

## #76

### THE EFFECT OF UNIVERSITY CAMPUSES ON THE SPATIAL CULTURES OF TWO MID-SIZED TOWNS:

A Comparative Study of Nottingham, UK and Eskisehir, Turkey

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#### ABSTRACT

This study focuses on the effects that university campuses and the presence of students has had on the growth and economy of two mid-sized cities. It examines the extent to which the existence of university campuses affects their local economies, and attempts to define the contribution of students to urban sustainability. Students are discussed in the context of university cities as examples of 'creative cities', so attractive to urban decision-makers. The university itself is presented as a 'creative industry', an indicator for socio-economically sustainable cities. The research then describes how universities manifest their roles in the public realm in a spatial way. To do so, two case studies are presented, Nottingham (UK) and Eskisehir (Turkey), which are similar in terms of demography and the location of their campuses. The study investigates both the relationship of campus locations with their surrounding areas, and the relationships that students have with their cities and local populations, using historical and contemporary maps, land use surveys, on site observations and questionnaire results about user activities.

The research examines the historical development of the university areas in the case-study cities in terms of their spatial structure and social morphology. The campus areas are divided into three categories according to their location in the city: the 'city centre', 'edge of the city' and 'outside of the city'. The locations of student accommodation are also mapped. The main analysis explores the emergent relationships of campuses and student areas to urban centres, using space syntax measures of network accessibility and area users routes. The aim of the study is to better grasp the relationship between campus and city by considering the presence and the distribution of university buildings and students in urban space in historical perspective. It highlights a better understanding of how student populations affect the socio-economic development of cities, can contribute to a better comprehension of the 'creative city' and the 'sustainable city'.

#### KEYWORDS

movement of economy, university campus, sustainable city, student, Space Syntax

## 1. INTRODUCTION

This research will present comparative research based on the analysis of two similar kinds of university towns: Eskisehir in Turkey, and Nottingham in the United Kingdom, in order to explore the socio-spatial impacts of the universities on the towns and the different ways in which students interface with the city. According to Coulson et. al. (2011, p.1-39), the history of higher education has evolved through successive phases to take its present-day form. The first universities, founded in the 1100s, were based on prototypical forms of fraternal organization in Bologna, Paris and Oxford. Professorial fame attracted many students to learning centres across Europe and they gathered in scholastic societies comprised of similar kinds of merchant guilds and artificers which built themselves up as the 'prime sponsor of learning' inside of their respective towns and cities over two centuries. During this period, universities were rooted in urban centres and formed the constitution of their host city. However, the early universities didn't have specific buildings. After the student population began to increase and internal migration abated, universities started to obtain property in various parts of their respective cities. As the Renaissance period progressed from c.1400, universities began to take possession of appropriate academic quarters. The omnipresence of physical universities in urban locations started to represent the town's character. Oxford and Cambridge were the first examples of students lodging with a town's people and, following this, the proliferation of 'halls' and 'hostels' occurred. According to Neuman (2003), since the eighteenth century, university emplacement began to engage with certain places and this settlement with its introverted learning community and its permanent spatial organisation created the term 'campus' (Yaylali-Yildiz et. al., 2014). From the second half of the nineteenth century, new social, economic and intellectual impacts caused an enormous increase in the number of university buildings. The structures of universities in this period are not surrounded by walls, isolated in the countryside, or introverted. Universities have a large monumental city centre composition and universities have settled for symbolic capitals or giant single structures that represent the new university buildings. Substantial cultural advantages have accrued through the synergy of the city and university. After World War II, student enrolments saw rapid increases and these substantial changes reflected the pattern of university buildings and designers were determined to represent the 'ideal community in a microcosm' as a 'whole cloth'.

The chronological development of a university's environment is related to changes in teaching, research, social ideologies, mobility, and architectural fashions. Each historical era has had its own effect on campus designs and their relation with their surroundings. This means that the year a university was founded, geographical, cultural differences and administrative approaches make changes to its architectural form and relationship to the city in each case.

Landry (2008) argues that embedding creativity into the city's 'genetic code' is the key factor behind creating a successful urban creative milieu through the use of non-traditional, innovative approaches to urban development. According to him, a 'creative milieu' is defined as a place that is a part of a city, an entire city, or a region, rather than a localised building cluster. This kind of milieu is a physical arrangement where a creative group of intellectuals, artists, power brokers, entrepreneurs, social activists, administrators, or students can operate in an open-minded and cosmopolitan context within a physical setting, wherein the creation of new ideas, products, artefacts, institutions or services might be facilitated by face-to-face interaction. As a result of this diverse relationship of social and spatial networks, economic success occurs. However, creativity is not a measurable quality because it is not only a physical concept, but also contains social network. Due to this fact, this study will primarily focus on the spatial effects of universities.

Space Syntax theory is a useful means through which to explore how universities shape and are shaped by the spatial morphology of cities over time. Hillier (1996) advances two theories linking spatial form with social form: the theory of 'natural movement' and the theory of 'movement of economy'. Griffiths (2014) notes that in Hillier et al. (1993)'s 'natural movement' proposition the spatial configuration of the urban grid itself generates 'attraction inequalities' so that more integrated urban spaces generate greater levels of movement on a 'probabilistic basis', prior to the consideration of land-use attractors. The theory of the movement economy

proposes that land uses profit from a 'high rate of movement cluster' in highly suitable locations at a premium cost and, as a result of this, less movement finds an appropriate position in the network. High-movement spaces that characterise urban centres become more generative of diverse social relationships and residential areas become more conservative. This different 'pervasive' centres' system is characterized by the distinction between 'foreground (retail) and background (residential)' networks that produce emergent intensities of movement across all scales of the urban grid (Griffiths 2014, Hillier and Vaughan 2007, Hillier 1999).

In addition to these spatial theories of movement Hillier (2015) defines three factors important to city sustainability: energy, society, economics, and in addition to those, a fourth one: creativity. The creativity of the city, according to Hillier, largely explains why cities exist – as spatial networks to create and control social networks. The university campus therefore is an actor reproducing the social network of a specific academic 'guild' and also has physical embodiment in the spatial structure of a city. Micro-to-macro scale space syntax analysis exploring the relationship between the foreground and background networks of the city can help us to understand how different kinds of university building are situated to facilitate or restrict socio-economic interfaces with the larger urban area.

In the Dictionary of Human Geography (Castree et. al., 2013) 'studentification' is defined as residential neighbourhoods, which are dominated by student households causing social, cultural and environmental changes to previously established residential communities. For the revitalisation of North American mid-sized city downtowns, residential land use enhancement – such as might be provided by student accommodation – was suggested as a solution by planners (Charbonneau et. al. 2006; Birch 2002; Gratz and Mintz 1998). Jane Jacobs (1961) stated that safety and liveliness are key factors for sustainable cities and suggested that housing in the city centre might be helpful to increase the presence of people on the street. Retail and service facilities are the other constituents of a lively urban society (Charbonneau et. al. 2006; Bunting et. al. 2000; Hudnut 2000). The solution of planners was that the presence of residential populations might encourage and enhance pedestrian movement, and consequently, increase safety and commercial development around the area; thus, mid-size cities might use the university community as an advantage to revitalise some parts of the city and associate this with student housing (ibid). Many different elements influence the housing selections of students such as financial power, their flexibility, distance from campus, accessibility, co-renters etc. therefore the complexity of housing decisions affects the spread of students to the areas and city (ibid). For this reason, conducting a research about this topic become difficult.

Henri Lefebvre (1991) argued that 'social space is social production' and that where there is change in spatial relations there will be a change in social relations. Chao Ye et al. (2014) argues that the production of space theory provides a perspective which connects society with space and time, and helps to understand land-use and cover change (LUCC) as a social, rather than simply an economic, process. Three types of time scale interact with LUCC policies and each has a different effect on LUCC and production of space (ibid). In general, spatial representations of LUCC reflect cultural heritage or transitions over the long term (more than 10 years); more economic and political changes are reflected in the medium term; and social change or everyday life is externalised in the short term (ibid). The development of a university town is a 'complicated, dialectical, and interactive process between time, space, and society', because a university is a place where knowledge is produced, but this production cannot be separated from the specific context of time, space and society. According to Chao Ye et al. (2014), this process is related to urbanisation and LUCC.

A campus refers to a social and spatial aggregation that has influence on the production of social space with various kinds of parameters. Space Syntax has been proposed as a theoretical and methodological framework for investigating the local to global effects of campus-space in cities. In order to understand the relationship between movements of clusters and land use, the identification of whole structure characteristics about residential and retail areas, which are genetic codes for cities, have been provided by this theory.

## 2. CASE STUDIES AND HISTORIC BACKGROUND

The main aim is to understand the general effect that university campuses have on their surrounding areas and how these areas find their place within the structure of a city. To meet this purpose, case-study areas have been chosen according to their similarities and the variety of campus locations from two different countries. The primary similarities are campus numbers and locations in a city, and general geographical, natural features, the city's location in the country, and transportation features.

Eskisehir is a city located in the centre of Turkey and the population of the city increased rapidly between 1950 and 1985. In addition to new industrial developments, during this period, higher education facilities had great progress and the city's land use was affected deeply (Ilgar, 2008). The city hosts two universities: Anadolu University, founded in 1982, and Osmangazi University in 1993. AU has two campuses, which are Yunus Emre, the oldest campus in the town, and Iki Eylul, which was opened in 1998 (Figure 1).

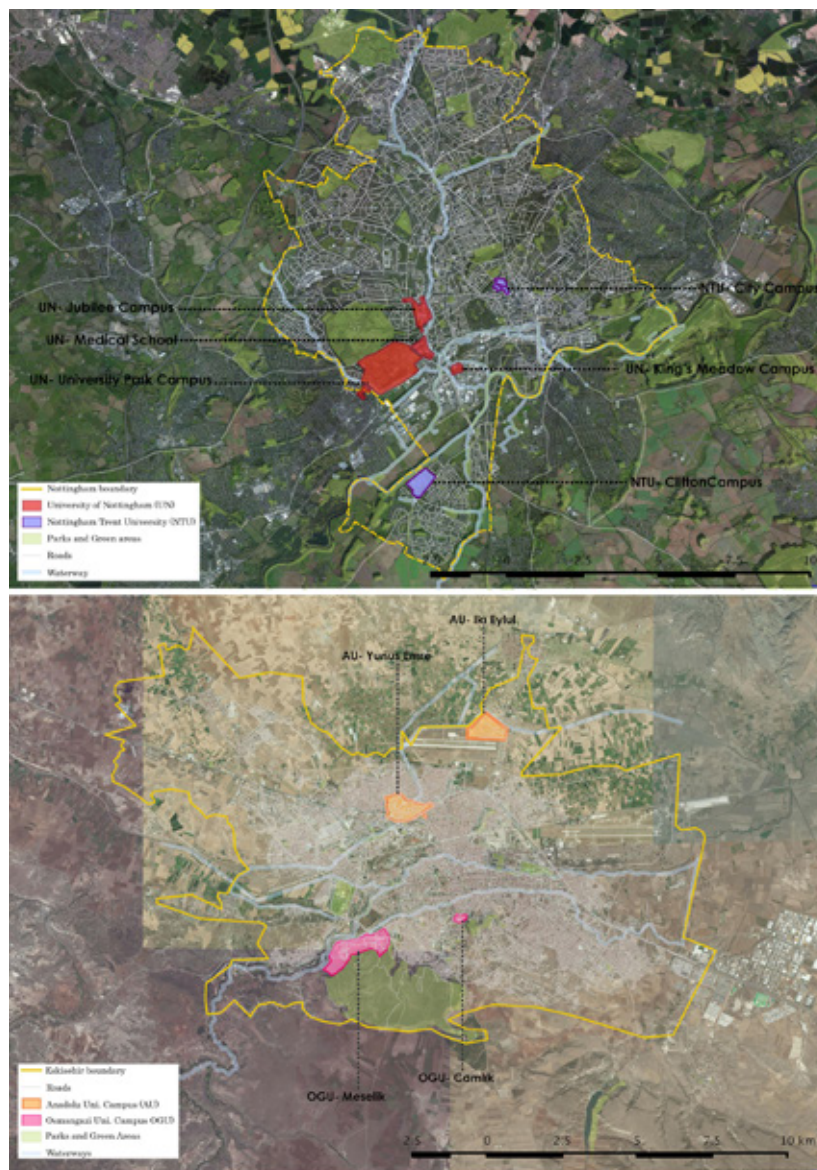


Figure 1 - Campus locations and general features of Nottingham (above) and Eskisehir (below) (Sources of Nottingham: based map; Bing aerial and roads, green areas and waterways; EDINA Digimap, Sources of Eskisehir: based map; Bing aerial, roads, green areas and waterways; Geofabrik)

The city of Nottingham is located in the East Midlands, in central England. Two universities are located in Nottingham: the University of Nottingham and Nottingham Trent University. The University of Nottingham's roots are in 1798 and in 1881, the school had its first permanent building, which is now Nottingham Trent University's building in the city centre. The university moved from its present main campus (University Park) in 1928 on the outskirts of the city. Overall, in Nottingham, the university has University Park, the Medical School, and the King's Meadow (2005) and Jubilee Campuses (1999). The second one, Nottingham Trent University, was originally founded in 1843, with a different name and after a few formations in 1992 it was initiated. Currently, it has two different campuses, which are known as City campus and Clifton Campus (Figure 1).

### 3. SYNTACTIC ANALYSIS OF CITIES AND STUDENTS' LIVING PLACES

The spatial analysis mostly focuses on how university campuses integrate and connect to the whole urban system and how they relate to the movement patterns of urban structure as an attractor, investigating the relation between spatial network and potential of movement. Choice and integration measures, which are through-movement and to-movement, are the major means of analysis to indicate potentiality of surroundings (Hillier and Hanson, 1984).

Campuses are divided into three types: city centre, edge of the city, and outside of the city. 'Outside' campuses' integration values are not high like the other campuses but still integrate with the city. Anadolu University Yunus Emre campus in Eskisehir and Trent University in Nottingham are city campuses, Osmangazi University and the University of Nottingham are edge of the city, and Iki Eylul campus of AU and Clifton campus of NTU outside campuses. After explaining the relation of the universities with their own towns, each case will be compared.

Figures 2 and 3 demonstrate the normalised angular choice analysis for two case-study cities in radius  $n$ , which refers to the potential of route choices of each segment in global scale. It illustrates the least accessible segments in blue and with high potential of accessibility in respect to the whole system in red. In Nottingham, all university campuses link to a system with a street that has a high value, including the outside campus, namely Upper Parliament Street and Mansfield Road in the City area, Clifton Boulevard and Derby Road in the Lenton area, and Clifton Lane in the Clifton area. In Eskisehir, the edge and city centre campuses have similar characteristics, however, the outside campus does not have as high value as the others. In Eskisehir, Ismet Inonu Street and Universite Street in the Tepebasi area and Ataturk and Genclik Boulevards are identified as high streets. In addition, around 1 km distance, that is suitable distance to walk, surrounding area of campus boundary and campus' own structure was selected to evaluate.

For Eskisehir, results show that the area around the city centre campus has a good integration with the city (Table 1). OGUM campus area is less integrated compared with the whole system. The reason for this is not only related to integration with the neighbourhood, it is also associated with the university's connectivity. The third, Iki Eylul, has almost the same integration value as the average of the whole system according to global integration value, but here, numbers of segments are lower than the others. In addition, the connectivity of the whole system with each area has different relations, for instance, OGUM campus is slightly higher (approximately 0.2 more) than the outside one and the central campus has the highest connectivity value.

Normalised angular analysis		Connectivity	Segment length	Normalised Integration (To-Movement)								Normalised Choice (Through Movement)									
				R400	R800	R1000	R2000	R3000	R4000	R6000	R8000	Rn	R400	R800	R1000	R2000	R3000	R4000	R6000	R8000	Rn
Eskisehir Segments Model n= 34 756	Min.	1	0.0007	0.403	0.399	0.400	0.414	0.481	0.505	0.473	0.526	0.576	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
	Max.	6	1702.05	3.428	3.777	3.799	2.425	2.144	1.969	1.850	1.806	1.745	1.679	1.703	1.738	1.578	1.538	1.533	1.515	1.522	1.582
	Average	4.413	54.634	1.402	1.319	1.289	1.214	1.178	1.153	1.122	1.102	1.098	1.012	1.027	1.025	1.005	0.989	0.977	0.959	0.947	0.920
City Centre AU- Yunus Emre Campus (main)	Min.	1	0.028	0.403	0.482	0.433	0.467	0.530	0.589	0.661	0.678	0.711	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
	Max.	6	507.688	2.522	2.350	2.124	2.074	1.849	1.825	1.704	1.599	1.635	1.493	1.475	1.477	1.472	1.476	1.468	1.500	1.516	1.582
	Average	4.416	49.041	1.389	1.327	1.303	1.240	1.212	1.201	1.161	1.112	1.133	1.027	1.040	1.037	1.016	1.001	0.991	0.975	0.960	0.942
Edge of the city OGU- Meselik Campus	Min.	1	0.004	0.443	0.399	0.400	0.421	0.508	0.505	0.473	0.548	0.632	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
	Max.	6	889.753	2.505	2.291	2.546	1.940	1.714	1.644	1.542	1.460	1.524	1.52	1.613	1.634	1.504	1.519	1.517	1.490	1.449	1.494
	Average	4.187	57.672	1.310	1.218	1.184	1.100	1.049	1.002	0.978	0.967	0.992	0.998	0.999	0.997	0.976	0.959	0.944	0.929	0.915	0.888
Outside of the City AU- İki Eylül Campus	Min.	1	0.112	0.543	0.504	0.499	0.414	0.495	0.562	0.651	0.660	0.709	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
	Max.	6	1242.2	2.664	1.883	1.911	1.954	1.968	1.834	1.629	1.463	1.515	1.613	1.629	1.527	1.408	1.396	1.409	1.353	1.337	1.367
	Average	3.980	88.332	1.375	1.183	1.138	1.005	0.990	1.051	1.065	1.015	1.043	0.834	0.899	0.950	0.871	0.828	0.809	0.788	0.768	0.751

Table 1 - The comparative ranges of spatial measures of 1 km distance surrounding area from boundaries include campus's internal system against the whole system of Eskisehir.

Normalised angular analysis		Connectivity	Segment length	Normalised Integration (To-Movement)								Normalised Choice (Through Movement)									
				R400	R800	R1000	R2000	R3000	R4000	R6000	R8000	Rn	R400	R800	R1000	R2000	R3000	R4000	R6000	R8000	Rn
Nottingham Segments Model n= 33 231	Min.	1	0.001	0.318	0.229	0.203	0.245	0.269	0.273	0.285	0.302	0.323	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
	Max.	6	11131.6	3.818	2.685	2.804	1.758	1.655	1.548	1.465	1.391	1.233	1.723	1.622	1.546	1.478	1.506	1.514	1.515	1.492	1.505
	Average	3.733	49.065	1.069	0.928	0.899	0.859	0.851	0.840	0.831	0.807	0.758	0.899	0.908	0.904	0.885	0.807	0.864	0.851	0.841	0.807
City Centre NTU- City Campus (main)	Min.	1	0.197	0.478	0.490	0.513	0.569	0.595	0.617	0.636	0.625	0.609	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
	Max.	6	615.49	2.328	1.845	1.780	1.735	1.549	1.499	1.444	1.381	1.214	1.434	1.405	1.406	1.437	1.450	1.695	1.493	1.470	1.504
	Average	3.967	41.479	1.171	1.089	1.090	1.114	1.102	1.095	1.080	1.026	0.957	0.952	0.963	0.961	0.944	0.933	1.103	0.922	0.916	0.897
Edge of the city UN- University Park Campus (main)	Min.	1	0.014	0.388	0.333	0.344	0.345	0.376	0.382	0.419	0.449	0.456	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
	Max.	6	1071.3	3.303	2.017	1.794	1.449	1.340	1.375	1.349	1.272	1.145	1.513	1.444	1.418	1.418	1.393	1.652	1.383	1.393	1.504
	Average	3.734	55.430	1.087	0.92	0.882	0.814	0.793	0.797	0.828	0.831	0.789	0.872	0.900	0.901	0.889	0.876	1.062	0.854	0.844	0.816
Outside of the City NTU- Clifton Campus	Min.	1	43.071	0.387	0.303	0.333	0.286	0.294	0.302	0.307	0.302	0.323	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
	Max.	6	1111.44	2.697	2.291	2.804	1.461	1.310	1.289	1.183	1.012	0.938	1.697	1.529	1.533	1.466	1.506	1.775	1.515	1.471	1.484
	Average	1.061	43.071	1.036	0.905	0.858	0.792	0.789	0.785	0.753	0.660	0.607	0.904	0.904	0.897	0.871	0.859	1.046	0.842	0.820	0.769

Table 2 - The comparative ranges of spatial measures of 1 km distance surrounding area from boundaries including campus's internal system against the whole system of Nottingham.

City and UNUP areas are significantly close to the whole model's value. It is significant that these areas provide the wide range of spatial syntactic values and refer to diverse types of urban space. On the other hand, Clifton area values are restricted within a narrow range and the maximum value is much lower than in other cases.

The wide-ranging differences between minimum and maximum values of area refer to duality structure of the city and the diverse characteristics of it. The duality structure of the city depends on patterns of local differences and global similarities that describe settlement forms (Hillier, 2001). Socio-cultural life creates one pattern, which is domestic life and socio-economic activities, while trade generates another. Therefore, less integrated areas generated by local process and refer residential site. Students are the agents who effect to flow between those patterns.

Normalised integration and choice combination analysis shows that student accommodation is located mostly in streets that have a warm colour at the higher end of the integration spectrum (Figure 4). This distribution is especially visible at radius 800 and 2000. Radius 800 is associated more with local scale, that is a distance walkable in 5-10 minutes, while radius 2000 is a suggested measure for urban-scale vehicular movement. In the Eskisehir analyses, the blue (segregated) areas are not preferred by students, while the most significant thing is that accommodation is clustered around high integration streets at a local radius. Student households are not detected in the south part of the city centre campus area, and the west part of the edge campus area even has a good value in global scale. It shows that students prefer to live in areas which are suitable for short travels on foot or by vehicles.

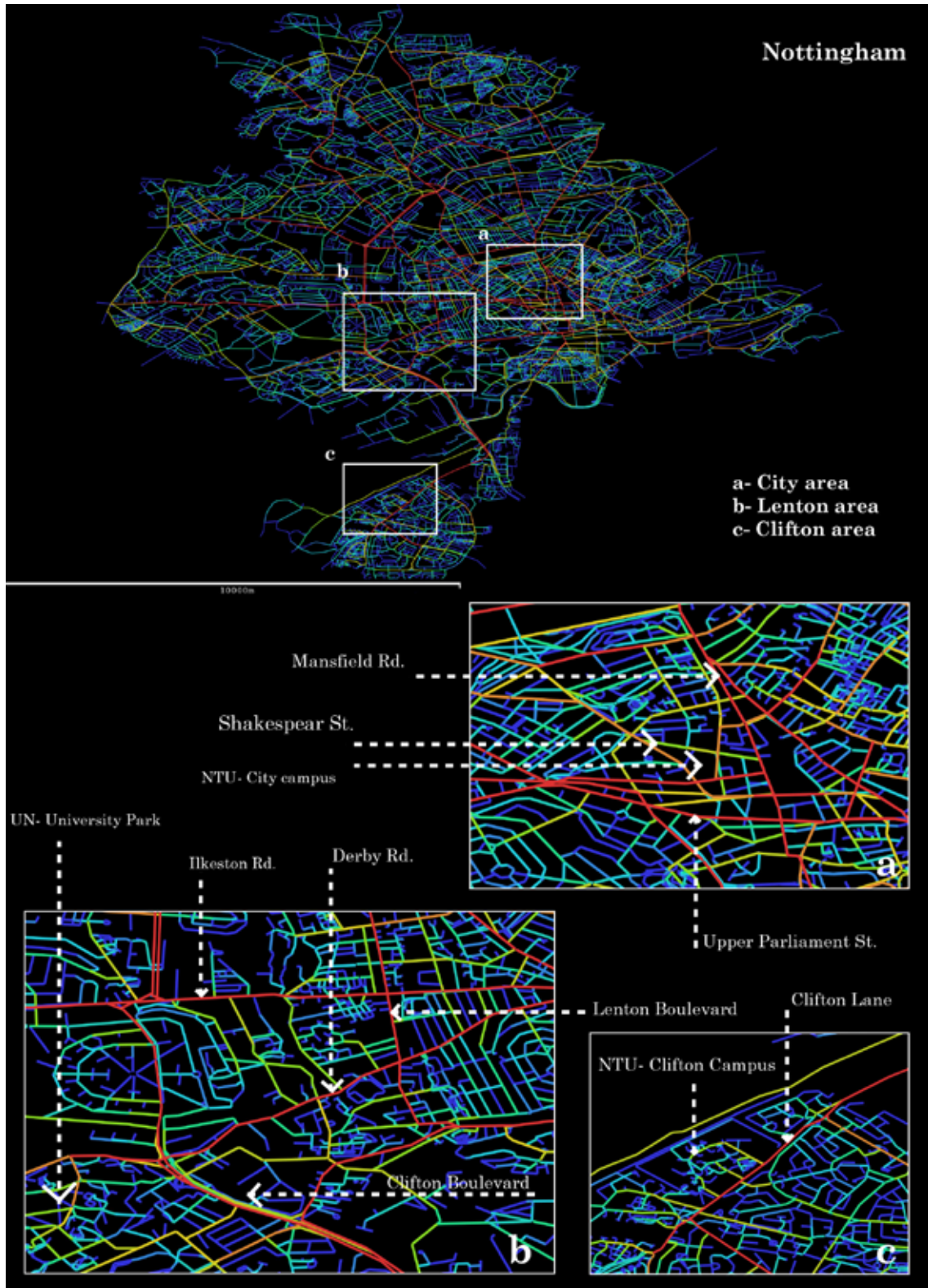


Figure 2 - The spatial normalised angular choice analysis at radius n of the whole system of Nottingham.

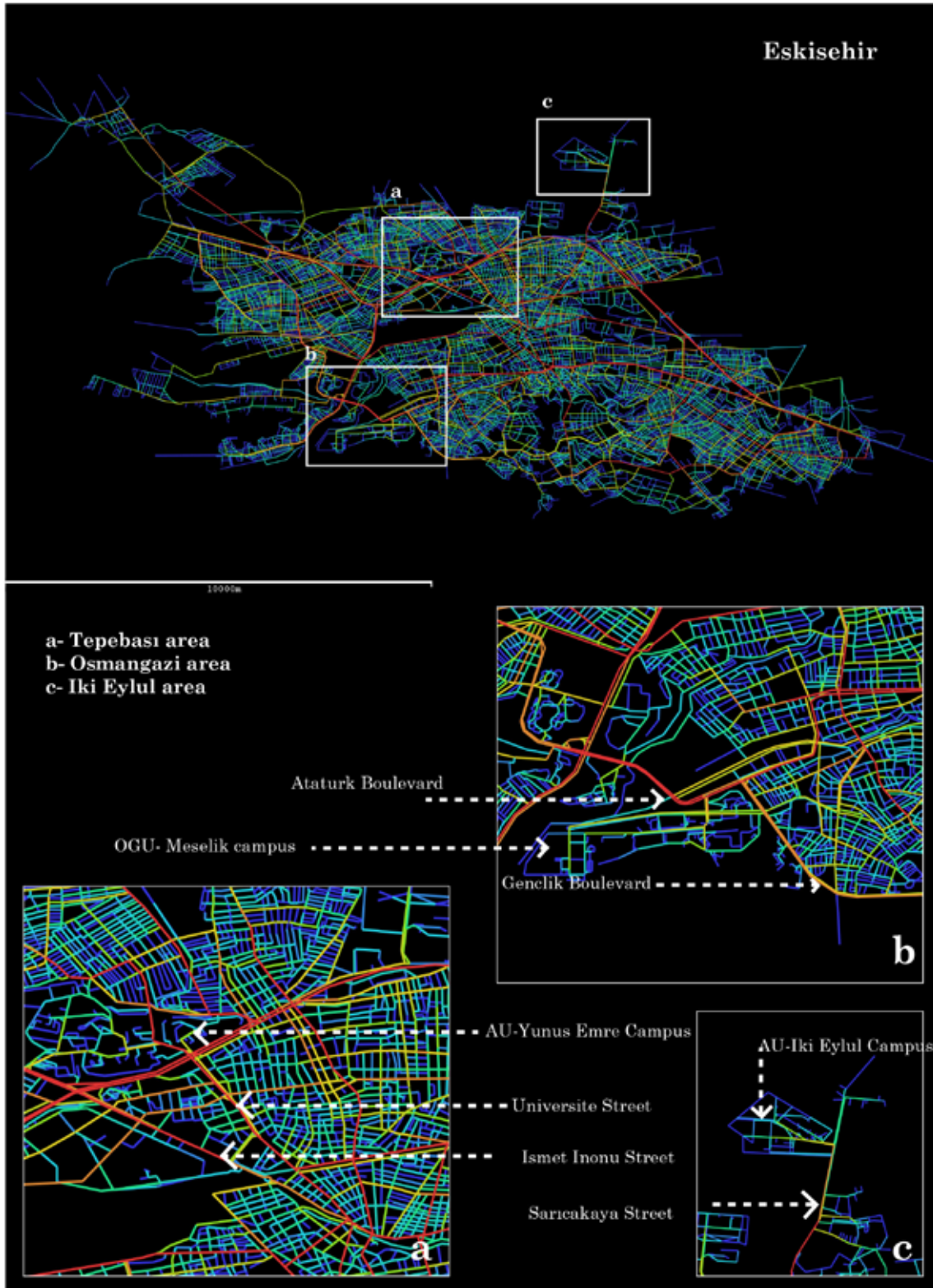


Figure 3 - The spatial normalised angular choice analysis at radius n of the whole system of Eskisehir.



Nottingham city centre campus and edge campus have high integration, however, the outside campus area has a lower average than the whole system (Table 2). NTU City area values are significantly more than all others. The minimum and maximum values of NTU

Selected segments according to student accommodation's entrance normalised choice and integration combination values show that student accommodations in 2 km distance from city centre campus in Eskisehir are located significantly integrated segments and also have high choice values in local to global scale (Figure 4). On the other hand, the accommodation around OGUM campus also has high value at a local and intermediate scale but average values are lower than the model's at a global scale. In Nottingham, by contrast, the highest percentage of student households are located in accessible and 'easy to pass' areas at a local, intermediate, and also global scale, especially in Lenton (Figure 4). Students relatively occupied the city centre in both cases and also local and intermediate scales come to the forefront for both.

#### 4. COMPARATIVE ANALYSIS

In order to explore the range of different socio-spatial interfaces between university buildings and the city in a greater depth, focusing on daily life activities and user types in student areas (Figure 4), user routes and activity questionnaires were conducted on high streets in both case study cities: Mansfield Road and Upper-parliament Street (UK) and Universite Street (Eskisehir) for city centre campus types and Derby Road (UK) and Genclik Boulevard (Eskisehir) for edge of the city campus types. These streets are intersections of foreground and background network of the cities according to syntactic analysis – that is they are local-global structures. Participants in the surveys were asked to draw their destination routes from start point to end point on a map. The kinds of user activities in selected areas were revealed through asking participants' their reasons to be in each location at that time. Participants, who are pedestrians, were selected randomly in the streets and divided into student or non-student groups and the approximate user percentage was specified. The survey was conducted on more than 25 people for each case during working hours (starting at approximately 11.00 am and ended at 7.00 pm). The study was only focused on pedestrian behaviour since it assumed that this travel mode has more contribution for casual encounters, commercial and daily life activities in which students participate. Segregated campuses have not been taken into account since there is not any shop or activity centre in both towns.

According to the results (Figure 5), participants' reasons for being there are mostly related to the university and a few non-student participants also selected this option. Therefore, the university is an attractive element for users of these areas. It is notable that for each area except the city centre campus in Nottingham, numbers of students has highest percentage of participants but even then the percentages are very close to each other in Nottingham city centre (57% non-student and 43% student).

At the city centre campus, shopping, eating, meeting or visiting friends/family, and drinking coffee/tea are the activities that have the significantly highest. Dominant activity types at edge of the city campuses are not similar to those in the city centre. In the case of Eskisehir, university is the primary reason for many of the users (31%) but for Nottingham it is relatively low (14%). Meeting or visiting friends/family and shopping activities are still the most popular. Eating and drinking activities, which were significant for city centre cases, almost disappear in the edge areas.

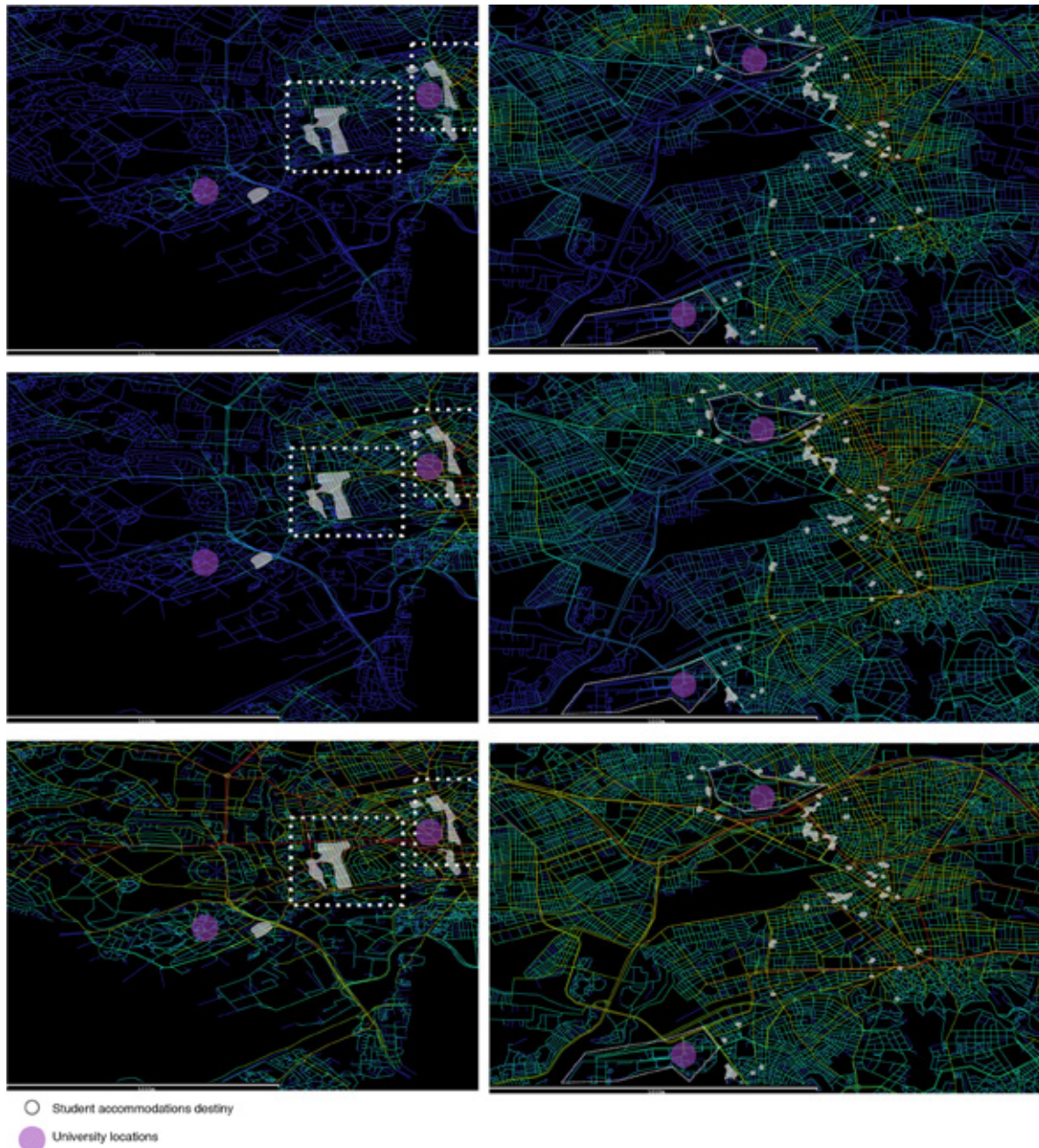


Figure 4 - Normalised choice and integration combination analysis in r 800 (above), r 2000 (middle), and r n (below), overlapped with student accommodation and university campus locations in Eskisehir (right) and Nottingham (left).

Survey shows that for all areas, participants living there are mostly students (Figure 5). Additionally, most of the activities are dominated by students in all areas, especially those related to commercial purposes such as shopping, eating, and going to pubs or cafes. However, results for the city centre area in Nottingham were not significantly similar. On the other hand, in the other type of campus areas some of the commercial activities disappeared. For example, in Nottingham it was eating and for Eskisehir it was the cinema and going to pubs and bars, or activities related to domestic life or worship.

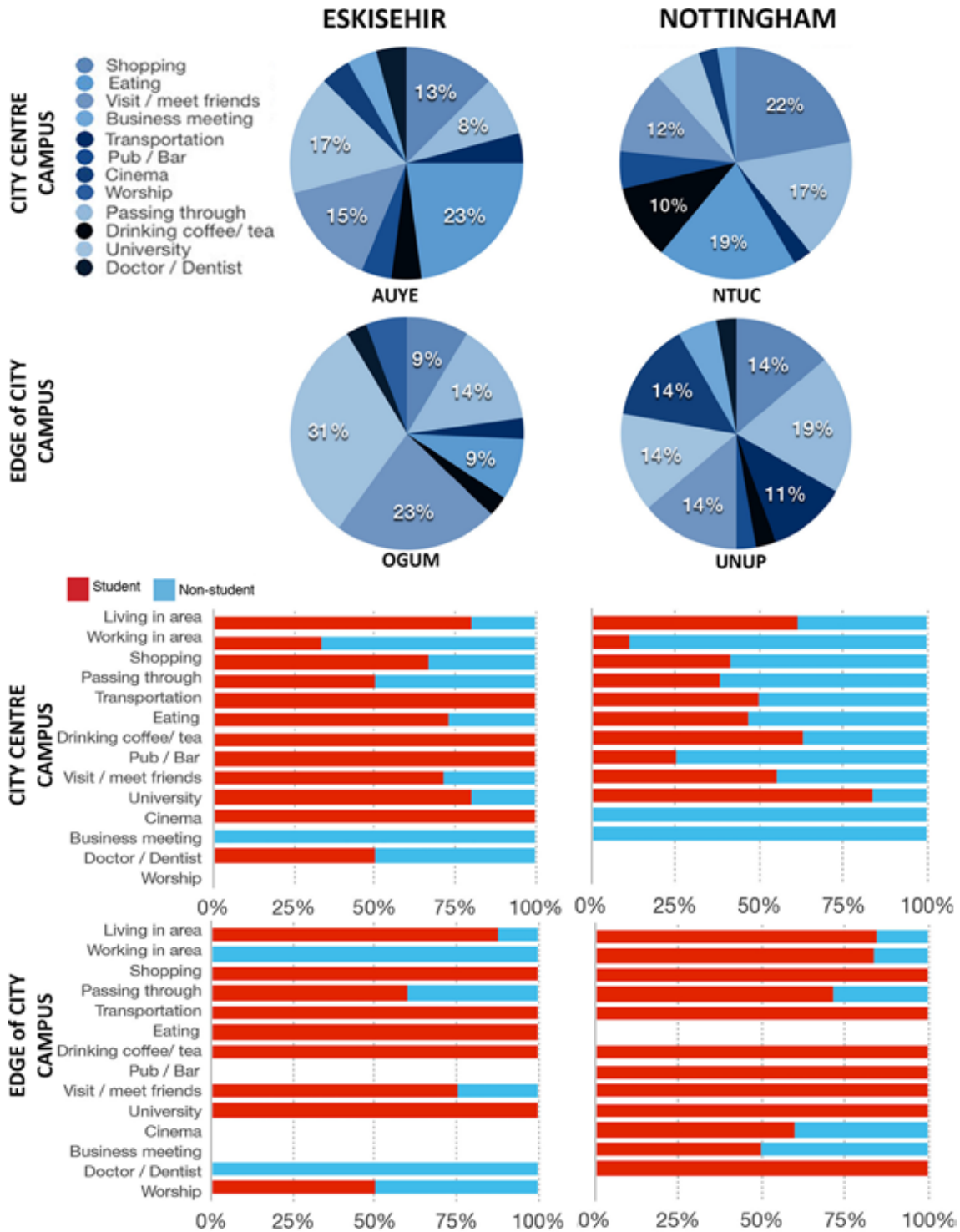


Figure 5 - Illustrations reveal the activity of selected area users according to survey results (above). Charts show the distribution of activities in areas and user types according to survey (below).

#### 4.1 CITY CAMPUS AREAS

The purpose of the tracing exercise was to view the distribution of users' movement in the survey areas and evaluate students' and non-students' movement patterns. According to Hillier et al. (2012), analysis at radius 400 or 800 are useful for indicating the spatial structure of local high streets, which have various kinds of activity. An intermediate scale between local and global scale is radius 1000, and higher scales such as radius 2000 and 3000 reveal global road networks. The reason for choosing these values is to interpret tracing results in relation to the syntactic radius to indicate the nature of the local movement pattern in relation to a range of urban scales.

In Nottingham, area selection was more complicated for this type of campus than in Eskisehir. The primary reason was that student household distribution was concentrated in two areas, with more than 40% (Figure 6). Therefore, the survey was conducted in two different areas: the north of the NTU around Mansfield Road and the south around Upper Parliament Street.

The survey results show that student and non-student user percentages are very close but in both areas non-students are over 50%. Therefore, there is not significant student domination in this centre campus, but the surrounding areas are interface areas since more than 50% of participants who live there are students. In addition 25% of participants work in the area so there are many office buildings.

Mansfield Road and Upper Parliament Street are the two streets with the highest value in choice analyses (Figure 6). Tracing results demonstrate that non-student participants' routes cover a wider area than students' and these roads are the higher-value ones in choice r2000 analysis. According to Mansfield Road tracings specifically, students stayed in the triangle between Mansfield Road and the parallel road, Sherwood St, or streets that intersect them. Movements were similar in nearby Upper Parliament Street. Students' routes overlap highly with non-students'; however, non-students' have a wider range of starting and end points. This shows that this area is attractive for both user types as daily usage, but for students the area is attractive for living because of its proximity to the university.

In Eskisehir, the movement tracing area was selected according to the distribution of student accommodation and university location. It is notable that background area, which is around University Street, is the place in which many studio flats sprung up after 2000 to fill the empty spaces in the urban grid (Figure 7). In this area, the tracing results indicate that 75% of users are students and their routes are more distributed along the background network than non-students'. Non-student users mostly choose streets that have high value in choice analysis and 40% of non-student participants are in the area because of the university, while 50% are only passing through.

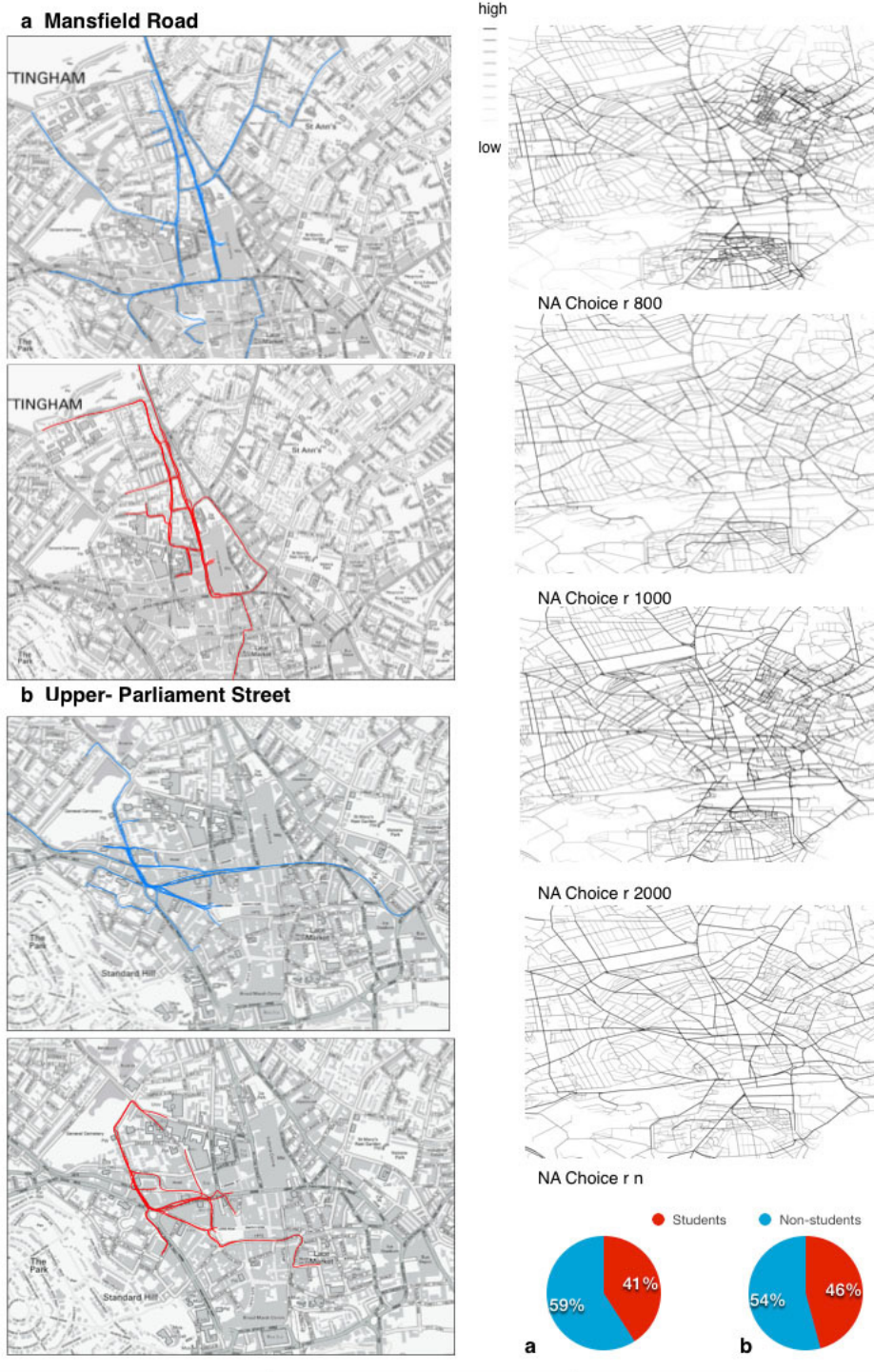


Figure 6 - Illustration of tracing and questionnaire results and normalised choice analyses for city centre campus area of Nottingham.

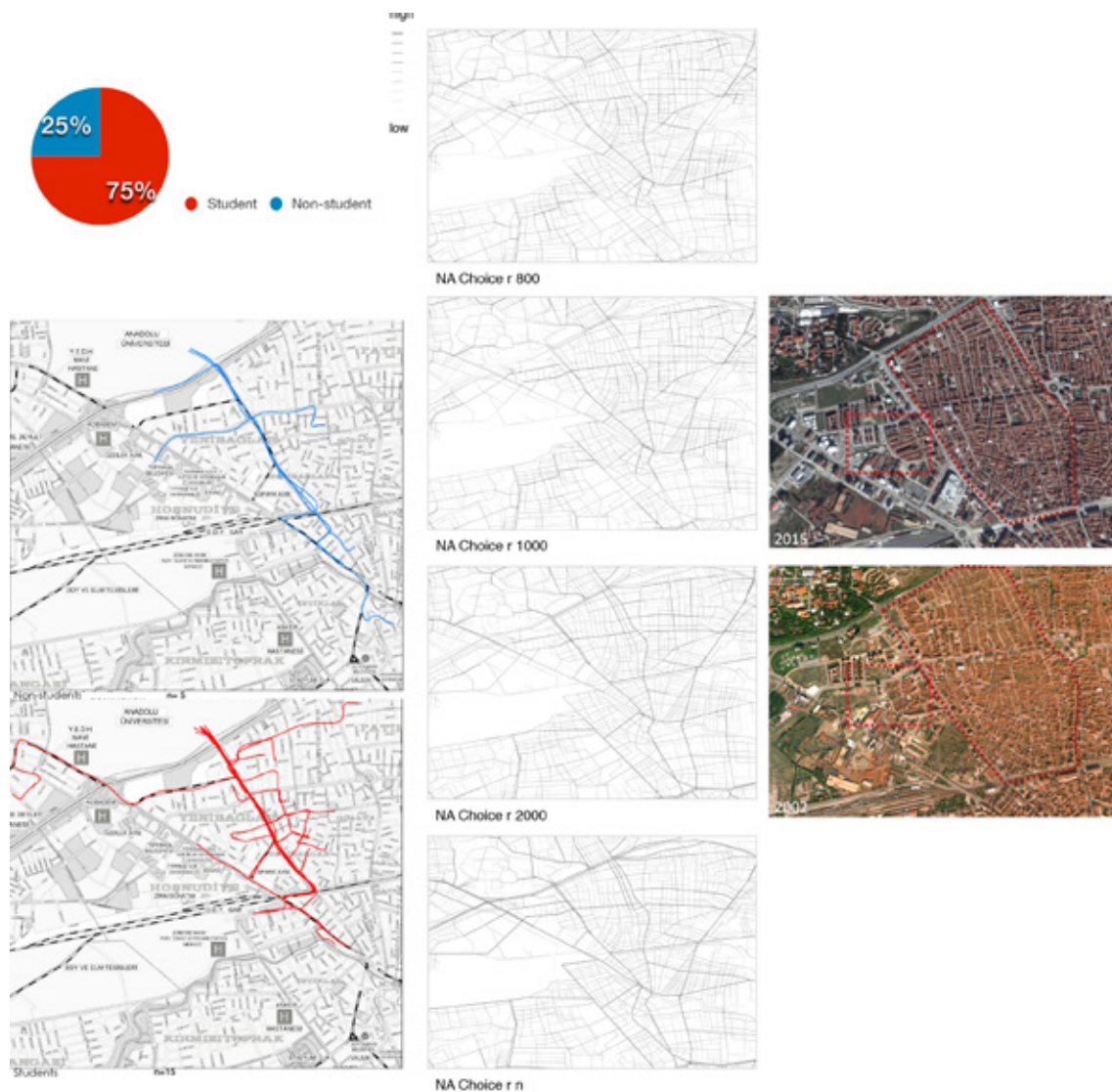


Figure 7 - Illustration of tracing results and normalised choice analyses for city centre campus area of Eskisehir and land use changes rapidly after 2000 (right). (Source of historical and current base maps: Google Earth) (Above image 2015, below image 2002)

Hillier's (1996) theory of movement economy suggests that development of the spatial organisation of settlements depends on areas of busier and quieter movement pattern flows, and that these patterns affect land use decisions. Identification of these changes and movement patterns influences future land use choices and local grids to adapt improvements that are more intensive. The influence of movement on land use and production of space will be evaluated and to do this, Eskisehir is a useful example based on improvements over the last decade.

The buildings along Universite Street start from Eskisehir city centre campus and host diverse ground floor use such as restaurants, cafes, grocery shops, local markets, retail, and service facilities (Figure 8). This diversity has rapidly increased over the last decade and the changes are continuing with other streets that have a good integration between them. On the other hand, other research areas do not include these kinds of diversity or rapid changes. In Nottingham city centre campus there have been some changes but they are not along one specific street or related to an area directly.

After 2000, the number of private accommodations significantly increased in Universite Street and unused lands started to fill rapidly in the surrounding areas. The other high street, called Ismet Inonu, started to change in the subsequent years. Old factories and workshops were closed and most of them moved outside of the city. New buildings were erected and existing ones were renovated and transformed, some into entertainment and youth centres, but mostly restaurants, pubs, and bars (Figure 8). On the contrary, ground floor usage is more diverse in Universite Street than Ismet Inonu but both of them have significant changes.

Hillier et al. (2012) propose that, all things being equal, urban shopping streets are maximised in local normalised choice value and some specific values refer some situations such as less than 1.2 shops do not start being a group, 1.3 refers continues shops, 1.4 means a local centre and 1.5 is associated with main centre. University Street which is ending with campus, has a good nature to continues shops in average value, and also even the maximum values in radius 1000 and 2000 are refer to local centers (Table 3). The other street's values are lower than and in local scale values less than 1.2, but between local and global scale, values are suitable for grouping shops. So, both streets have significant attractiveness in intermediate scale.

Normalised angular analysis		Normalised Choice (Through Movement)						
		R 400	R 800	R 1000	R 2000	R 3000	R 4000	Rn
Eskisehir Segments Model	Min.	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Max.	1.679	1.703	1.738	1.578	1.538	1.533	1.582
	Average	1.012	1.027	1.025	1.005	0.989	0.977	0.920
Universite Street	Min.	0.962	1.167	1.218	1.256	1.263	1.246	1.226
	Max.	1.279	1.364	1.400	1.461	1.433	1.465	1.552
	Average	1.430	1.272	1.308	1.351	1.361	1.376	1.423
Ismet Inonu Street	Min.	0.840	1.057	1.113	1.201	1.233	1.260	1.321
	Max.	1.074	1.111	1.185	1.260	1.273	1.293	1.349
	Average	0.974	1.089	1.146	1.228	1.254	1.277	1.340

Table 3 - Universite and Ismet Inonu Street's normalised angular choice analysis results.



Figure 8 - Map illustrates the present land-use map of Eskisehir city centre. (Based on map provided from municipality and land-use information was input by author) and aerial pictures highlight the transformed area in last decade. (Base map source: Google Earth)

#### 4.2 THE EDGE CAMPUS AREAS

Osmangazi area is in the eastern part of the campus and the accommodation facilities detected only in this area for OGU and also student's questionnaire notes demonstrates that most of them live in studio flats or shared apartments which are located this area. The unoccupied land changes between 2002 and 2015 were mostly residential low-height apartments, with the ground floors are used for residential purposes (Figure 9). However, syntactic analyse in radius 2000 which is representing intermediate scale show that the streets of the area have a high value. The participants are mostly students here (80%). The tracing paths demonstrate that non-students are also using the background network since 50% of non-students live there. Besides, some of the destination line of student traces end or start at Tepebasi, which is the Anadolu University area. It means that some students prefer to walk between city centre campus and this area.

According to the results for Nottingham (Figure 10), 76% of participants are students here and this area has the highest rate of student households in all Nottingham. Specifically, in the area between Derby and Ilkeston Roads, which are roads with a high value in radius 1000 and 2000, approximately 65% of households accommodate students. At a local scale, the area is a totally residential part of the city and there is not a significant local centre, but a normalised choice radius 2000 map demonstrates that this area is mid-range, between local and global. The movement pattern of students is mainly on Derby Road. This area does not include any local retail activity except the only shop, a chain market, and also there is a cinema and bank.

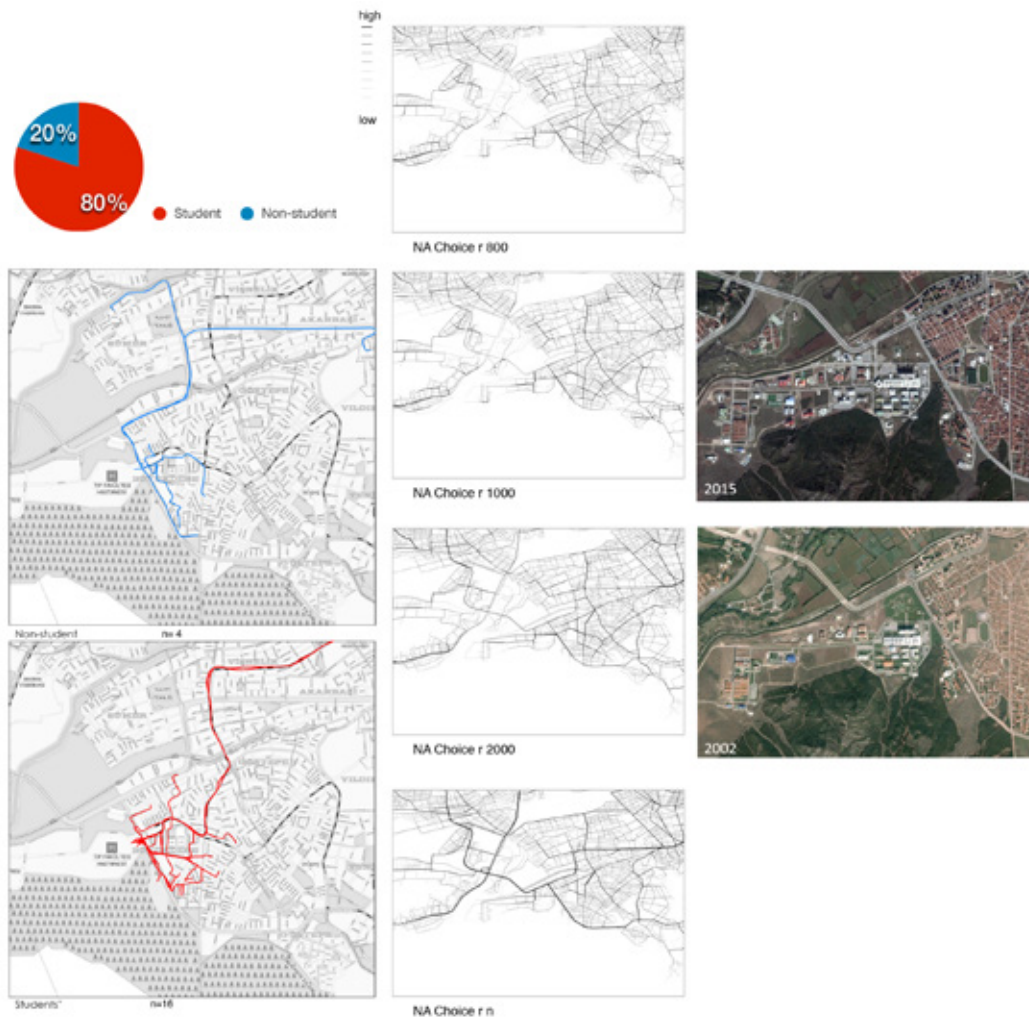


Figure 9 - Illustration of tracing results and normalised choice analyses for edge of the city campus area of Eskisehir and land use changes rapidly after 2000 (right). (Source of historical and current base maps: Google Earth) (Above image 2015, below image 2002)





Figure 10 - Illustration of tracing results and normalised choice analyses for edge of the city campus area of Nottingham.

## 5. DISCUSSION

The survey data and analysis show that the area of city centre campuses which have the first higher educational buildings in each town, have diversity in economy and user activity. In addition to this, non-student users mostly use only high streets in those areas. However, students' movement also has variety and distribution through residential areas. Moreover, in both city centre areas, building transformation has occurred – in Eskisehir's case small workshops and old factories have been turned into entertainment centres. Vaughan et al. (2010) suggest that for suburban town centres, the potential embedded in the street network is the key element of providing vitality in local centres and also the activities of someone such as routine, extensive and varied ones become a reason of movement in specific area. In this case, it might be said that going to university as a daily routine activity of students therefore, the AU campus might be the reason for enhancing the potential routine movements in neighbourhood area and provide regular usage of this area by students and academic 'guilds'. This routine movement pattern facilitated the transformation of the area from industrial site to entertainment streets according to their segment's potential in whole structure.

Nottingham city centre campus area that includes Mansfield Road and Upper- Parliament Street, appears to be an interfacing area between students and non-students. It is not dominated directly by students, but in local scale analysis, students become a characteristic of the area. It is notable that this area is more complicated than Eskisehir. This complexity might depend on the highest value of the area in syntactic analysis and also the historical background, since this study does not cover the changes before and after first university settlement. Only some small changes have been detected in recent years. It is clear that this area is one of the preferable living places for students, but the reason for the changes is the presence of students or presence of students' reason is these changes is not clear. Thus, this may be a controversial and complex topic than it seems and it may be evaluated further with detailed research by analysing land use changes since the university open in there.

Syntactic analysis shows that edge campuses are located in accessible locations in towns, not only for students but also for all users, although they are gated and have own internal structure. This might affect the urban pattern and the development of some surrounding areas. The student areas were framed by high value streets in intermediate scale in both cases. This also might be the reason for these cities' reputations as student towns since in city centre; student pattern is highly tangible because of their location's centrality.

## 6. CONCLUSION

This study aims to explore the university and town relation and university campus influence on the sustainability of a town as a creative city. The urban structure of the two cities were analysed to understand more about how their spatial morphology relates to their current socio-economic situation in the context of presence of students. There is a pretty simplistic idea of the role of universities in the development of cities, and these have been invoked as part of a push to make 'creative cities' attractive to urban decision makers. The study suggests that the university-town relationship and its dual benefits is a complex urban phenomenon. However, students provide vitality, and the study suggests that the differences between student and non-student users' movement patterns affects the production of space and enhance usages of different areas. Overall students are settled down more in relatively integrated areas of the city and participate in the movement economies of these areas. A spatial-morphological analysis suggests how universities, students and student life in cities cannot be artificially separated from the life of the city as the popular image of 'town and gown' might suggest – on the contrary, the historic relationship of the city and the university continues to create new synergies - and challenges – that need to be the subject of research.

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