Spatial Planning and Open Space Integration in Urban Ethiopia: a Sustainable Accessibility Exegesis

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1 ABSTRACT

Urban planning practices of many cities are in constant mutation throughout the world. With sustainability as a goal, land use monitoring and regulation is becoming more in demand. This analysis seeks to assess the accessibility and attractiveness of public open spaces in a sample of cities and/or towns in Ethiopia. Specifically, it questions the extent to which Ethiopian cities are designed to human scale. The analysis utilizes data from a series of surveys conducted in four major cities and/towns. A econometric analysis was employed to pool the findings together. Results reveal that most public open spaces are less attractive and difficult to access. Absence of such recreational facilities in many neighbourhoods has seen some households travelling greater distances to access such facilities in other (often distant) neighbourhoods. Three major factors are to blame. These include absence of a land use (re)mixing strategy, weak development controls that have seen some open spaces giving way to illegal land uses and the general absence of quality infrastructure in existing open spaces. The most affected households reside in poor neighbourhoods. The scale of the challenges was also found to be much higher as one moved from smaller cities to much bigger cities. Only a spatial planning strategy that is guided by a known land use (re)mixing strategy would ensure improved accessibility to open spaces. Such an effort however needs to be complemented by strategies that strive to strengthen the current development control mechanisms and the fortressing of open spaces that are under immense pressure from other competing uses. A major facelift on the attractiveness of existing open spaces through the provision of quality infrastructure is also required.

2 INTRODUCTION

Urban planning practices of many cities are in constant mutation owing to a myriad of driving forces. Lifestyle patterns of many cities are shifting to those of a sustainable society (Chiesura, 2004; Burnett, 2007; Ioj˘a, 2011). One notable force is urbanization that has seen the distance between people and the natural space expand (Li et al, 2005). Increasing urbanization trends, have seen nartural ecosystems increasingly being replaced by urban development. One of the most affected component of urban landscapes is open space. Open spaces are part of the urban greenspace that form an important component of the complex urban system. Urban greenspace plays a crucial role through direct and/or indirect provision of essential ecosystem services (Costanza et al., 1997). Benefits that accrue to urban communities are many. Such benefits are often environmental, aesthetic, recreational and economical in nature (Bradley, 1995; Tyrv¨ainen, 2001; L¨utz and Bastian, 2002). Mahdavinejad and Abedi (2011) contend that urban openspaces have an exceptional environmental importance with regard to their contribution to the reduction of various types of pollution and to the improvement of microclimatic conditions. In addition to this role, they also make positive contributions to human health and well being. They also lead to an important contribution to human thermal comfort in exterior spaces (Aravadinos, 1999). Aspects such as “amount of public green spaces per inhabitant”, “public parks” and “recreation areas” are often cited in literature as important factors that make the city liveable, pleasant and attractive for its citizens (Mahdavinejad and Abedi, 2011).

With sustainability as a goal, land use monitoring and regulation of open spaces is becoming more in demand. This is because planning and management of urban greening is of utmost significance to urban sustainable development (Miller, 1988; Grey, 1996; Teal et al., 1998). With this new thinking, it is also strongly beleived that developing more sustainable cities is not just about improving the abiotic and biotic aspects of urban life, it is also about the social aspects of city life (Mahdavinejad and Abedi, 2011). Such a social focus encompasses among other aspects people’s satisfaction, experiences and perceptions of the quality of their everyday environments (Chiesura, 2004). This analysis takes this social inclination by assessing the accessibility and attractiveness of public open spaces in a sample of cities and/or towns in Ethiopia. Specifically, it questions the extent to which Ethiopian cities and/or towns are designed to human scale and/or aspirations. Public open spaces are in this analysis refer to recreational facilities such as public parks, playgrounds and amusement centers and residential gree space.

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2.1 Open space management and accessibility issues

The design of public and green spaces has emmetrged and one importatnt area of particular interest for landscape architects and planners in recent years (Oguz, 2000; Chiesura, 2004). It is now beleived that sustainability indicators for urban development should include more parameters about public spaces and green open areas, as well as indexes reflecting citizens' satisfaction and perception of their living environments (Chiesura, 2004). Herzele and Wiedemann (2003) for instance developed an integrated indicator to assess the accessibility and attractiveness of urban greenspace in four Flemish cities. Pauleit et al. (2003) proposed a more flexible approach named Accessible Natural Greenspace Standards Model to promote the natural greenstructure of towns and cities and devised a decision-support framework for its implementation.

Cooper Marcus and Francis (1998) argue that aesthetics are a factor that affects use and enjoyment. Some critiques have argued that the aesthethic/design approach should also be based on function rather than aesthetics alone (Goliˇcnik, 2010). The the utility derived from the open space depends on the distance to and the size of the parcel (Anas, 1978; Wu and Platinga, 2003).

2.2 Spatial planning and open space management

A number of challenges that spatial planners and/or urban designers face in creating inclusive urban spaces for contemporary and future use have been noted by many research scholars (Ward Thompson, 2002; van Kamp et al., 2003; Maruani and Amit-Cohen, 2007; Matsouka and Kaplan, 2008). With regard to the planning and management of public open spaces Goliˇcnik and Thompson, (2010:38) beleive that urban designers are still far from finding answers to the following daunting questions;

- How well to predict the use of spaces they have created?
- How certain they can be that a place designed for certain types of activity and occupation will serve its users' needs well?

It is generally argued that the empirical basis for much of the decision making as it regards the creation of people friendly urban space is often lacking (Forsyth, 2007; Frick, 2007).

The notion that landuse planning could be used to determine appropriate levels of accessibility to different landuse functions is not new (Curtis, 2008). The bulk of such efforts have been encuspulated in discussions revolving around the area of land use transportation integration (Freilich and White, 1994; Kelly, 1994). While there is no concensus as to the ideal urban form – an urban morphology that would achieve sustainable accessibility, there is a general agreement among urban planners and designers that some urban forms are more sustainable that others (Williams et al., 2000; Sorenson, 2001; Hickman and Banister, 2002). It is believed that urban forms that are guided by a sound land use (re) mixing strategy promotes the achievement of sustainable accessibility to public open space.

3 MATERIALS AND METHODS

Since the study is largely an environment – behaviour research, the major research instrument employed in this study was observation. Such kind of studies have long history. Typical studies in the past have always used behavior mapping as a way of understanding the interaction between people and space (SeeIttelson et al. 1970; Bechtel et al. 1987). Such an approach is premised on the fact that there is less recorded on how people use green space and the kinds of dimensions and details that support different uses within such settings. (Lawson, 2001; PPS - Project for Public Spaces, 2005; Goliˇcnik and Thompson, 2010). In addition to observed behavior of space users as well as the recording of size and typology of public open space facilities, a questionnaire was administers to a smaple of random observed space users. This was done to comprehensively capture both that passive and active interaction between people and space. A total of 451 questionnaires were administered with the help of Urban Management Masters (UMM) students at the Ethiopian Civil Service University (ECSU) in 2009. Such a survey was conducted in four selected cities and/or towns – including the capital city of Addis Ababa, the city of Dire Dawa, and the two towns of Nekemte and Chancho. Sample charcteristics and a description of each study area chacteristics is summarized in table 1.

Name of City/town	Number of surveyed open space users	General characteristics of city/town	Urban landscape characteristics charcteristics
Dire Dawa	112 observed space users surveyed in the city's 5 out of 9 kebeles	It is the second bisggest city (after Addis Ababa – the capital). The total urban population is 232 854 inhabitants.	Dire Dawa covers a total area of 128 802 hactares of which 2 684 hactares is urban.
Nekemte town	100 observed space users surveyed in the twon's 7 out of a total of 12 Kebeles	It is the administrative capital of Wellega zone in Oromia Regional State. The town is 331km away from the country's capital Addis Ababa. Its population stood at approximately 76 817 in 2009.	According to the current urban master plan, the town occupies 3 192 hactares of land of whicxh 627 hactares is urban land. Urban agricutures constitute 1.24% of urban land; Urban forest 32.5 percent; Open space 5.6%, Sportfields 0.5%; the built environment 60.1%.
Chancho town	67 observed space users surveyed in the twons 3 out of a total of 5 kebeles.	It is the administrative capital of Gololcha Woreda in Oromia Reginal State. The town is located 307 km to the South-East capital city of Addis Ababa According to the CSA report of 2007, the towns gross population density stood at 1641.1 people per km^2.	The covers apprimately 493 hactares of land.
Addis Ababa	172 observed space users surveyed in a sample of kebeles of the city's 3 out of 10 subcities of Yeka, Lideta and Bole	It is the capital city of Ethiopia. The estimated total population of the city in 2008 was 2 738 248 (FDREPC, 2008).	?

Table 1. Sample characteristics and discription of study area

3.1 Model specifications

The logistic regression model was applied to determine factors that explained why some urban urban citizens define their surrounding public open spaces as accessible. When dealing with a dichotomous dependent variable - the main interest is to assess the probability that one or the other characteristic is present (Peng and So, 2002; Peng et al, 2002). The logistic regression model answers the question what determines the probability that the answer is yes, or no. The special features of the model guarantees that probabilities estimated from the logistic model will always lie within the logical bounds of 0 and 1. In other words the probability that an urban citizen picked at random is defines public open space as accessible is not a continuous variable but a discrete one. The logistic regression model can be expressed mathematically as follows;

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n + ui$$

Where

Y = is the dependent variable (i. e. probability that an urban citizen chosen at random is agrees that the surrounding public open spaces are accessible.

B_0 = is the intercept (constant) term

B_k = coefficients of explanatory variables

X_i = explanatory variables

The aggregate expression of the model can be summarized as follows:

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$$Y = \beta_0 + \sum_{k=1}^{k} \beta_i x_i + ui$$

The selection of predictor variables was based on the review literature review on accessibility, spatial planning and green space management issues as detailed in the next section. Model variables were therefore defined as follows;

Y = Probability of an urban citizen agrees that the surrounding public spaces are accessible (i.e. probability/Agree = 1)

X_1 = Type of user (1 = occassional user; 10 = frequent user)

X_2 = Typology of public space (3 = public parks; 2 = playgrounds; 3 = residential green spaces)

X_3 = Size of parcel (1 = small; 10 = large)

X_4 = Observed open-space function (0 = serving its purpose; 1 = not serving its purpose)

X_5 = Income status (0 = low; 1 = high)

X_6 = Distance to open space facility (0 = next to neighbourhood; 10 = far away from neighbourhood)

X_7 = Size of urban area (population equivalent on a 5 point likert scale; 1 = small/Chancho town; 5 = large/Addis ababa)

X_8 = Aesthetic appeal/attractiveness of open space (0 = less appealing/attractive; 10 more appealing/attractive)

3.2 Selection of model variables

The choice of explanatory variables was made on the basis of a review of literature on accessibility, spatial planning and green space management. Many scholars beleive that accessibility to public open spaces is a function quality of spatial or land use planning (Hickman and Banister, 2002; Curtis, 2008). There is general consesus that spatial planning approaches breed different urban forms that ultimately govern the resultant level of sustainable accessibility (Williams et al., 2000; Sorenson, 2001). Delshammar (2005) maintains that spatial planning agencies may comprise a wide range of activities directed at open spaces and at users, both indirectly through work performed in public open spaces that users relate to and use and, more directly,through dialog and participation. To this end, increasing user information and participation is seen as central to making it easier for people to relate to and use public open spaces (Randrup and Persson, 2009). Although others beleive that user participation in open space management may be time consuming and expensive (Buchecker et al. 2002; Mabelis and Maksymiuk, 2009), reseaerch scholars such as Jansson and lindgren (2012) maintain that it can assist spatial planning agencies in fostering socially sustainable open space landscapes and processes.

Other research scholars beleve that it is the quality of created open spaces that determine their level of accessibility. Such open space quality attributes are quantifiable, through an assessment of citizen's satisfaction and the general perception of their living environments (Herzele and Wiedemann, 2003; Pauleit et al. 2003; Chiesura, 2004). Such a more aesthetically inclined approach is beleived to be a major factor that affects use and enjoyment of public spaces (Cooper Marcus and Francis, 1998)

Some critiques have however argued that a complete understanding of determinants of public open spaces accessibility should also be based on function rather than aesthetics alone (Forsyth, 2007; Frick, 2007; Goliˇcnik, 2010). The ultimate utility derived from the open space depends on the distance to and the size of the parcel (Anas, 1978; Wu and Platinga, 2003). Level of accessibility to open spaces is also believed to vary according to type of users. Such different user groups can be characterised by socidemographic variables such as gae and income, or whether they are actively or passively using spaces (Jansson and lindgren, 2012). Kaplain, (2001) defined passive users as urban citizens who experience the spaces mentally or visiually.

3.3 Model evaluation

Parameters in logistic regression model were estimated using the maximum likelihood method. The statistical significance of each coefficient was evaluated using the Wald test. In this analysis, the enumerated regression coeficients represent the change in the logit of the probability from a unit change in the associated

predictor, assuming other factors are constant (Gujrati, 2003). The goodness-of-fit test of the regression model in this study was analyzed using;

- The Omnibus test, which is a likelihood ratio chi-square test that test whether the coefficients of the variables in the model are all jointly equal to zero.
- The Hosmer & Lemeshaw (H-L) goodness-of-fit test, which examines the null hypothesis that the model adjust well to the data and
- The Cox and Snell (1989) and Nagelkerke (1991) – two descriptor measures that reveal the amount of variation in the outcome variable that is explained by the models (Long, 1997; Hosmer and Lameshaw, 2000).

The Hosmer & Lemeshow (H-L) inferential goodness-of-fit test yielded a Chi-square (7 degrees of freedom) of 9.296 and was insignificant ($p > 0.05$) suggesting that the model fitted to the data well. Two other descriptive measures of goodness of fit are R2 indices defined by Cox and Snell (1989) and Nagelkerke (1991). Results suggest 35.4% to 56.2% of variations in the outcome (i.e. the probability of a randomly chosen urban citizen agreeing that own public open space is accessible.

4 RESULTS

Results reveal that out of the 451 surveyed urban inhabitants in four smpled cities and/or towns of Ethiopia, a total of 80.3 % beleived that public open spaces were not easily accesssible. A number of constraining factors were discerned. Such constraints were analysed using the binary logistic model. Results are summarized in table 2. The positive beta estimate on type of user implies that people who regularly use observed public open spaces were 1.027 times (ie. Exp B = 1.027) more likely to agree that such facilities were easily accessible that those seldom use them. Such variation in access between active and passive public open space users were however not significant ($p > 0.5$). Accessibility to public open spaces was also found to vary significantly with the typology of public space ($p < 0.05$). The negative beta estimate reveals that public parks were dismissed as highly inaccessible (in relative terms) as compared to play grounds and residential green open spaces.

Another significant factor ($p < 0.01$) was the size of the observed size of the land land parcel. Large public open space facilities were largely dismissed as inaccessible when compared with small ones ($\beta = - 0.655$). Th major agument was that small public open spaces were in relative terms many than the larger ones which were mostly located in few far distant neighbourhoods. From the face value, this might be a reflection of hierarchical distribution of different sizes of open space facility. Further probing however revealed that this was largely a reflection of lack of capacity by planning agencies to provide an adequate supply of such open space facilities.

Study results also revealed that about 31, 9% of the total sample respondennts were using public open spaces where elements of serviing an unintended function were observed and recorded. Such unintended functions included illegal disposal of solid waste, unauthorized urban farming activities, illegal structures (housing and informal business) and livestock grazing. The binary logistic results revealed that respondents who were observed using public open spaces which had an element of not serving the intended purpose were 0.007 times more likly to dismiss the concerned parcel as inaccessible (refer to table 2). Such a finding was very significant ($p < 001$).

Access to public open space was also found to vary significantly with the income status of the user ($\beta = 2.837$; $p < 0.001$). Open space users who belonged to a low income bracket were 17.068 times more likely to dismiss the public open space more inaccessible than those who occupied the high income bracket. This is because the supply of such facilities was very limited in low income residential areas as compared to high income residential neighbouhoods. As expected, open space users who defined surrounding public open spaces as being far away from the own neighbourhoods were 0.082 times more likely to dismiss such facilities as more inaccessible than those who felt that such facilities were within reach ($\beta = -2.5$; $p < 0.001$). The size of the urban area from which the public open space user came from also mattered. Users from the much bigger cities of Addis Ababa and Dire Dawa were more likely to identify their publiblic open spaces as in accessible than those who came from the much smaller towns of Nekemte and Chancho. These results were however not significant ($p > 0.5$). Another significant factor ($p < 0.001$) was the attractiveness and/or aesthetic appeal associated with the concerned public open spaces. Many users felt that the public open

spaces were less attractive and aesthetially appealing. Since the beta estimate is positive, such users were 19.054 times likely to dismiss such public facilities as inaccessible more than those who thought otherwise. Several reasons were advanced. Most users felt that the bulk of public open spaces were not monitored and maintained regularly. Most facilities were characterised as dirty owing to indiscriminate disposal of solidwaste. The supportive infractructure such as access roads, equipment for public tolilets and water taps was also reported to be in dire state.

	B	S.E.	Wald	Df	p-value	Exp(B)
Type of user	.027	.934	.001	1	.977	1.027
Typology of public space	-.560	.234	5.750	1	.016	.571
Size of parcel	-.655	.245	7.140	1	.008	.519
Observed open space function	-4.961	.842	34.725	1	.000	.007
Income status	2.837	.520	29.787	1	.000	17.068
Distance to open space facility	-2.500	.510	24.008	1	.000	.082
Size of urban area	-.018	.414	.002	1	.965	.982
Aesthetic appeal/attractiveness	2.947	.456	41.811	1	.000	19.054
Constant	3.249	1.174	7.658	1	.006	25.774

Table 2. Test parameters for the binary logistic model.

5 DISCUSSION

Despite their utmost significance to urban sustainable development (Miller, 1988; Grey, 1996; Teal et al., 1998), public open spaces are often poorly accessible to many urban dwellers in developing countries such as Ethipia. The use and enjoyment of public open space has been compromised by a variety of actors related to their accessibility. The aesthetic/design approach as expoused by Cooper Marcus and Francis (1998) was found to be a significan factor affecting access to and subsequently the use and enjoyment of public open space by urban dwellers. Most public open spaces in the sampled four towns are from meeting the minimum requirements of sustainable accessibilty as they are poorly designed and less aesthetically appealing. A more functionalistic perspective to utility derived by users of public open space (Goliˇcnik, 2010) revealed that a sizable number of parcels are not serving their intended purpose and are therefore (by implication) excluding other urban dwellers from enjting the benefits from such facilities. Such a challenge – of creating creating inclusive urban spaces for contemporary and future use is not unique to spatial planners and/or urban designers in Ethiopia. Many other research scholars concur that there is a generally high level of uncertainty among spatial planners and/or urban designers that the places they design for certain type of activities and occupation will serve the intended needs of users well (Ward Thompson, 2002; van Kamp et al., 2003; Maruani and Amit-Cohen, 2007; Matsouka and Kaplan, 2008; Goliˇcnik and Thompson, 2010). The mismatch between intended and actual use of public open space in the sample cases presented is largely as a result of weak development control mechanisms, whihas seen illegal land use activities competing for space. Contesting usesing have been in the form orm of waste disposal, illegal land use developments such as informal settlements, informal business, urban agriculture and livestock grazing.

The analysis concurs with findings from elsewhere that the the utility derived from the open space depends on the distance to and the size of the parcel (Anas, 1978; Wu and Platinga, 2003). The hierachical classification and distribution of public open space parcels was however not found to be a plausible expalnation to limited access to large parcels by many users. Rather, results revealed that most municipalities were failing to meet the minimum required ratio standard set by the National Urban Planning Institute (NUPI) a proffesional body for urban planners in Ethiopia. Such supply constraints are on one hand as a result of resource constraints and on the other hand as a result of rising urbanization rates which has seen the distance between urban populations and the natural environment expand in most cities around the world (Li et al, 2005).

The notion that different spatial planning approaches breed different urban forms that ultimately govern the resultant level of sustainable accessibility (Williams et al., 2000; Sorenson, 2001) is not misplaced. This analysis revealed that access to public open spaces in high income neighbourhoods whose urban mophorlogy

was better (in relative terms) when compared to those of low income neighbourhoods were more accessible. Such better urban forms are in part a reflection of the active involvemnt of high income residences in matters concerning the planning and management of public open spaces. Such involvement is crucial as it assists spatial planning agencies to fostering socially sustainable open space landscapes and processes (Jansson and lindgren, 2012).

If sustainable accessibity is to become a reality in urban Ethiopia, a number of interventions are required. At the more operational level, municipal officials should deal with all types of maintenance, upkeep and development of public open spaces. In addition to maintenace of vegetation, there is need for municipal authorities to engage in routine cleaning, installation and maintenance of equipment in all public open spaces. The installation aspect should also extent to creating physical security features that will fortress the bulk of public open space facility to avoid encroachment of other illegal land use activities. At a more strategic planning level and tactical levels, spatial planning agencies in Ethiopia, should encourage more collaboration with public space users so as to align their future spaces with user needs.

6 CONCLUSION

Urban planning practices of many cities today are in constant mutation as spatial planning and/or urban design authorities seek to find sustainable solutions in recreating inclusive urban spaces. Using accessibility to public open space facilities as a predictor variable, this analysi sought assess the extent to which a sample of four Ethiopian towns and/or cities were designed according to human scale and other aspirations. Results revealed that revealed that most public open spaces are less attractive and difficult to access. At a more general level, three major factors are to blame. These include absence of a land use (re)mixing strategy, weak development controls that have seen some open spaces giving way to illegal land uses and the general absence of quality infrastructure in existing open spaces. The most affected households reside in poor neighbourhoods. Only a spatial planning strategy that is guided by a known land use (re) mixing strategy would ensure improved accessibility to open spaces. Such an effort however needs to be complemented by strategies that strive to strengthen the current development control mechanisms and the fortressing of open spaces that are under immense pressure from other competing uses. A major facelift on the attractiveness of existing open spaces through the provision of quality infrastructure is also required.

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