

ASSESSMENT OF LANDSCAPE DESIGN ELEMENTS APPLICATION FOR CROWD MOVEMENT OPTIMIZATION IN CATHOLIC CHURCHES IN BENUE STATE, NIGERIA

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Abstract

The optimization of crowd movement assists not only in the efficient discharge of crowd, and facilitation of comfortable environments, but also helps to check crowd related crime. This paper aims at determining the extent to which landscape design features have been applied in Catholic churches to aid crowd control and optimise crowd movement. Data collection was based on structured observation schedule and questionnaires issued to Catholics drawn randomly from public places. Data collected was analysed using SPSS and the results were imputed in the Microsoft excel package for the development of charts. Findings show that 55% of catholic churches have applied landscape design elements to optimise crowd movement. Majority of catholic churches in the State have provisions for parking that is below the optimum, most of respondents' worship at churches having defined paths in the landscape, of which 89% expressed that paths provided for circulation are of at least optimal widths. 82.4% of respondents held that way finding in their places of worship is easy and effective. The paper concludes that for crowd movement to be optimised, there must be a synergy between building capacity and landscaping provisions to enhance free flow of crowd even at peak periods.

Keywords: *Catholic churches, Crowd, Crowd management, Landscape, Urban development*

INTRODUCTION

With the increasing population in urban areas and a rise in the rate of public events, there has been an increase in the amount and scale of assemblage of large numbers of people going about in public places (Haghani and Sarvi, 2016). The practice of managing crowd involves the assessment and interpretation of diverse information sources, making predictions of crowd behaviour as well as deciding on a range of possible, highly context dependent intervention mechanisms (Wijermans *et al*, 2016).

According to Wijermans (2011), a crowd is a large assembly of different people at the same place and time, who do not necessarily share the same goal or interest. Haghani and Sarvi (2016), points out that crowd can form at different magnitudes and for different reasons, and identifies some of the activities that result into crowding to include sport events, political protest, religious gatherings, and the demand for public transport and public buildings at peak hours.

Collection of crowds at public places, particularly in public buildings, has become a serious problem in urban areas resulting from urban development and expansion. Incidentally, increasing population is often not matched up with a corresponding increase or expansion of infrastructural provisions, leading to the overstraining of public amenities and shared facilities. As already revealed by ICOMOS 2001 survey, buildings having the highest number of visitor are not always the most crowded. The survey further indicated that overcrowding is not just a function of population, but also an outcome of carrying capacity of facilities. The simple logic

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is that overcrowding can be cancelled out to a large extent when large populations are matched up with large capacities of facilities. Thus, large building capacities must be complemented with corresponding large capacity circulation provisions, both within the building and out in the surrounding landscape for crowd movement to be optimised.

This paper determines the extent to which landscape components have been applied in Catholic churches to aid crowd control and optimise crowd movement, taking Benue state as the study area. Benue State is chosen as the study area because the State's population is dominated by Christians and so there is a tendency for large influx of crowd to churches.

LITERATURE REVIEW

The Effect of Over Crowding

Mass gatherings involving large crowds pose a challenge on infrastructural capacity and potentially results into accidents (Taneja and Nomesh, 2017). According to Ahuja and Karlapalem, (2015), these accidents are not totally unexpected, and they keep reoccurring at similar occasions. Cases of disastrous incidents occurring in recent times show that crowded places can be prone to reasonable safety risks and that in the phase of large numbers of people, if not well planned and managed, can potentially result in serious injuries and fatalities (Helbing *et al*, 2007; Still, 2014).

Some Incidences of Crowd Disaster

Just within 2013 to date, thousands of people have lost their lives to stampedes, fires and other disaster resulting from overcrowding. Yamin and Albugami, (2014) notes that most of such events happened to be religious gatherings. On the eve of 2013, more than sixty people died and hundreds sustained various degrees of injury in Ivory Coast (CNN, 2013). Dozens of people were reported to have been crushed to death in a stampede at Kumbh on 10th February, 2013 (The Guardian). On the 13th day of October, 2013, more than one hundred people were reported to have lost their lives when a bridge collapsed due to overcrowding that resulted into a stampede in India (ABC Online News). At least 717 people were reported to have lost their lives in a stampede that resulted during a hajj pilgrimage in Mina (BCC News, 2015). In 2016, at least 52 people were killed during a thanksgiving festival in Ethiopia from human stampede (BBC news, 2016). In the year 2017, eight people were killed and 60 seriously injured in a stadium crush in DembaDiop stadium in Senegal. (Al Jazeera, 2017).

Churches as Public Buildings

By their very nature, churches are buildings where a lot of people collect. Komechak (1982) notes that the early Christians used the term 'church' to refer to the gathering of Christians (the act of gathering) rather than the building. However, in the present day, the term 'Church' is conveniently used to connote the buildings in which Christians carry out their worship. The people who collect in the premises of churches come from all walks of life and from different places and have different ways of life. Ikibe and Akande (2017) describe church buildings as both public and religious buildings. Adedayo *et al* (2016), affirms that churches are public buildings because they are open to all members of the public and there are no restrictions to people who make use of the church. The absence of restriction in the church environment is the major reason why people having different motives go in, some as participants and others as opportunists. This makes church buildings to be prone to overcrowding and the attendant risks and safety dangers associated with it.

The Nature of Crowd

According to Kingshott (1993), in all circumstances of crowd, the members will have a degree of mobility, and attempting to control their mobility may result into group or individual irritability that may lead to unpredictable and impulsive action. However, since the circumstances of crowds differ, the nature of crowd also differs. Some crowd are peaceful and organised, while some can be violent, aggressive and highly disorganised.

Different researchers express the classification of crowd differently. For instance, according to Mombouisse (1967), crowds could be of four distinct natures including casual, conventional, expressive, and aggressive. Berlonghi (1995) expressed the classification of crowds to include spectator crowd, demonstrator crowd, or escaping crowd. Kingshott (2014) identifies two type of crowd to include passive and active crowd. However, for the purpose of this paper, the classification by Kingshott has been adopted because it provides a broader spectrum of classification and considers the possible circumstances of crowd.

The Passive Crowd

Under ideal conditions, crowd in churches are always passive. The passive crowd refers to one that accepts manipulation for reasons of their own needs and the personal objective of the members. In other words, this type of crowd are peaceful and organised, and are willing to be controlled because of the motive its members.

The Active Crowd

Relative to active crowd, four categories have been identified to include the aggressive, escapist, acquisitive and expressive crowd (Kingshott, 2014). The aggressive crowd describes crowds whose objective is violence, destruction or both in achieving what is perceived as their common purpose. Under normal situations, this category of crowd cannot be found in churches.

The escapist crowd describes the crowds that may initially be passive, but as a result of a common element of danger and fear, feel the need to escape from the immediate environment. This is usually the nature of crowd in churches when there is a call for emergency such as a fire, an interior explosion or an attack on the congregation

The acquisitive crowd define a crowd in which some people take advantage of a general disorder to perpetrate criminal acts. In other words, some people who may be acting along with the crowd or separately from the crowd mask themselves with the shield of disorder to unleash criminal offences such as looting on others. This type of crowd can also be generate in churches in times of emergency

Finally, the expressive crowd refers to one whose primary concern is to express feelings and emotions. This type of crowd is rarely of church origin, and their activities are usually not within the environment of the church.

Passive Crowd Control in the Landscape of Churches

Having looked at the nature of crowd in churches, it can then be deduced that in the church environment, the landscape can be said to be effective in the control of crowd if it has the following features

- Makes easy the control of passive crowd by properly organised functional spaces such as parking spaces, meeting venues, green areas, and relaxation spots on the site; way finding optimization and traffic control by way of clearly defined walkways and driveways leading to the functional spaces; and proper signage to give direction to people who are new in the environment
- Makes easy the movement of escapist crowd by way of optimally sized and properly defined route to enable free movement and give direction so as to avoid multi-directional movement that would result into increased rate of trampling when trying to escape in the case of an emergency

RESEARCH METHOD

A descriptive survey was conducted on the selected catholic churches in Benue state. The post occupancy evaluation method, which gives room for direct observation of the areas to be studied using observation schedule and questionnaires was used. According to Adedayo *et al* (2016), the post occupancy evaluation is generally acceptable for getting users' opinion and carrying out observation studies in the built environment. The churches included in the study are churches situated in the major urban centres chosen based on the four catholic dioceses in the State. Eight (8) churches were studied. The churches studied comprise of the two major churches in each diocese (including the cathedral), having clearly marked boundaries, which hold at least two worship sessions on Sundays, and have a total population of at least 2000 persons.

Table 1: List of Churches Studied

S/N	Name of Church	Diocese
1	OLPH cathedral, Makurdi	Makurdi
2	St. Theresa's Parish, Makurdi	Makurdi
3	St. John's Cathedral, Gboko	Gboko
4	St. Thomas Parish, Gboko	Gboko
5	St. Gerald's Cathedral, K/Ala	K/Ala
6	St. Mary's Parish, K/Ala	K/Ala
7	St. Francis Cathedral, Otukpo	Otukpo
8	St. Mary's Parish, Otukpo	Otukpo

Source: Authors' fieldwork (2018)

Three hundred questionnaires were administered to Catholics drawn randomly from public places like markets and schools. The data collected was then inputted into the SPSS package for analysis. The result was then inserted in the Microsoft excel for the development of charts as a form of presenting the results.

DATA ANALYSIS AND RESEARCH FINDINGS

Population Control

The result show that 92.9% of respondents' worship at churches were not less than two worship sessions are held on Sundays, while only 7.1% worship were only one session is held. 2.7% of respondents perceived their places of worship as under populated on Sundays, while 47.7% expressed that their places of worship are optimally populated, while 49.5 % felt that their

places of worship were over populated. Of the total population, 84% of respondents walk to church on Sundays, while only 16% drive their vehicles to church.

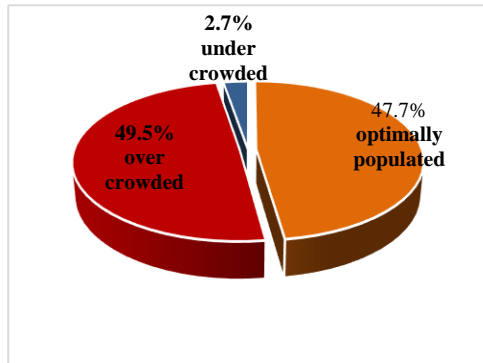


Figure 1: Respondents' Perception of crowd at Catholic Churches in Benue state on Sundays

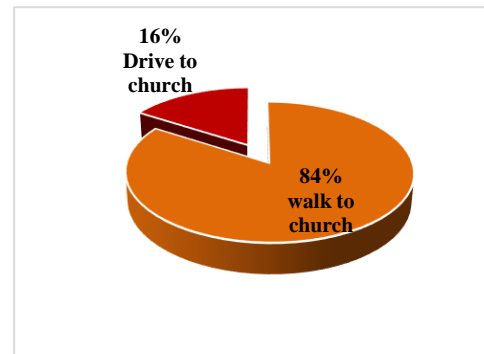


Figure 2: How Respondents get to their places of worship on Sunday

Table 2: Parking Space Provision at Case Studies

S/N	Name of Church	Capacity of Church Building	Number of Available Parking Spaces	Obtainable Parking Ratio	Remark
1	OLPH cathedral, Makurdi	2112	115	1:19	Below optimum
2	St. Theresa's Parish, Makurdi	2512	111	1:23	Below optimum
3	St. John's Cathedral, Gboko	2376	172	1:14	Below optimum
4	St. Thomas Parish, Gboko	1984	54	1:37	Below optimum
5	St. Gerald's Cathedral, K/Ala	2150	210	1:10	Below optimum
6	St. Mary's Parish, K/Ala	1780	40	1:45	Below optimum
7	St. Francis Cathedral, Otukpo	2500	225	1:11	Below optimum
8	St. Mary's Parish, Otukpo	1450	48	1:32	Below optimum

Source: Author's fieldwork (2018)

Table 3: Discharge Rate of Crowd from Church Premises at end of Worship

S/ N	Name of Church	Capacity of church building (No of persons)	Total Width of Exits on building (mm)	Discharge rate of Crowd from building (persons /time)	Estimated Rate of pedestrians (84% of total discharge /time)	Total width of pedestrian exits from premises (mm)	Discharge Rate from premises (Persons /time)
1	OLPH cathedral, Makurdi	2112	10800	18	15	1500	2
2	St. Theresa's Parish, Makurdi	2512	9000	15	13	2000	3
4	St. John's Cathedral, Gboko	2376	12600	21	18	3000	5
5	St. Thomas Parish, Gboko	1984	10800	18	15	3000	5
6	St. Gerald's Cathedral, K/Ala	2150	12600	21	18	3000	5
7	St. Mary's Parish, K/Ala	1780	5400	9	8	3000	5
8	St. Francis Cathedral, Otukpo	2500	12000	20	17	1800	3
9	St. Mary's Parish, Otukpo	1450	7200	12	10	1800	3

Source: Authors' fieldwork (2018)

Circulation

From the analysis, 26.1% of respondents expressed that no path have been defined to coordinate circulation at their places of worship. 30.6% indicated that paths to be used by both pedestrians and vehicles were provided, while 43.2% moved that walkways were provided separately from driveways at their places of worship. Of the population that said path ways were provided at their places of worship, 11% felt that the provided paths were too narrow, 78% perceived the paths as optimally sized, while 11% moved that the paths were too large.

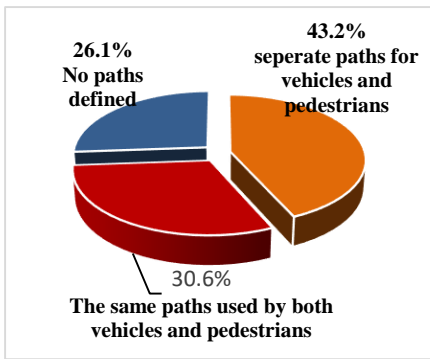


Figure 3: Respondents' description of the organisation of circulation in their places of worship

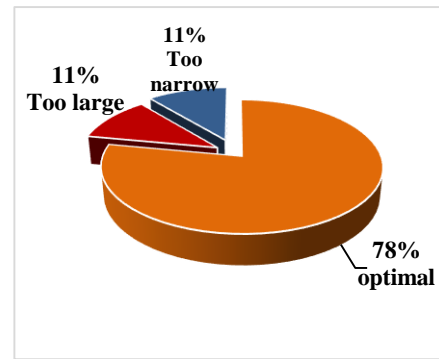


Figure 4: Respondents' Perception of paths in the environment in their places of worship

Way Finding

82.4% of the respondents expressed that way finding at their places of worship is easy and effective, while just 17.6% moved that way finding at their places of worship is difficult and demanding. Of those who perceive way finding as easy and effective stated their reasons, the result which is portrayed in figure 5, and the reason of those who perceive it as difficult and demanding portrayed in figure 6

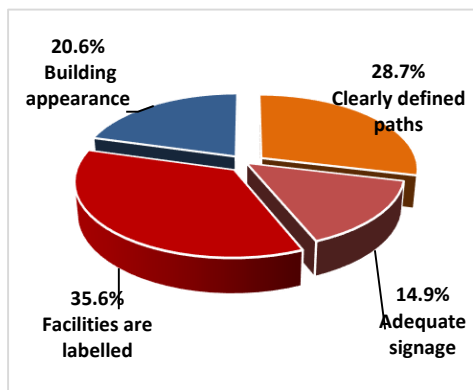


Figure 5: Respondents' reasons of easy way finding in the landscapes of churches in Benue State

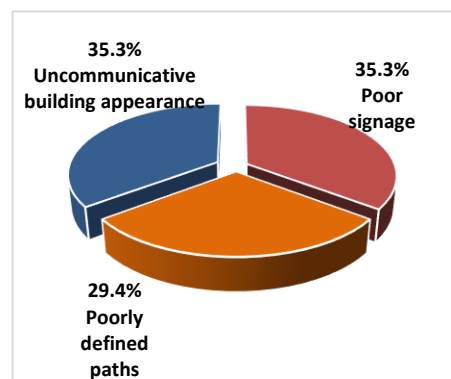


Figure 6: Respondents' reasons of difficulty in way finding in the landscapes of churches in Benue State

DISCUSSION OF FINDINGS

Respondents' perception of population at their places of worship indicate that a vast majority of churches are filled at least up to capacity on Sundays, with a significant percentage of churches been over crowded. This implies a shortage in infrastructural provisions, which results into some challenges posed on infrastructural capacities of such churches. The results further shows that 84% of respondents walk to church on Sundays, which is an indication that most Catholics worship at the Catholic Church nearest to their place of residence. By implication, it can be deduced that since only 16% of them go to church with their vehicles, a parking ratio of 1:6 will be optimal for catholic churches as against the traditional 1:4 for public buildings found in many standards. This ratio was compared with parking ratios obtainable in the studied churches considering the carrying capacity of church halls relative to the available parking spaces, and the result portrayed that parking consideration in those churches is below optimum. The great deficit in the discharge rate from premises when compared with the discharge rate from church building in the case studies indicates that pedestrian exits leading

out of the premises are usually crowded at the close of worship, resulting from a build-up of crowd and some pedestrian resort to making attempts to go through exits meant for vehicles, which jeopardises any attempt to control crowd at these points, a condition which can potentially result into safety dangers leading to serious injuries and fatalities as pointed out by Helbing et al (2007) and Still (2014)

The result further shows that in a vast majority of catholic churches there are no paths for circulation. However, going by the users' perception, it can be seen that in majority of the places where circulation paths have been provided, they are at least adequate. The result also reveals that way finding in the church environment is not a problem to most users.

CONCLUSION AND RECOMMENDATION

The major problems in the landscape of churches in urban centres, particularly catholic churches in Benue state comprises of inadequate parking provisions and the hick up in the discharge of pedestrian crowd at the close of worship sessions. The problem of parking space shortage as observed during this study arises from the fact that more emphasis is placed on building structure developments and large building capacities, which results into the inadequacy of space on the site to provide enough parking spaces that would suit the capacity of the worship space. Inefficient crowd discharge rate arises from the fact that these churches have fences constructed round the perimeters and the pedestrian exits provided on the fence do not match up discharge rate from building. Although as noted by Anon, provision of perimeter security, combined with landscape elements and stand-off areas is a good way of achieving passive security for buildings, when there is no adequate provision made to ensure efficient discharge of crowd, this would result into the build-up of crowd at exit during closing, which jeopardises users' comfort and which may create an avenue for crowd related crime to be perpetrated.

Crowd movement optimisation should be seen as a key consideration right from the planning stage of church building projects. Development control agencies should pay close attention in checking for parking considerations in church designs to ensure that adequate parking ratios are attained. Designers in the building industry should be thorough when designing to ensure that there is enough space left on the site to make adequate provisions for landscaping elements on the site plan so that they meet up ratios that match up with the building capacity, and where this is not possible, other options like basement and multi-storey parking should be explored. When designing for churches with a complex of facilities in the landscape, architects should bear in mind that communicative building concept is key to aiding way finding to new comers in the environment. Church leaders and administrators should ensure that facilities in the landscape of churches are well labelled, and adequately sized paths should be properly defined to reduce haphazard movement, thereby enhancing safety in church environments.

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