

Open Space Management in Universities: With Reference to the University of Kelaniya, Sri Lanka.

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Abstract: Open space which refers to the land set aside during the development process is a contemporary topic as it is mandatory for a healthy education environment. As the intake of undergraduates of University of Kelaniya (UOK) are increasing significantly, available open space and the per capita open space of UOK are decreasing. Quantitative research approach was employed in terrain (2184296ft²) of UOK, to analyze sufficiency of available open space types of University of Kelaniya by 2014. The specific objectives were to identify available open space by year, to identify available open space per undergraduate by year, to estimate the impact of student enrollment on open space of the University, to identify available open space types per an undergraduate of University of Kelaniya and to map the available open space types of university of Kelaniya. Primary sources such as Department Records and Annual Records of Administration Division of the University of Kelaniya were used to collect data. University maps other quantitative data and code of practice on provision of public open space, sport and recreation by North Devon District Council (2004) were used. Arc GIS and SPSS were used as analyzing software. Results implicated that available open space per an undergraduate of the University is 165.77ft² by 2014. Among the four open space types viz. playing pitches, multi-use games area, equipped facilities for children and young people and informal open space, only playing pitches and informal open space were identified. Space per undergraduate on playing pitches and informal open space were insufficient with the increased number of undergraduates. To meet with the recommended open space amount per person, deficiency of 114.03ft² and 118.47ft² must be replete in identified two open space types. Other types of open spaces should be introduced to the University by utilizing the available open space as there is an imbalanced utilization of prevailing two open space types. And the impact of student enrollment on open space of the University is [2500833.149ft² - (105.685ft²*total student enrollment)].

Keywords: Education, Open Space, Open Space Types, Student Enrollment

I. Introduction

Open space is mandatory for a healthy education environment and it means many different things to different people (USDAFS, 2008; Gibbons, 1998a). According to the EPA (2013), "Open space is any open piece of land that is undeveloped (has no buildings or other built structures) and is accessible to the public". Today, Sri Lankans witness that huge number of development projects are running in the arenas of naval, aviation, commercial and energy as well as the educational sector to develop Sri Lanka as a Naval Hub, an Aviation Hub, a Commercial Hub, an Energy Hub and a Knowledge Hub (MahindaChinthana, 2010). Sri Lankan education has historically taken place within the natural environment, though "students are learning in buildings specifically designed for education (Conners, 1983)" to date. Specifically designed buildings apart from the natural environment which is considered as open space are even used by academic institutions such as universities. The University of Kelaniya (UOK) has its origins in the historic Vidyalkara Pirivena at Peliyagoda, established in 1875 and became the Vidyalkara University of Sri Lanka in 1959 under the Vidyodaya and Vidyalkara Act No. 45 of 1957 (Student Handbook, 2014). Due to the University Act (No 01) of 1972, Vidyalkara University of Sri Lanka became Vidyalkara Campus of University of Sri Lanka. Eventually, through the amended University Act (No 16) of 1978, Vidyalkara campus was renamed the University of Kelaniya, Sri Lanka.

At present, the University is grown up to six faculties, forty six academic departments (Student Handbook, 2014) and educating more than sixty subjects for more than 8000 internal students with more than 600 academic staff (ibid.). Also there are about 650 non-academic staff and 30000 external students in this educational organization. In such fettle, UOK is walking steadily towards her vision by conducting several development projects using the open space which is available at the University's terrain. Hence the intake of undergraduates of UOK are increasing significantly available open space is decreasing and the benefits of open space cannot be absorbed which means that the per capita open space of UOK is decreasing. Hence it was assumed that the open space of the university is negatively affected by the number of student enrollment. The

key objective was to analyze sufficiency of available open space types of University of Kelaniya by 2014. The specific objectives were to identify available open space by year, to identify available open space per undergraduate by year, to estimate the impact of student enrollment on open space of the University, to identify available open space types per an undergraduate of University of Kelaniya and to map the available open space types of university of Kelaniya.

II. LITERATURE REVIEW

Open space means many different things to different people (USDAFS, 2008; Gibbons, 1998a). For example, a recreation director might think of supervised, improved playgrounds while a hiker might envision natural areas undisturbed by man (Gibbons, 1998a). However, "Open space" lacks a consistent definition, but the phrase generally refers to land that is undeveloped or lightly developed for users other than agriculture (Landscape America, 2008). According to the EPA (2013) same definition can be seen regarding open space; "Open space is any open piece of land that is undeveloped (has no buildings or other built structures) and is accessible to the public". "An area of land that is valued for natural processes and wildlife, for agricultural and sylvan production, for active and passive recreation, and/or for providing other public benefits" (Town of Shelburne 2008). "Open space is land and/or water area with its surface open to the sky, consciously acquired or publicly regulated to serve conservation and urban shaping function in addition to providing recreational opportunities" (Marilyn, 1975).

Yet, open space can include: Green space (land that is partly or completely covered with grass, trees, shrubs, or other vegetation), Green space includes parks, community gardens, and cemeteries. Schoolyards, Playgrounds, Public seating areas, Public plazas and Vacant lots (EPA, 2013). For the purposes of the Open Space Conservation Strategy, the Forest Service defines open space as land that is valued for natural processes and wildlife, agricultural and forest production, aesthetic beauty, active and passive recreation, and other public benefits. Such lands include working and natural forests, rangelands and grasslands, farms, ranches, parks, stream and river corridors, and other natural lands within rural, suburban, and urban areas. Open space may be protected or unprotected, public or private (USDAFS, 2008). Those explanations in a few words, express that open space are land set aside during the development process.

Land is commonly set aside for recreation and storm water management purposes, but can also be set aside for natural resource protection, preservation of cultural and historic resources, preservation of scenic vistas, and many other reasons (UDEL, n.d.). Land set aside for recreation is commonly referred to as "active open space," while land set aside for most other purposes is referred to as "passive open space." Passive open space often includes stream buffers, forested areas, floodplains, wetlands, areas of steep slopes, and other areas that are inappropriate for development or are of conservation concern (ibid).

Thus, Gibbons (1998b), had categorized open space by function and suggested following six functional types (1) Natural Resource Protection Areas (includes animal and vegetative habitat, stream belt corridors, trap rock ridges), (2) Outdoor Recreation (parks, playgrounds, beaches, trails, plazas, sitting areas, arboretums), (3) Resource Management (forests, fisheries, farmland), (4) Protection of Public Health and Safety (floodplains, wetlands, unbuildable areas or areas with limitations for development including steep slopes, high water table, shallow depth to bedrock), (5) Areas that Shape Community Character or Design (buffer strips, front, back and side yards, urban plazas, greenways, open space dedications related to development) and (6) Historic or Archeological Sites (battleground, historic structures and grounds, historic districts, town greens) to introduce a taxonomy for open space.

In 2004, North Devon District Council had introduced a new face for open space by categorizing open space types and presenting certain standards for open space types (See Table 1). With the purpose of providing guidance to supplement the policies and proposals such as the country structure plan the Code of Practice on Provision of Public Open Space, Sport and Recreation by North Devon District Council was announced. Now, this code of practice provides necessary guidance to landowners and developers on how the infrastructure or service requirements are likely to be required as a part of their development and how they will be assessed and sought (Provision of Public Open Space, 2004). Hence, this study is focusing on adapting the Code of Practice on Provision of Public Open Space, Sport and Recreation by North Devon District Council to reach the objectives of the study.

Table 1: Open Space requirements per Person (ft²)

Open Space Type	Square Feet per Person
Playing Pitches	129.17
Multi Use Games Area	21.528
Equipped facilities for Children and Young People	21.528
Informal Open Space	269.10

Source: Code of Practice on Provision of Public Open Space, Sport and Recreation (CPPPOSR) by North Devon District Council, 2004

III. METHODS AND MATERIALS

The empirical study was quantitative in nature. A field survey for two weeks was administered to record the GPD locations of the University. Primary sources on past eight years (2007 – 2014) such as Department Records and Annual Records of Administration Division of the University of Kelaniya were used to collect data. University maps, other quantitative data FROM UOK Works Department and code of practice on provision of public open space, sport and recreation by North Devon District Council (2004) were used in analyzing process with Open Space Requirements of CPPPOS and Arc GIS software as analyzing tools (See Figure 1).

To identify available open space by year [Available open space for year $x = (\text{Available open space in previous year} - \text{land used for development for year } x)]$ and to identify available open space per undergraduate by year [Available open space per an undergraduate for year $x = (\text{Available open space for year } x / \text{Total undergraduates in year } x)]$; total enrollments and land usage for development projects since 2007 to 2014 were considered. To identify available open space types per an undergraduate of University of Kelaniya, Open Space Requirements of CPPPOS by North Devon Council (2004) was adopted. Available open space types of university of Kelaniya were mapped using the Arc GIS by adopting CPPPOS by North Devon Council (ibid.).

Based on the hypothesis that the open space of the university is negatively affected by the number of student enrollment; to estimate the impact size of the student enrollment on the university open space, a regression analysis ($Y = \beta_0 \pm \beta_1 X_1 + \varepsilon$) using SPSS software was carried out where y represents open space as dependent variable and X_1 goes to student enrollment per year as independent variable in the model. Also, percentages of recommended open space by CPPPOS and prevailing open space types of UOK and {Percentage amount of available open space type at UOK = [(amount of available open space type at UOK / recommended amount of open space type) * 100%]} were considered in reaching the key objective.

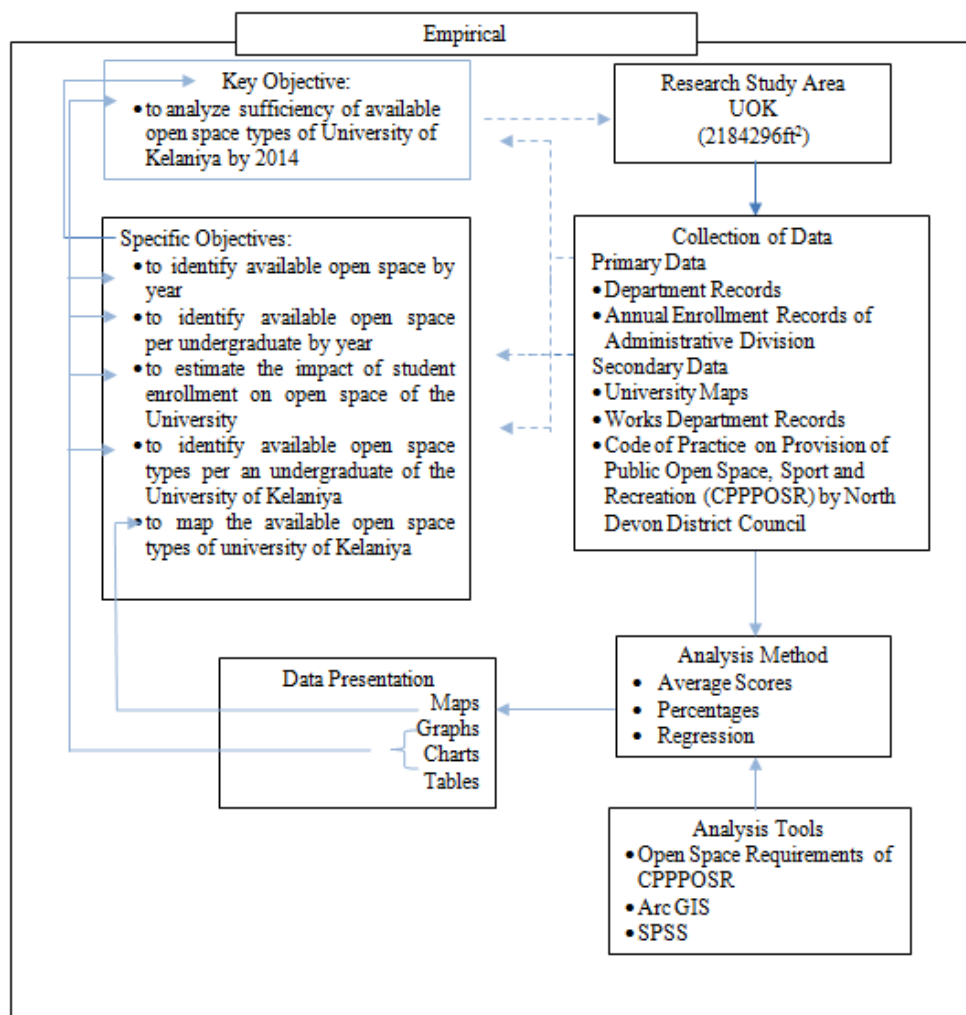


Figure 01: Study Methods and Materials
Source: Designed by the Researchers

IV. FINDINGS

4.1 Available open space at the University by year:

Table 2: Student Enrollment and Available open Space

Year	Number of Student Enrollment			Land Used for Development(ft ²)	Available Open Space(ft ²)
	Male	Female	Total		
2007	3084	4902	7986	543115	1641181
2008	3055	5368	8423	1920	1639261
2009	3121	4960	8081	11101	1628160
2010	2830	5634	8464	6111	1622049
2011	2730	5528	8258	1379	1620670
2012	2742	5937	8679	715	1619955
2013	2601	6217	8818	57316	1562639
2014	2530	6562	9092	55454	1507185

Source: Survey Data, 2014

As per the data on table 2 and figure 2, except in 2009 and 2011 number of students' enrollment had been dramatically increased. Though, the consumed land area for development projects were varied by year; land consumption for development, had directly influenced in the decrease of available open space at the University.

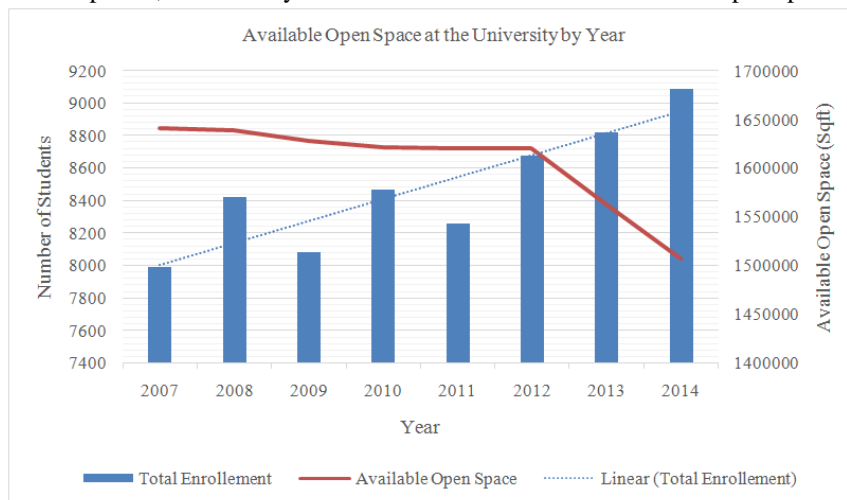


Figure 2: Available Open Space at the University by Year

Source: Survey Data, 2014

Both the table and figure visualize that there is an indirect proportion between number of student enrollment and the available open space at the University as the open space of UOK annually decreases when the number of student enrollment increases.

4.2 Available open space per undergraduate by year:

With the gradually incensement of undergraduate enrollment(See Table 3), available open space per an undergraduate of the University has been decreased to 165.77ft² by 2014as available open space of the university is 1507185ft² by 2014.

Table 3: Open Space at the University and Available open Space per an Undergraduate

Year	Number of Student Enrollment		Available Open Space(ft ²)	Available Open Space per Undergraduate(ft ²)
	Number of Undergraduates			
2007	7986		1641181	205.51
2008	8423		1639261	194.62
2009	8081		1628160	201.48
2010	8464		1622049	191.64
2011	8258		1620670	196.25
2012	8679		1619955	186.65
2013	8818		1562639	177.21
2014	9092		1507185	165.77

Source: Survey Data, 2014

It is pertinent that available open space of the university and available open space per an undergraduate has been dramatically decreased (See figure 3).

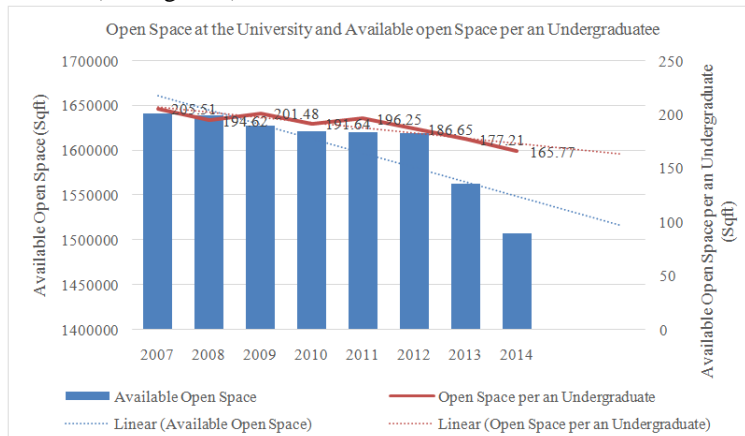


Figure 3: Available open space and open space per undergraduate of the University of Kelaniya by 2014
Source: Survey Data 2014

4.3 The impact of student enrollment on open space of the University:

A model for estimating the impact of student enrollment for the University on its prevailing open space was identified when $Y = \beta_0 \pm \beta_1 X_1 + \varepsilon$ where Y open space and X_1 student enrollment per year. The purpose of estimating above mentioned model was to measure the impact size of the independent variable (Student enrolment) on dependent variable (Open space) and the regression coefficients of estimated model are shown below (See table 5).

Table 4: Model Summary

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.852 ^a	.726	.680	26293.347	.726	15.901	1	6	.007
a. Predictors: (Constant), Total Enrolment									

Source: Survey data, 2014

As per the model summary table, it highlights the prediction capacity of independent variable. “Student enrolment” as the independent variable explains the dependent variable (Open Space) by 72.6%. On the other hand this estimated model is statistically significant at 95% confidence interval. The parameter estimations and their inferential statistics are shown below.

Table 5: Regression Coefficients of Variables

Coefficients								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	2500833.149	224810.420		11.124	.000	1950741.868	3050924.429
	Total Enrolment	-105.685	26.503	-.852	-3.988	.007	-170.536	-40.834
a. Dependent Variable: Open Space Availability								

Source: Survey data, 2014

According to coefficient table, the value of the β_0 is 2500833.149. Which means that the open space area in University of Kelaniya which has no connection with student enrolment. The regression coefficient β_1 - 105.685 shows the slope of the regression line which means that each one enrolment done by the University causes to decreasing of open space by 105.685 square feet. All parameters which have been estimated in above table are statistically significant at 95% confidence interval.

Hence, the estimated model regarding open space can be configured as $Y = 2500833.149 - 105.685X$. By using this estimated model, it can be predicted the expected open space at a given student enrolment.

4.4 Available open space types per an undergraduate of University of Kelaniya:

Among the four open space types viz. playing pitches, multi-use games area, equipped facilities for children and young people and informal open space, only playing pitches and informal open space were identified (See Table 6) during the study.

Table 6: Available Open Space Types at the University (ft²)

University Area: 2184296 University Total Open Space: 1507185 Total Undergraduates: 9092				
Open Space Type	Available Open Space	Required Open Space per Person	Available Open Space per Undergraduate	Deficit
Playing Pitches	137619	129.17	15.14	114.03
Multi Use Games Area	N/A	21.528	-	-
Equipped facilities for Children and Young People	N/A	21.528	-	-
Informal Open Space	1369566	269.10	150.63	118.47

Source: Survey Data 2014 and CPPPOS by North Devon District Council

Available playing pitches per an undergraduate is 15.14ft² and available informal open space for an undergraduate is 150.63ft². These two types of open spaces hardly met the standards of Code of Practice on Provision of Public Open Space, Sport and Recreation by North Devon District Council as those two types have deficit of 114.03ft² and 118.47ft² respectively.

4.5 Map the Available Open Space Types at the University:

Identified two open space types of the University premise were mapped as shown in the figure 4. Neither multi-use games area nor equipped facilities for children and young people could recognized according to the survey by 2014.

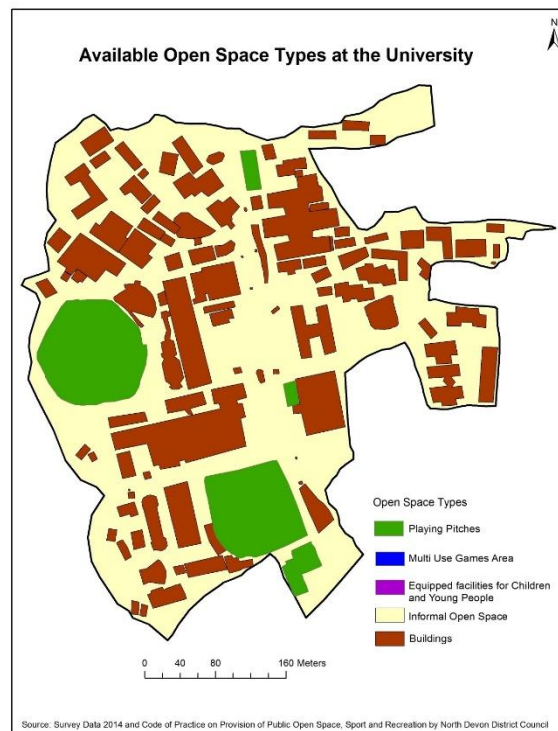


Figure 4: Available Open Space Types at UOK by 2004

Source: Survey Data, 2004

4.6 Sufficiency of the available open space types of University of Kelaniya:

As per the recommendations of Code of Practice on Provision of Public Open Space, Sport and Recreation by North Devon District Council, 61% of informal open space, 29% of playing pitches, 5% of multi used games areas and equipped facilities for children and young people (See Figure 5) are required.

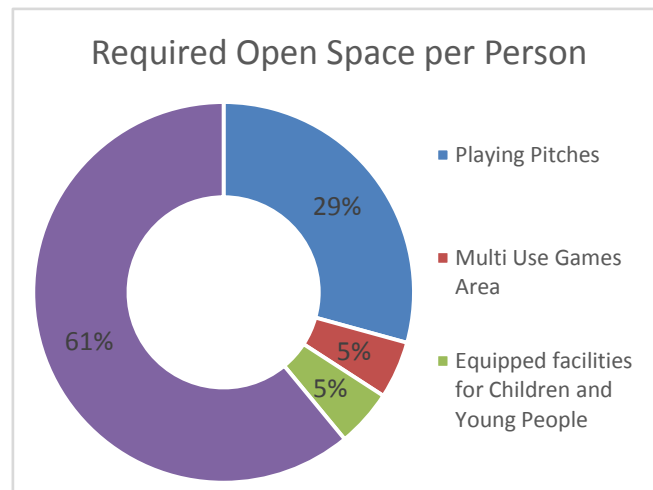


Figure 5: Required Open Space per Person
Source: CPPPOSrby North Devon District Council, 2004

Yet, out of required 29% (See figure 6) of playing pitches per an undergraduate, UOK has only 11.72% [(15.14/ 129.17)*100%] and out of required 61% of informal open space per an undergraduate, UOK has only 55.98% [(150.63/ 269.10)*100%]. 0% of open space in multi-use games area and equipped facilities for children and young people were identified.

Hence, it is vibrant that there is a distribution imbalance of prevailing two open space types of the University while it is having insufficient open space for playing pitches as well as multi-use games area and equipped facility for children and young people.

V. MANAGEMENT IMPLICATIONS AND CONCLUSION

Very often environment is seen as an obstacle to development, as the importance of integration is not recognized or understood. (Johannesburg Summit, 2002). But, in the development process there can be found the best ways to preserve open space (UCONN, 2008). Open space is more valuable when it linked together. Therefore, prevailing open space of the University should be linked with the developed land and utilized, considering the required open space types. As it is also proven that the open space of the university is negatively affected by the number of student enrollment, the University should implement its policies on managing open space at the university by considering the model $y = 2500833.149 - 105.685x$, while concerning the current deficit of identified open space types.

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