paradigm for our intervention types for urban design and planning, including creation, development, and evolution. According to him, based on the creation-based paradigm, designer and the planner is the “single power”, in a way that has a control on everything and aims to create a specific product, which is predicted prior to its production. But in the development paradigm, city is regarded as an “animate entity” that grows as the results of a process of becoming a certain

specific. Therefore, task of the designer and planner is to conduct and control this flow. While, based on the development paradigm, city is not a designed element and not a growing entity, but a collective entity or phenomenon, similar to a jungle or an ecosystem in which these population of elements are under evolutions together but there is not a decided ideal form as the final goal of it. Unlike the Darwin’s theory of evolution, formation of this model is not planned prior to it and the designers and planners have temporary control and therefore role of the people in shaping the environment, becomes the subject of attention (Marshall 1395: 341–51; Gerrits 2011).

Type of considered order; Creating a hierarchical, sequential order, and non-linear order are the types of this criteria. It is evident that in the hierarchical order, unlike the sequential order, elements are not in same level because of a determining factor (for instance, the scale).

Considered elements of the place; Theorists and experts consider five elements for the place including image, physical elements (squares, roads etc.), institutions (organizations, rules, regulations, codes, etc.), communications (power, class, sexuality, etc.), and people and their behaviors (daily life, habits, customs, etc) (Kavaratzis and Hatch 2013; Kalandides 2011). Therefore, this elements become the basis for the typology of the theories and the approaches.

Extent of theory or approach; Theories and approaches are typologically analyzed according to their scale of intervention in the form of five scales including region, city, neighborhood, urban space, and details of the urban facades.

Finally, it is pertinent to note that some of the theories can be located in a number of types of a criteria simultaneously. In the Table. 3., typology of the transect and its background theories and approaches has been presented.

Table 3.
Typology of the reansect and its background theories and approaches

Index of the typology		Cross-section of the valley	Doorn Manifesto	Cross-section of the historical route of the city	Creating artificial structures compatible with the natural context	Pattern language and the Nature of order	Cross-sections between neighbouring units	Transect
Philosophical orientation	Descriptive	■		■	■		■	■
	Normative		■			■		■
Elements of concern	Substantive	■	■				■	■
	Procedural			■	■	■		■
Application of ecology as a basic discipline	Ecology in city				■			
	Ecology of city	■	■	■		■	■	
	Ecology for city							■
Urban design and planning paradigms	Paradigm of evolution							
	Paradigm of development				■	■		■
	Paradigm of creation	■	■	■			■	
Purpose of employing cross-sections	As a formal tool			■	■			■
	Creation of the spectrum	■	■		■	■	■	
Type of considered	Hierarchical order					■	■	
	Sequential order	■	■	■	■			

Index of the typology		Cross-section of the valley	Doorn Manifesto	Cross-section of the historical route of the city	Creating artificial structures compatible with the natural context	Pattern language and the Nature of order	Cross-sections between neighbouring units	Transect
order	Non-linear order							■
Considered elements of the place	Image							
	Physical elements	■	■	■	■	■		■
	Institutions					■	■	
	Communications							
	People and their behaviors	■				■	■	
Extent of theory or approach	Region	■	■		■	■	■	■
	City	■	■	■	■	■	■	■
	Neighborhood					■	■	■
	Urban spaces					■		■
	Details of the urban facades					■		■

6. Conclusions

As it is mentioned, the goal of this research is the typological analysis of transect and its lineage theories and approaches. This typology is performed based on the criteria which are extracted from the study of similarities and differences between this theories and approaches. According to the fact that typological analysis is only performed for the mentioned theories and approaches, the theoretical framework that is presented in the table 3 is a reductionist framework. Therefore, the research about generalization of it on other theories is suggested as further study.

The analysis shows that the theory and approach for transect model have considerably higher advantages compared to its background options. In other words, the types which were not supported by the previous models (e.g., types of the theories and approaches which take advantage of ecology in developing sustainable urban areas) became covered by transect. Also in some of the criteria including purpose of employing cross-sections and type of considered order evaluation of their weaknesses and advantages varies based on the condition and therefore cannot be analyzed in this research. In this cases, the presented theoretical framework are only tools for the typology and cannot be the basis for passing judgments.

According to this framework, transect has reduced the dimensions of the place into the elements in the physical aspect and have remained silent on providing a definition for other elements of the place. While Alexander in his Pattern Language, efforts to consider more dimensions related to the place in respect to Duany's. In other words, it has only considered the gradual change of the urban character through the physical point of view and has not considered to the role of people, images, organization, and communication in the formation of the urban character. Therefore, although the transect model is considered as playing the leading role and the pioneering theory and approach on conduct and control of the cities, it does not possess an advantage on explaining different dimensions of the place compared to other theories.

Also, in the paradigm of urban design and planning, the evolutionary solutions are considered more suitable compared to creation-based and development based types, since the role of the citizens on the urban development is considered and generally has a focus on the bottom-up process on conducting and controlling of the cities. But transect and other studied theories and approaches, as missing in this topic. Transect marks the future urban form through a reductionist structure, while it has not paid any attention to the role of the people on the conduct and control of the cities. In other words, the role and the participation of the people are not considered in this approach. In spite of the fact that this weakness is also present in other studied theories and approaches, but considering the evolution of a paradigm through the course of time and attention to the role of people in the contemporary paradigms, are considered greater negligence. Therefore, the presence of the efficient presence of transect on urban design and planning aligned with the modern paradigms depends on its evolution in the mentioned fields. Therefore, as a theoretical framework, this typology considers the significance of the evolution of this theory and approach in the mentioned dimensions.

According to this, suggested further studies of the research is categorized into three fields; typological analysis of transect and its background theories and approaches according to new criteria which are identified due to the development of the body of knowledge and changes in the typological approaches; generalizability evaluation of the resulted theoretical framework from this research in the typology of different urban design and planning theories and approaches; and eventually theorizing or to develop the theory and approach of transect along with the aim of eliminating its shortcomings and weaknesses to pay attention to all of aspects of the place and to consider the role of people on guiding and controlling the urban form.

References

- 1) Alexander Wandl, D.I., Vincent Nadin, Wil Zonneveld, and Remon Rooij. (2014). "Beyond Urban-rural Classifications: Characterising and Mapping Territories-in-between across Europe." *Landscape and Urban Planning* 130 (October): 50–63. doi:10.1016/j.landurbplan.2014.06.010.
- 2) Alexander, C. (2009) *A pattern language*, Trans: Reza Karbalai Norouzi., Tehran, Center for Urban Studies and Architecture in Iran.
- 3) Alexander, C., Ishikawa, S. Murray Silverstein, Max Jacobson, Ingrid Fiksdahl-King, and Shlomo Angel. (1977). *A Pattern Language: Towns, Buildings, Construction*. New York: Oxford University Press.
- 4) Alexander, C. (2002a). *The Nature of Order. Book One: The Phenomenon of Life*. New York: Oxford University Press.
- 5) Alexander, C. (2002b). *The Nature of Order. Book Two: The Process of Creating Life*. New York: Oxford University Press.
- 6) Alexander, C. (2004). *The Nature of Order. Book Four: The Luminous Ground*. New York: Oxford University Press.
- 7) Alexander, C. (2005). *The Nature of Order. Book Three: A Vision of a Living World*. New York: Oxford University Press.
- 8) Alexander, C. *The Nature of Order: An Essay on the Art of Building and the Nature of the Universe, Book 1 - The Phenomenon of Life*, Translated by Siroosh Sabouri and Ali Akbari, Parham Naghsh publications, Tehran.
- 9) Allmendinger, P. (2002). "Towards a Post-Positivist Typology of Planning Theory." *Planning Theory* 1 (1): 77–99.
- 10) Anderson, D R, K P Burnham, and B. R. Crain. (1985). "Estimating Population Size and Density Using Line Transect Sampling." *Biometrical Journal* 27 (7). WILEY-VCH Verlag: 723–31. doi:10.1002/bimj.4710270702.
- 11) Audirac, I. (2011). "Old vs. New Urbanism." In *Companion to Urban Design*, edited by Tridib Banerjee and Anastasia Loukaitou-Sideris, 510–25. Oxon: Routledge.
- 12) Baer, W. C. (2011). "Customs, Norms, Rules, Regulations, and Standards in Design Practice." In *Companion to Urban Design*, edited by Tridib Banerjee and Anastasia Loukaitou-Sideris, 277–87. Oxon: Routledge.
- 13) Batty, M, and S Marshall. (2009). "The Evolution of Cities: Geddes, Abercrombie and the New Physicalism." *Town Planning Review* 80 (6): 551–74. doi:10.3828/tpr.2009.12.
- 14) Berg, Hannah E, and Todd K Bendor. 2010. "A Case Study of Form-Based Solutions for Watershed Protection." *Environmental Management* 46: 436–51.
- 15) Bess, P. 2006. *Till We Have Built Jerusalem: Architecture, Urbanism, and the Sacred*. Wilmington, Del: ISI Books.
- 16) Birch, E. L. 2011. "From CIAM to CNU; The Roots and Thinkers of Modern Urban Design." In *Companion to Urban Design*, edited by Tridib Banerjee and Anastasia Loukaitou-Sideris, 9–29. Oxon: Routledge.
- 17) Bohl, C. C, and Elizabeth Plater-Zyberk. 2006. "Building Community across the Rural-to-Urban Transect." *Places* 18 (1): 4–17.
- 18) Brain, D. 2005. "From Good Neighborhoods to Sustainable Cities: Social Science and the Social Agenda of the New Urbanism." *International Regional Science Review* 28 (2): 217–38. doi:10.1177/0160017605275161.
- 19) Burnham, K P, and D R Anderson. 1976. "Mathematical Models for Nonparametric Inferences from Line Transect Data." *Biometrics* 32: 325–36.
- 20) Carmona, M., Stephen Marshall, and Quentin Stevens. 2006. "Design Codes: Their Use and Potential." *Progress in Planning* 65: 209–289.
- 21) Carmona, M., Steve Tiesdell, Tim Heath, and Taner Oc. 2010. *Public Places, Urban Spaces; The Dimensions of Urban Design*. Second Edi. Oxford: Elsevier.
- 22) Coleman, R.d P. 1978. "Attitudes towards Neighborhoods: How Americans Choose to Live." Working Paper (Cambridge: Joint Center for Urban Studies) 49: 3–4.
- 23) Conzen, M.R.G. 1968. "The Use of Town Plans in the Study of Urban History." In *The Study of Urban History*, edited by H. J. Dyos, 113–30. New York: St Martin's Press.
- 24) Correa, J. 2006. "Counterpoint: Transect Transgressions." *Places* 18 (1): 24–25.
- 25) Cowan, R. 2005. *The Dictionary of Urbanism*. Streetwise Press.
- 26) Coyle, S. 2011. *Sustainable and Resilient Communities: A Comprehensive Action Plan for Towns, Cities, and Regions*. Hoboken, NJ: John Wiley & Sons.
- 27) Cresswell, T. 2005. "Moral Geographies." In *Cultural Geography: A Critical Dictionary of Key Concepts*, edited by David Sibley, Peter Jackson, D A., and Neil Washbourne. New York: I. B. Tauris.
- 28) Daneshpour, Z. (2000) "An introduction to the theoretical basis and the typology of the planning theories with a focus on urban planning" *Fine Arts magazine*, : 42-57.
- 29) Deming, M. Elen, and Simon Swaffield. 2011. *Landscape Architecture Research; Inquiry, Strategy, Design*. New Jersey: John Wiley & Sons.
- 30) Díaz-Palacios-Sisternes, S., Francisco Ayuga, and Ana I. García. 2014. "A Method for Detecting and Describing Land Use Transformations: An Examination of Madrid's Southern Urban-rural Gradient between 1990 and 2006." *Cities* 40 (October): 99–110. doi:10.1016/j.cities.2014.03.010.
- 31) Downs, A. 1981. *Neighborhoods and Urban Development*. Washington, DC: Brookings Institution.

- 32) Duany, A, and David Brain. 2005. "Regulating as If Humans Matter: The Transect and Post-Suburban Planning." In *Regulating Place; Standards and the Shaping of Urban America*, edited by Eran Ben-Joseph and Terry S. Szold, 293–332. New York: Routledge.
- 33) Duany, A, and Elizabeth Plater-Zyberk. 1991. *Towns and Town-Making Principles*. New York: Rizzoli Press.
- 34) Duany, A, and Emily Talen. 2001. "MAKING THE GOOD EASY: THE SMART CODE ALTERNATIVE." *Fordham Urban Law Journal* 29 (4): 1445–68.
- 35) Duany, A, and Emily Talen. 2002. "Transect Planning." *Journal of the American Planning Association* 68: 245–66.
- 36) Duany, A, William Wright, and Sandy Sorlien. 2009. *SmartCode Version 9.2*. Ithaca: New Urban News Publications.
- 37) Duany, A. 1998. "A Common Language of Urban Design." *Places* 11 (3): 76–78.
- 38) Duany, A. 1999. *The Lexicon of The New Urbanism*. Miami: Duany Plater-Zyberk & Company.
- 39) Duany, A. 2002. "Introduction to the Special Issue: The Transect." *Journal of Urban Design* 7 (3): 251–260.
- 40) Duany, A. 2013. "A General Theory of Landscape Urbanism." In *Landscape Urbanism and Its Discontents: Dissimulating the Sustainable City*, edited by Andrés Duany and Emily Talen, 115–24. Gabriola Island, BC: New Society Publishers.
- 41) Eguchi, T, and Tim Gerrodette. 2009. "A Bayesian Approach to Line-Transect Analysis for Estimating Abundance." *Ecological Modelling* 220 (13–14): 1620–30. doi:10.1016/j.ecolmodel.2009.04.011.
- 42) Eidous, O. 2006. "A Semiparametric Model for Line Transect Sampling." *Communications in Statistics - Theory and Methods* 35 (7): 1211–21. doi:10.1080/03610920600628528.
- 43) Ejlali, P.(2009) "Identifying the planning theory and its types". *Social science quarterly*, issue 44, pp.1-47.
- 44) Farr, D.. 2008. *Sustainable Urbanism: Urban Design With Nature*. Hoboken, NJ: John Wiley & Sons.
- 45) Foroughmand Araabi, Hooman. 2016. "A Typology of Urban Design Theories and Its Application to the Shared Body of Knowledge." *URBAN DESIGN International* 21 (1): 11–24.
- 46) Freeman, R. 2006. "The Elm Street Program [The Transect]." *Places* 18 (1): 36–39.
- 47) Garnett, N. S. 2013. "Redeeming Transect Zoning?" *BROOKLYN LAW REVIEW* 78 (2): 571–90.
- 48) Geddes, P. 1915. "Cities in Evolution - An Introduction to the Town Planning Movement and to the Study of Civics." LONDON: WILLIAMS & NORGATE.
- 49) Gerrits, L. 2011. "Cities, Design and Evolution." *Planning Theory & Practice* 12 (3): 470–72.
- 50) Given, L. M. 2008. *The SAGE Encyclopedia of Qualitative Research Methods*. Thousand Oaks, CA: SAGE Publications.
- 51) Golkar, K. (2009). *Creating sustainable places, ideas revolving the urban design theory*. Tehran, Shahid Beheshti University (SBU).
- 52) Gren, A. M. 2006. "Exploring Typologies, Densities, and Spatial Qualities; The Case of Low-Income Housing in South Africa." *Royal Institute of Technology - Stockholm*.
- 53) Haase, D., and Henning Nuissl. 2010. "The Urban-to-Rural Gradient of Land Use Change and Impervious Cover: A Long-Term Trajectory for the City of Leipzig." *Journal of Land Use Science* 5 (2): 123–141.
- 54) Hemert, J. van. 2007. "Sustainable Zoning: A New Imperative, the Sustainable Community Development Code." *Rocky Mountain Land Use Institute*.
- 55) Hiby, L., and M. B. Krishna. 2001. "LINE TRANSECT SAMPLING FROM A CURVING PATH." *Biometrics* 57: 727–31.
- 56) Hojati, S., Hossein Khademi, Angel Faz Cano, and Ahmad Landi. 2012. "Characteristics of Dust Deposited along a Transect between Central Iran and the Zagros Mountains." *Catena* 88. Elsevier B.V.: 27–36. doi:10.1016/j.catena.2011.09.002.
- 57) Hysler-Rubin, N. 2011. *Patrick Geddes and Town Planning: A Critical View*. New York: Routledge.
- 58) Joo, W., Stuart H. Gage, and Eric P. Kasten. 2011. "Analysis and Interpretation of Variability in Soundscapes along an Urban–rural Gradient." *Landscape and Urban Planning* 103 (3–4): 259–76. doi:10.1016/j.landurbplan.2011.08.001.
- 59) Kalandides, A.. 2011. "The Problem with Spatial Identity: Revisiting the 'sense of Place.'" Edited by Ares Kalandides. *Journal of Place Management and Development* 4 (1): 28–39.
- 60) Kavaratzis, M., and M. J. Hatch. 2013. "The Dynamics of Place Brands: An Identity-Based Approach to Place Branding Theory." *Marketing Theory* 13 (1): 69–86.
- 61) Kullmann, K. 2014. "Towards Topographically Sensitive Urbanism: Re-Envisioning Earthwork Terracing in Suburban Development." *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*, 1–21.
- 62) Lang, J. T. 1987. *Creating Architectural Theory: The Role of the Behavioral Sciences in Environmental Design*. Van Nostrand Reinhold Company.
- 63) *Creating Architectural Theory: The Role of the Behavioral Sciences in Environmental Design*. Translated by Alireza Einifar, 2nd print. Tehran, Tehran university publications 2004.
- 64) Lang, J. T. 2005. *Urban Design: A Typology of Procedures and Products*. Burlington, MA: Elsevier/Architectural Press.

- 65) Marcantonio, D. 2007. "The Classicism of the Transect." *THE CLASSICIST* 7: 18–23.
- 66) Marshall, S. (2014). *Cities design and Evolution.*, Trans: Seyyed Hossein Bahraini and Ameneh Bakhtiar., Tehran university press, Tehran.
- 67) McDonnell, M. J., and S. T. A. Pickett. 1990. "Ecosystem Structure and Function along Urban-Rural Gradients: An Unexploited Opportunity for Ecology." *Ecology* 71 (4): 1232–37.
- 68) McDonnell, Mark J., Steward T. A. Pickett, Peter Groffman, Patrick Bohlen, Richard V. Pouyat, Wayne C. Zipperer, Robert W. Parmelee,
- 69) Margaret M. Carreiro, and Kimberly Medley. 1997. "Ecosystem Processes along an Urban-to-Rural Gradient." *Urban Ecosystems* 1 (1): 21–36.
- 70) McHarg, Ian L. 1967. "An Ecological Method for Landscape Architecture." *Landscape Architecture* 57 (2): 105–7.
- 71) McHarg, Ian L. 1969. *Design with Nature*. New York: Natural History Press.
- 72) McHarg, Ian L. *Design with Nature*. Translated by Abdol Hossein Vahabzadeh, Jahad Daneshgahi, Mashhad, 2008.
- 73) McHarg, Ian L., and Frederick R. Steiner. 1998. *To Heal the Earth: Selected Writings of Ian McHarg*. Washington, DC: Island Press.
- 74) McPhearson, Timon, Steward T. A. Pickett, Nancy B. Grimm, Jari Niemelä, Marina Alberti, Thomas Elmqvist, Christiane Weber, Dagmar Haase, Jürgen Breuste, and Salman Qureshi. 2016. "Advancing Urban Ecology toward a Science of Cities." *BioScience* 66 (3): 198–212. doi:10.1093/biosci/biw002.
- 75) Mir Moghtadaei, M. (2006) "Suggesting a method in order to analyse the 'character' of a city" *Environology*, 39: pp. 129-140.
- 76) Moga, Steven T. 2016. "The Zoning Map and American City Form." *Journal of Planning Education and Research*, June, 1–15.
- 77) Mohajeri, N., Qomi, S. "An analytical approach on the design theories of Christopher Alexander: From notes in the combination of form in the language and the pattern language to new concepts of the complexity theory." *Hoviat-e Shahe*, 2: pp. 45-56.
- 78) Pickett, Steward T. A., Mary L. Cadenasso, Daniel L. Childers, Mark J. McDonnell, and Weiqi Zhou. 2016. "Evolution and Future of Urban Ecological Science: Ecology in , of , and for the City." *Ecosystem Health and Sustainability* 2 (7): 1–16.
- 79) Rafian, M.; Asgari, Ali and PARviz Ejlali (2005). *Theory of planning: Traditional and Modern viewpoints*, Aagah Publications.
- 80) Reynolds, P. D. 2016. *A Primer in Theory Construction*. Oxon: Routledge.
- 81) Richards, P. 2008. "A Transect of Urban Settlement Types; THE TRANSECT, SMARTCODE AND URBAN STRUCTURE." Queensland.
- 82) Safiyan, A., Mokhtari, Z.; Khajeh, S. J. and Hamireza Z. (2001). "Analysis of the gradient of the urban territorial patterns (case study: City of Isfahan). *Human Geography research center* 45 (1): 87–104.
- 83) Scheer, Brenda Case. 2013. "'A Crisis in the Urban Landscape', 'The Origins and Theory of Type', and 'Legitimacy and Control.'" In *The Urban Design Reader*, edited by Michael Larice and Elizabeth Macdonald, Second edi, 307–27. Oxon: Routledge.
- 84) Scheer, B. 2011. "Metropolitan Form and Landscape Urbanism." In *Companion to Urban Design*, edited by Tridib Banerjee and Anastasia Loukaitou-Sideris, 611–18. Oxon: Routledge.
- 85) Smithson, A. M., ed. 1968. *Team 10 Primer*. LONDON: Studio Vista.
- 86) Spirm, A. W. 2000. "Ian McHarg, Landscape Architecture, and Environmentalism: Ideas and Methods in Context." In *Environmentalism and Landscape Architecture*, edited by Michel Conan, 97–114. Washington, DC: Dumbarton Oaks.
- 87) Spirm, A. W. 2011. "Ecological Urbanism." In *Companion to Urban Design*, edited by Tridib Banerjee and Anastasia Loukaitou-Sideris, 600–610. Oxon: Routledge.
- 88) Steuteville, R. 2000. "Transect Applied to Regional Plans." *New Urban News*. <http://bettercities.net/article/transect-applied-regional-plans>.
- 89) Tachieva, G. 2010. *Sprawl Repair Manual*. Washington, DC: Island Press.
- 90) Tagliaventi, G. 2006. "The European Transect: An Organic Way for Architecture to Develop Towns, Cities, and Metropolises." *Places* 18 (1): 46–52.
- 91) Talen, E. 2002. "Help for Urban Planning: The Transect Strategy." *Journal of Urban Design* 7 (3): 293–312.
- 92) Talen, E. 2008. "Beyond the Front Porch: Regionalist Ideals in the New Urbanist Movement." *JOURNAL OF PLANNING HISTORY* 7 (1): 20–47.
- 93) Teymouri, Javad; Eshagh, Mahmoud Zeibary; Sobhani, Houshang and houshang pourshafi zanganeh. (2003) "Comparison of the systematically random inventory with circular sampling inputs and the transect method in the regard to the precision and the lower costs in the west Oak jungles", *Natural resources of Iran magazine*, issue: 56., pp. 96-383.
- 94) Thompson, C. W. (2004). "Geddes, Zoos and the Valley Section." *Landscape Review* 10 (1&2): 115–19.
- 95) Tiryakian, Edward A. 1968. "Typologies." In *International Encyclopedia of the Social Sciences*, edited by David L. Sills, 177–86. New York: Macmillan.
- 96) Troglia, E., T. Haas, T. Martschenko, and S. Pagluila. 2012. "The Energy Transect; Including

- Sustainability Issues in Urban Morphology Analyses.” In , 183–93.
- 97) van Duivenbooden, N., P.N. Windmeijer, W. Andriess, and L.O. Fresco. 1996. “The Integrated Transect Method as a Tool for Land Use Characterisation, with Special Reference to Inland Valley Agro-Ecosystems in West Africa.” *Landscape and Urban Planning* 34: 143–60. doi:10.1016/0169-2046(95)00205-7.
 - 98) Walters, David. 2007. *DESIGNING COMMUNITY; Charrettes, Master Plans and Form-Based Codes*. Oxford: Architectural Press.
 - 99) Wheeler, Stephen M. 2015. “Built Landscapes of Metropolitan Regions: An International Typology.” *Journal of the American Planning Association* 81 (3): 167–90.
 - 100) Whelan, Yvonne. 2014. “Geographies of Urban Morphology.” In *Key Concepts in Historical Geography*, edited by John Morrissey, David Nally, Ulf Strohmayer, and Yvonne Whelan, 151–58. LONDON: Sage Publication.
 - 101) Yiftachel, O. 1989. “Towards a New Typology of Urban Planning Theories.” *Environment and Planning B: Planning and Design* 16 (1): 23–39.
 - 102) Yu, Xi Jun, and Cho Nam Ng. 2007. “Spatial and Temporal Dynamics of Urban Sprawl along Two Urban-Rural Transects: A Case Study of Guangzhou, China.” *Landscape and Urban Planning* 79: 96–109. doi:10.1016/j.landurbplan.2006.03.008.