



Reengineering public space: Humanistic streetscaping of the Bulawayo Central Business District through tactile planning and design.

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Abstract

The streetscape, a major component of the urban public space, is used and experienced by everyone. While multisensory streetscaping can make the streetscape more humanistic, many streetscapes have been blamed for being oriented towards the visual sensory mode at the expense of other senses. The minimal understanding of the tactile sensory mode, in particular, is undesirable because it is a proximal sense through which humans interact directly with the environment and is also directly attached to human pleasure and survival. This may partly explain why streetscapes often fail to satisfy direct human bodily needs. Motivated by a gap in literature at the confluence of psychology and the design fields, this paper examines how humanistic streetscaping can be improved from the tactile planning and design standpoint using a Case of Bulawayo Central Business District (CBD). The study follows an exploratory qualitative design with a phenomenological strategy of inquiry where data was collected through semi-structured interviews and participant observation using purposive sampling. Drawing from the tactile human experiences through its sub-modalities of pain, temperature, movement and pressure, this study found that the streetscape in the Bulawayo CBD is not adequately humanistic in terms of tactile quality. The study concludes that tactile planning and design can create a bond between the humans and the street environment and is sure to inject humanistic characteristics to the streetscape and subsequently make cities more adaptive to climate change. The study recommends the re-engineering of public space through the introduction of a 'tactile street roof'.

Key words: *humanistic streetscaping, tactile planning and design, tactile street roof, multisensory.*

1. Introduction

According Muleya and Dube (2019), humanistic streetscaping refers to the incorporation of the human element in the understanding, planning and design of streets and subsequently creating streets 'with a bias towards humans over vehicles...' The anticipated product are streets that are responsive and receptive to humans. These are streets planned, designed and managed with the users in mind. The concept has roots in the perspectives of psychology namely humanism, positive psychology and environmental psychology (Pastorino & Doyle-Portillo, 2011).

A multisensory approach to streetscaping can be used as a window incorporate the 'human element' thus providing room for 'humanistic streetscaping'. It is generally accepted that a multisensory approach to public space quality is necessary for inclusive design (AIGA, DC, 2018: Online; UK Climate Impacts Programme, 2016). However, the visual sensory mode has dominated the design of public space at the expense of other senses. Various authors' works on the streetscape (for example Kesseiba, 2016; Rehan, 2012) and Jacobs, 1961) are biased towards the visual sensory mode. Kesseiba (2016), for example, emphasised that:

'During design, one should concentrate on evaluating the visual relationships among elements of which the basic principles include unity, harmony, continuity repetition, accent, balance, scale, proportion, simplicity and variety.'



The foregoing quotation is one example of the basic design principles, which are largely of a visual orientation. Even public space quality assessment has largely been biased towards the visual qualities of a given place (Muleya & Campbell, 2020). The design for the eye at the expense of other sensory modes have been blamed for the creation of non-responsive environments (Carmona et al., 2010; Herssens & Heylighen 2008; Pallasmaa 2005). It is argued that the visual and auditory sensory modes (higher senses) are given more attention at the expense of the lower senses namely tactile, gustatory, and olfactory as well as the internal senses (Freeland, 2012; Howes, 2005). Muleya and Campbell (2020) lamented that:

'[d]isturbingly, the higher senses to which attention is paid, are distal senses that do not directly interact with the human body, while the neglected lower senses are proximal senses that allow for direct interaction between the users and the environment'.

It therefore follows that the neglect of the lower senses partly contributes to the inadequate performance of the public space as viewed from user experience and aspirations.

1.2 Research Purpose and Objectives

The tactile mode is one of the least considered senses both in practice and in theory from the perspective of streetscape planning, design management. It is little investigated despite the fact that the tactile modality is involved in the majority of human activities and is important in everyday life, for example eating, walking, kissing, feeding and social relationships. It has the biggest impact on pleasure and well-being. It is the highest stimulating sense (Gallace, 2012). AIGA DC (2018) highlighted that that tactile design seeks to engage the whole person and not just the eyeballs. Therefore, the streetscape design from the perspective of the tactile sense is thus promising to make the streetscape environment more humanistic.

This study therefore sought to understand human tactile experiences in the Bulawayo Central Business District and subsequently inform tactile planning, design and management of the streetscape. The overall intention is to reengineer the streetscape through incorporation of tactile qualities. According to the Cambridge Dictionary reengineering means 'the process of changing and improving the design of a product or a system. The purpose of this study is therefore to improve the streetscape quality through tactile planning, design and management. The study is partially justified as a search for improvements of urban microclimates, a topical issue that can lead to the production of sustainable environments in light of climate change. The study is premised on the understanding that the outdoor environment can be modified to afford a comfortable environment to the users through planning and design (Sadeghi & Bahadori, 2021). The specific objectives of the study are as follows:

1. To understand the human tactile experiences and aspirations in the Bulawayo Central Business District and subsequently inform tactile planning, design and management of the streetscape.
2. To provide a springboard towards the formulation of basic design principles and public place quality assessment criteria from the tactile perspective.



3. To reengineer the public space through incorporation of tactile qualities in the streetscape

Just like with the popular visual relationships and in light with the objectives, the study will establish tactile relationships such as tactile harmony, tactile continuity, tactile unity and tactile variety among others. Motivated by a gap in literature at the confluence of psychology and the design fields, this paper examines how humanistic streetscaping can be improved from the tactile planning and design stand point using a Case of Bulawayo Central Business District (CBD). In particular the gap resides on the minimal attention given to the tactile quality of the streetscape, while it is the most promising opportunity towards humanistic streetscaping.

1.3 Literature Review

The literature review focusses on the tactile sensory mode, the streetscape, and finally the relationship between tactile quality and streetscape planning, design and management.

1.3.1 Tactile sensory mode

Tactile stimulation is the first sensory mode to form in the very initial stages of human development. The skin, which is the largest of human sense organs constituting about 17% average body weight of an adult, consists of tactile receptors (Gallace, 2012). It is for this reason that Pallasmaa (2005) described the tactile sense as the 'mother of all senses'. The tactile sense encompasses sub-modalities such as pressure, temperature, itch and pain (McGlone et al., 2014), movement, joint position, and muscle sense which are important in everyday life (Gallace, 2012). This sensory mode is clearly vital both to human comfort and survival. A case in point is the level of heat or cold, light or high pressure, or pain if subjected to the human skin or body. Pain, for example, is very important to human survival because it gives a warning signal that the body is subjected to a stimulus, which if not eliminated will damage the body (Gallace, 2012).

The skin also separates or distinguishes humans from the external world and protects organs from external biological and physical menaces. Gallace (2012) highlighted that through touch, the skin:

protects our body by signalling potential danger and signalling us to make prompt responses...While vision and audition inform us about 'distal stimuli', our sense of touch informs us about those things that are occurring at the very last frontier between ourselves and the outside world, both socially and physically.

The tactile sensory mode is a sub-modality of the human somatosensory system. It provides discriminative as well as affective input into the brain (McGlone et al., 2014). Apparently, given that the affective input is related to moods, feelings and attitudes it has a bearing on human pleasure. Compared to speech, tactile sense expresses more emotion, conveys more intention, meaning and comforting. Good examples of touch include sex, nurturing, licking-grooming. According to Gallace (2012) people prefer a pleasant touch, particularly the so-called golden social touch. Good examples include interacting with others, slow-stroking, handshakes, caress, pat on the back and tender kiss. A pat on the back, for example, is known to enhance social interaction (Pastorino & Doyle-Portillo 2011). Touch is associated with many of life's pleasurable experiences. The 'power of touch' thus plays an important social function (McGlone et al., 2014). Touch deprivation in children leads to negative



behaviours and or health problems (McGlone et al., 2014). Touch is important to social well-being through provision of comfort, to determine dominance and to establish bonds. Qualities of objects such as weight, texture and hardness affect behaviour, choices and preferences both consciously and unconsciously (Gallace, 2012). The skin is thus both a social and life-sustaining organ.

1.3.2 The streetscape

The streetscape is the major component of the public space (Jacobs, 1961) and it occupies the most spaces among the outdoor spaces (Sadeghi and Bahadori, 2021). According to Kesseiba (20168), '[s]treetscaping has a very remarkable role in enhancing and creating a more favourable and healthy urban space'. Therefore, the state of the streetscape has a large bearing on the overall quality of the townscape. The streetscape is important given that it is experienced and used by everyone.

Moughtin (2003) defines the term 'streetscape' as 'an enclosed three-dimensional space between two lines of adjacent buildings'. Apparently, the definition has emphasis on enclosure of the street space, which depends on the relationship between the height of the buildings fronting the street and the width of the street (height- width ratio). The generally accepted height to width ratio is 1:3 since it is neither agoraphobic nor claustrophobic. The advantages of an enclosed street are usually interpreted from the visual perspective. For example, Poerbo (2001) uses terms like 'visually pleasing' and 'visual interest' in describing an effective height to width ratio. By referring to the ratio as the urban canyon and in particular the Sky View Factor (SVF), Sadeghi and Bahadori's (2021) analysis of the streetscape has visual connotations. The SVF ranges from zero to one meaning no sky view to full sky view respectively. Enclosure, as an urban design principle, is normally associated with continuity in the streetscape.

In light of the fact that the visual sensory mode is distal, there is need to improve the proximal tactile quality of the streetscape in order to make it more humanistic. This in line with Muleya and Dube's (2019) commentary that 'the enclosure concept seems to provide an opportunity for designers to intimately link public space with human needs and desires'.

1.3.4 Tactile quality and the streetscape planning, design and management

Tactile quality of products is quickly becoming important. Gallace (2012) highlighted that:

In the last few years, manufacturers and advertisers are increasingly coming to consider the importance of tactile interactions, and the knowledge arising from scientific research into our sense of touch is progressively becoming an important basis for the design of products that are more appealing to the user or consumer.

Clearly, as a consumer-oriented product, the streetscape can potentially be improved to become more appealing through incorporation of the tactile elements right from the planning, the design and management stages. Herssens and Heylighen (2008) argued that inclusive design is possible through the use of haptic design parameters or haptically marked elements, for example touchable experiences or tactile points of references to orient the blind, for example furniture. In alignment with the same universal design philosophy, design of the

public space may include both tactile supporters and barriers for the visually impaired. Haptic supporters may include textured landmarks while barriers may include poor tactile quality of the underfoot such as uneven ground surfaces (Jenkins et al., 2015).

In line with the tactile approach, the planning, design and management of the streetscape may consider the tactile sense sub-modalities such as pressure, temperature, itch and pain, movement, joint position, and muscle sense. The choice of materials or objects may need to consider the weight, texture and hardness. The streetscape can also be deliberately designed to create an environment for human socialisation through touch while observing the COVID-19 protocols.

2 Materials and Methods

The study follows an exploratory qualitative design with a phenomenological strategy of inquiry where data was collected through semi-structured interviews (31 street users), detailed participant and walk by observation. The observation of streets namely the Leopold Takawira Avenue and the Joshua Mqabuko street (running east to west and north south respectively as shown on by lines in Figure 1 and the specific sites within streets; and the interview participants were selected through purposive sampling. The two streets provide a longitudinal cross-section of the CBD.

The phenomenological strategy of inquiry entails that the study will consider the taken for granted and/or less noticeable street activities, settings and human experiences.



Figure 1: The grid patterned Bulawayo CBD and the two study streets.

3 Results and Discussion



This section presents and analyses the findings of this study. Discussion are placed in rectangular boxes. Three themes that emerged from the study included tactile experiences from weather elements, pleasurable contact or pressure, and pain or unbearable pressure or threats to safety.

3.1 Tactile experience from weather elements

The findings are presented and interpreted under the following subthemes: protection from the sun and protection from rain. The subthemes are in line with Carr et al., (1992) assertion that 'protecting people from the sun and rain is an important physical comfort-related principle'.

Protection from the sun

The walk-by observation revealed that throughout the streets under study, the shade situation provided by the buildings and trees varied from segment to segment. The extent of human experience in relation to weather elements has been demonstrated through snapshots of the two streets. The shade situation was analysed for appreciation of the tactile environment of the streets.

A full day's observation in the Leopold Takawira Avenue (between Main street and Fort street), was undertaken on Monday 27 November 2017. At 08:00, all sidewalks at the northern sidewalk were fully shaded, except on the eastern edge where the morning sun from the east illuminated sidewalk edges. The southern side was exposed to the sun with patches of shade from a small number of trees. At 10:00, the overhangs at the Tel One and POSB buildings provided shade to 1/8th of the pavement width (accommodating standing people who were leaning against the wall), while on the northern side most people outside the Mining Industry Pension Fund (MIPF) building were concentrated under street trees, some exposed to the sun and some under umbrellas. At 12:30, the overhang shadow for the Tel One and Post Office buildings on the southern side covered 3/8th of the sidewalk width (sidewalk width estimated using number of pavers that make up a sidewalk). At 14:30, the southern part of the pavement was in full shade from the Tel One and POSB building walls, except on the western edges. At this time the southern building bodies were providing shade even without canopy or overhang. Trees were shading the car park. At the same time in the northern sidewalk, the Charter House (without a canopy) were exposed to the sun wholly, except where there was shade from a tree. The MIPF building (with a canopy) sidewalk was exposed on the western edge and a quarter of the sidewalk width. At 17:00, the southern pavement and side parking were fully shaded, whereas the north was fully exposed to the sun, except where the only tree was throwing shade but it was no longer hot. At 18:00 (almost sunset), the whole segment, that included the sidewalk on either side, the traffic surface, side and central parking, were covered by shade from the building from the south that overflows to the north.

The foregoing observation strongly point to the need for street trees and canopy in order to shade the sidewalks on either side throughout the day. At least a continuous canopy is necessary for continuous protection from rain and the sun either on the northern or southern sidewalk. As for the avenue under observation, and other avenues, a continuous tree-canopy system on the northern sidewalk would be better because it will protect people from



the unbearable sun during the critical time in summer and expose the southern sidewalk to the comfortable sunshine in winter. Such a sheltered sidewalk, was observed to be very important, especially for people with conditions such as albinism who are mostly affected by the sun's heat. It was also noted that the height and distribution of buildings around a sidewalk in question and the day of the year has a bearing on the shade status of the streetscape. The study was done in November when the sun was migrating southwards towards the summer solstice. Logically, the opposite is true when the sun has passed the equinox towards the winter solstice. A walk-by observation on 13 April 2018 revealed that by 15:00 the southern part of the sidewalk in Leopold Takawira Avenue was exposed to the sun. In this regard, this study contributed to the comfort principle by proposing a sheltered sidewalk.

An attempt was made to critically observe the state of shade on the northern side of the Leopold Takawira avenue (between Robert Mugabe Way and George Silundika), on Tuesday 28 November 2017, where there is a continuous canopy. A fraction of the exposed or covered sidewalk was estimated or measured using the number of pavers that make up the sidewalk width. At 14:00, 3/7th of the sidewalk width in front of the NMB Bank was exposed to the sun (highest exposure – worst); one quarter the rest of the sidewalk widths were exposed (medium exposure); while only one-seventh of the Selborne Hotel sidewalk width was exposed (lowest exposure – best). The observed explanation is as follows: With no street tree for all the three scenarios, the Selborne Hotel has both a low canopy which also has hanging vertical protective sun blinds, thus at a given angle of the sun's rays it takes the longest to illuminate the sidewalk; the NMB Bank has the highest canopy although the width of the canopy is similar to the rest of the buildings in the segment thus the sun's rays take the least time to illuminate the sidewalk. The rest of the buildings have a lower canopy, no vertical blinds and a higher canopy compared to the Selborne Hotel (thus medium exposure).

Drawing from the foregoing, it can be concluded that longer and lower canopies (with tactile human scale) saves the sidewalk from the sun for longer and provide a wider shade.

Still on the same part of the segment, at 16:00, six seventh of the NMB sidewalk is exposed to the sun, while other buildings in the segment's sidewalk are half exposed. The only tree on the northern segment provides shade to an old lady seated on the sidewalk edge – the shed is directed to the north-east from the sunlight from the south-west. At 17:00, the whole northern part sidewalk was completely exposed, including walls for the NMB building where only a small portion was covered by the tree. This is the time (16:00–17:00) when people (high-density residents who are mostly pedestrians) are supposed to face a western direction into the sun to the local Egodini Public Transport Terminal – high-density is wholly located to the west of Bulawayo. It was observed that pedestrians were walking in the sun. Two ladies facing the direct sun in the west (afternoon), stopped and were overheard complaining about the heat, they took a bit of rest before they proceeded in apparent discomfort. On the southern side, the shade was present but patchy throughout the day depending on the distribution and canopy characteristics of the tree.



Clearly, the canopy and tree system has to complement each other to save pedestrians on the sidewalk most of the daytime.

The situations found in the Leopold Takawira Avenue where there are combinations of no canopy, with canopy, trees, no trees, and in some scenarios discontinuous canopies, were also found in Joshua Mqabuko Nkomo Street. However, due to differences in orientation, there were differences in terms of human experience of the outdoor weather elements. A detailed observation was carried out on 25 October 2017 along the Joshua Mqabuko Street (Leopold Takawira avenue and Eight Avenue). Given the north-south orientation of the street, with or without trees or canopies, the sidewalks on either side of Joshua Mqabuko Nkomo Street were shaded at 08:00, except where the building height was very low on the eastern part of the street and where the sun insolation penetrates through the avenues on either side of the segment. The western sidewalk was the first to be exposed to the sun. By 10:00, the western sidewalk was already exposed and shade was also almost disappearing in the eastern segment. Between 12:00 and 14:00, both sidewalks were totally exposed where there were no canopies and street trees. This is a *temperature critical period* where either side of the street are exposed during the hottest time of the day and pedestrians have no option but were observed to walk in the sun. During this period, it was so hot that people were sharing a ribbon of shade which was not enough to accommodate both pedestrians and stationary cars which were parked in the sun on both sides of the street, thus leading to discomfort when the passengers get back to the hot car interior. The start time and end time of the *critical period* depended on the height of the buildings bordering the segment, the street width and the characteristics of each sidewalk in terms of canopy characteristics and tree presence. From 14:00, the western sidewalks were shaded, starting with those that have a canopy, marking the end of the *critical period*. Short trees were able to shade parts of the sidewalk but most of the shade was thrown onto the car park and traffic surface. Tall trees were shading the traffic surface and part of the eastern segment towards 15:00 hours. During the same period, the sidewalk and part of the walls in the eastern part was still fully exposed to the sun. However, buildings with canopies, and more so, those with vertical blind covers were found to be better off. During this period, trees taller than the canopy height were not able to contribute to the cover of the eastern sidewalk. As expected, stationary and mobile activity was happening at the western part (including the POSB) where there was shade from 14:00 to 16:00, and a minimal number of people at the eastern part used the sidewalk. By 16:00, the western buildings were supplying full shade to the whole street, including the western sidewalk.

As confirmatory to the importance of building height, a walk-by observation on 13 April 2018 found that between 11th Avenue and 12th Avenue where there were low perimeter fences at either side of the Joshua Mqabuko Nkomo Street (Dunlop and the Methodist Centre), and with no street trees, such areas had the longest *critical periods*, almost equivalent to full daytime.

Shade was observed to be an important temperature regulator, the regulation of which is directly linked to the tactile sense. Clearly planning for shade, and in particular for the 'critical period', have to be done at the initial stages. The height of buildings bordering the street, street width and the local characteristics of each sidewalk in

terms of canopy characteristics and tree presence were important factors. While the relationship between street width and height and the resulting spatial containment used to be largely a visual issue (Carmona et al. 2010:183), this study is introducing the concept of 'tactile spatial containment' where the characteristics and placement of physical elements are carefully selected to deliberately protect humans from the unbearable sun. The 'critical period', which is a term introduced by this study, is important from the conception of layout planning, through the design process and the management of the tactile environment of the streetscape. This proposal is in line with Sadeghi and Bahadori's (2021:2) assertion that the outdoor thermal environment depends on the built environment factors. The streetscape can potentially be planned for multisensory containment.

Protection from rain

Walk-by observations were also made in Leopold Takawira Avenue between the Josiah Tongogara Street and Robert Mugabe Way (Figure 2) to check the extent to which people are protected from rain.



Figure 2: Part of the Leopold Takawira Avenue: southern sidewalk A, and northern sidewalk B, and eastern sidewalk C for the Robert Mugabe Way.

This was done during a rain event that ran from around 12:00 to 15:00 on Saturday 25 November 2017. The findings were that people scrambled for the canopy-covered sidewalk where they remained trapped for more than three hours waiting for the rain to stop (sidewalk B); they could not proceed to the next block because the pedestrian crossing was exposed. The owners of the buildings were chasing away those who sought refuge from the rain from the inside of their buildings. People spent a lot of time standing under canopies waiting for the



rain to calm down. Other people were running through the rain from one block to the other because other buildings in these walkways had no canopies. Those that proceeded into the rain were heavily soaked. Given that the rain was accompanied by a cold spell, such a gesture may not only lead to loss of possessions but health problems as well. One other observation was that the people who were under the canopy, their lower bodies were still exposed to the south-easterly driven rain as the rains sprinkled at an angle onto the stationary pedestrians. Most of the pedestrians had to shift to the sidewalks facing the west facing Robert Mugabe Way (sidewalk C) in the same block. People were safer in the street sidewalk (sidewalk C), compared to the avenue sidewalk (sidewalk B), therefore the canopy for both allowed easy people flow. Users would have sought better refuge from the south-easterly wind-driven rain at the sidewalk on the southern part of Leopold Takawira Avenue (sidewalk A) but there was no canopy on the sidewalk. Outside the normal sidewalk, the Tower block, through its generous design, managed to protect people on the southern part of Leopold Takawira Avenue.

On follow-up, on the trace tactile effects of the rain event on 26 November 2017, it was observed in Leopold Takawira Avenue (between Hebert Chitepo street and Lobengula street), that gutters either submit water to the storm water drainage system in front of the building or to the service lane which, in turn, pours into the drain. Due to its lower level and slope, the service lane is expected to collect water from gutters throughout its length to the Leopold Takawira Avenue drain under the sidewalk. Ordinarily, the cambered nature of the avenue is supposed to prevent water from flooding the traffic surface, while the sidewalk edge protects the sidewalk from flooding. However, due to blocked drains from the dirty sidewalk, lack of paved camber and low sidewalk edge, the segment was flooded such that it was a nuisance after the rains and continuous flooding has led to degradation due to erosive action. Being the best covered segment in Leopold Takawira Avenue in terms of canopy and trees on either side, one would expect people to be safe from the effect of the rain. From interviews with one vendor, it came out that the rain had negative effects, first because the segment was crowded and thus the canopy could not shelter everyone, even with complementary shelter from the market shades; and secondly, the water discharged from the service lane instead of sinking into the drain, flooded the sidewalk and paved area making it uncomfortable for almost everyone under the canopy or tents. When this happens, vendors have to stand on their toes to avoid the cold and uncomfortable water touch. Another vendor pointed out that the canopies are short and thus not enough to protect a big number from rain and went on to propose the use of steel structures which can potentially protrude to give a wider canopy system. The observation confirmed that the sidewalk was flooded as vendors tried to sweep away soil and other deposited material in the morning.

The foregoing user experiences points to the need to plan for both the pedestrian overhead and the street floor. In the former case, a canopy of adequate width and height within a sheltered sidewalk system or a more innovative system, which this study calls a 'tactile street roof', are required. On the design for underfoot, the relationship between the sidewalk, service lane, the drainage system and the traffic surface has to be continually managed to avoid flooding.



3.2 Tactile experience from pleasurable contact

This theme focuses on the contact of the human body with the physical elements and the ability of the street environment to promote social touch.

The detailed observation found that there were no formal street seats on or around the sidewalk for both Leopold Takawira Avenue and Joshua Mqabuko Nkomo Street. Seats were found in the City Hall garden and at the terminus; that is where people are found to be resting, relaxing, and doing some reading, some socialising and others waiting for friends or relatives, enjoying a pleasurable breeze and social touch. On the sidewalk for both the avenue and the street under study, people sit on informal seats. For example, in the City Hall sidewalk, people sit on the perimeter wall where during the observation it was found that the texture is good, but the small surface is unbearable and the palisade fence is disturbing as a vertically straight back rest and, thus, they are not comfortable. The majority of people have been observed to sit, eat, socialise and rest at the pavement edge, which is too short for comfortable seating and risky since the lower part of the body will be resting on the parking bay. In some buildings such as the Tower block, City Hall, Tredgold Building, POSB and the Bulawayo Centre people sit on entrance steps (Figure 3). Vendors sit on personal chairs, plastic containers and crates.

Informal seating on steps and planters,
Bulawayo Center

Informal seat on a wall on the sidewalk



Figure 3 Informal street seating

Most users (20) demanded formal seats in the streetscape. One user suggested that formal seats could only be fitted on the sidewalk on condition that the sidewalk width is increased because currently the sidewalk is crowded by people flow and vendors. Contrary to the majority of users and Mehta's (2006:126) finding that formal seats contribute to street liveliness, two users were totally against formal seats on the sidewalk. They argued that the sidewalk is meant for walking and must be used as such and setting up formal seats will not only make the street ugly but will crowd the sidewalk. The two users were satisfied with the current informal seating. When asked about the sick, old and the physically challenged, one said that only the healthy/or active people should visit the CBD; those who will walk without any need to sit. He added that urban areas are for the fit; the physically challenged must go to rural areas. The researcher found this man's view to be extreme and against the modern philosophy of inclusivity. It would seem there are people who believe that others are not fit to be urbanites due to their physical and mental circumstances.

For purposes of inclusivity, both formal and non-formal seats are required in the streetscape. The numbers, placement, size and arrangement of formal seats and the presence of shade were observed to be determinant factors in promoting socialisation. The different type of seats, the texture, the height, the relationship with the table, if any, also had a significant impact on the tactile environmental quality. Carr et al. (1992:232) insinuated that what is necessary is the provision of comfortable and sufficient seating.

In the central segments of the Joshua Mqabuko Nkomo Avenue, the physical setting was observed to promote social touch through a high level of socialisation and it was minimal at peripheries due to low commercial activity. The situation is different in respect of Leopold Takawira Avenue, where the human presence and the level of socialisation are high throughout the avenue but seems to increase from the east to the west. The explanation is that the avenue is bordered by purely commercial uses, including government and council offices throughout its length. The avenue is the main link of the east and west through the CBD. The population increases to the west because of the markets and the main local bus terminus to the high-density residential areas. The big numbers, which is a result of human convergence to the terminus and the market, have reached a point where the increasing number of people leads to diminishing returns for surveillance. People have become visual

barriers of each other. The crowdedness enhances the reported pickpocketing due to tactile sensory overload. One user confirmed that the segment is the most populous in the CBD, with the highest incidents of crime.

A high quality public space is supposed to promote social life. In this way and according to UN News (2015), it allows users to 'participate in public life', however the degree of human concentration may be distributed across the streetscape to avoid sensory overload.

As observed and reiterated by most users (26), the general tactile quality of the lawn was poor throughout at the City Hall garden fronting the Leopold Takawira Avenue. The poor-quality lawn turf was observed to discourage stationary activities (sitting, relaxing, lying and socialising) and consequently the golden social touch among people. Ladies were observed to spread a piece of cloth on the lawn before they can either sit or lie down although their male counterparts would lie directly on the same lawn. When asked why, one user highlighted that the lawns were not comfortable because it was of poor quality, patchy, with a discontinuous thin layer, a dirty or muddy surface; dominated by weeds, dead plant material and biting ants.

The researcher's contention was that the lawn should be usable not only to satisfy the eye but also for the tactile and other sensory modes. At issue must be the type and quality of the lawn that satisfies human underfoot touch and bodily touch as users walk, lie or relax on the lawn. This is a necessary tactile environment for all.

3.3 Pain and threats to safety

The study found that safety threatening objects or objects that can potentially result in human pain or discomfort were observed through a walk-by in the CBD. These include the Unity Village perimeter spikes and deliberately broken bottles on the Thompson Building hedge planter to discourage people from sitting there (Figure 4).

Planter with spikes on sidewalk



Low wall with spikes, Unity Village



Low wall with broken bottles, Thompson Building

Threatening signage, Thompson Building



Figure 4 Sensory threatening outdoor elements

One user pointed out that Unity Village management prohibits any stationary activity on the low wall, on the sidewalk and under the street tree since that promotes littering and allows thieves to spot goods inside the market. Exposed electricity wires in the streetscape are not only visually threatening but a tactile threat or danger when in contact with the human body. It was observed that some trees present a threat to humanity. Such trees include thorny trees, old trees or their dead branches, and trees with an invasive root system that compromise the tactile quality of the sidewalk. For example, during the same rain event on 30 September 2017, an old street tree fell onto a building (Figure 5).

Invasive tree roots



Tree fallen on a building after a storm



Thorny plants on the pavement



Thorny plants



Figure 5 Sensory threatening/ potentially pain causing plants

The uneven nature of the sidewalk resulted in injuries and human pain. One vendor, who has been selling his products almost daily along the Leopold Takawira avenue reported that a slippery ramp next to her seating position, causes at least 10 people to fall per day, especially those with slippery boots and the elderly. She also talked about the remnant park meter which is even more dangerous to everyone and in particular to the blind. Similarly, the uneven sidewalks in along the Joshua Mqabuko Street (between twelfth and thirteenth avenue) has injured three people (two ladies and a child) in an hour of observation. See Figure 6.

Steep-sided sidewalk – Service lane interface



Ramped sidewalk – Service lane interface



Sidewalk accessed from the parking through a ramp



A ramp linking the lower street surface to the upper sidewalk through a ramp



Figure 6: Access and navigability through the vertically edged sidewalk

Vehicular–human conflict has led to life threats, injury and death in the streets. One user pointed out that accidents normally happen along the Joshua Mqabuko street (between twelfth and thirteenth avenue) because there is no pedestrian crossing and that people cross from all over at any angle for their convenience. He reported of a person who was hit dead the previous week. One design error that can potentially lead to vehicular–human conflict at the Zuva filling station (and other filling stations in the study areas) is on the vehicular–surface sidewalk interface. The vehicles into and out of the filling stations are given precedence over pedestrians crossing the street. The vehicular surface is physically smooth and clearly defined while the sidewalk is truncated into impassable steep-sided segments. This is not only in such a way that the sidewalk is difficult to visually recognise but also cannot be navigated easily, especially by the disabled. The observed temptation is for people to use the better finished vehicular surface thus competing with vehicles.

There were also threats from other humans such as robbers and murderers. One mobile airtime vendor stressed that robberies take place both during the day and night and reported one that happened a day before in Unity Village. One security guard reported that at the *Inxwala* site, gangsters rob and sometimes kill people on foot even during the day, especially during the rainy season where they run away to the bushy and long grass within the site. This happens despite Council efforts to reduce the thicket by cutting the grass. He proposed that the vacant site need to be quickly developed in order to improve surveillance through human presence. This is explained by ‘safety in numbers’ (Butterworth, 2000). The need for protection from the physical harm from cars, people, natural elements and structurally unsound buildings (Lang 2007:221) is an important need for physical and psychological comfort.



In light of the foregoing safety threats, this study contended that the threats have created an unfriendly human environment given that the public space belongs to everyone. The dangerous sidewalk surface and inability to give precedence to pedestrians through the relationship of the sidewalk and traffic surface are tactile issues. Some important safety issues include natural surveillance, safety from other humans and improving the public space quality to reduce negative safety perceptions. Safety has to be improved to make great streets in Bulawayo.

3.3 Movement

People flow was singled out as one common human activity in the study areas. The adequacy of the streetscape in terms of promoting movement is analysed based on concepts of “tactile supporters and barriers” (Jenkins et al., 2015). Detailed observation was carried out to assess the extent to which the streetscape facilitates ordinary people flow.

In most segments, the pedestrian realm partially supports walking due to the inadequacy of sidewalk surfaces. This has made even active gestures on the rough sidewalk surface dangerous, even though some adult males and children were seen running, jogging or playing on the surface. It was observed that with or without pedestrian crossing markings, pedestrians seem to criss-cross the vehicular surface at any angles instead of the 90 degrees across the street. What motivates pedestrians to exercise such dangerous crossings is their desire to take the shortest route to their destination. It would seem that the same motivation drives some users to walk through the service lanes as the shortest routes to their destinations.

The flow of people in the streets was also observed from the perspective of the sensory disabled and people with physical challenges. More than three blind men on different occasions, different days and segments were observed to successfully navigate throughout the block on their own with the help of metal cane taps that produces sound when in contact with the sidewalk. The continuous rhythmic sound on the sidewalk, the break of the block at service lane acted as touch points. It was noted that after realising a slope at the service lane interface, the blind men would either hit the wall margin or pillar as *confirmatory touch points*. The sound on the paved sidewalk also helped to alert other pedestrians to open a way and help the blind where necessary. In all three cases, the blind men would shout for aid at the pedestrian crossings at the end of the block. Other people will help them across, after which they would proceed unaided until reaching their destination. In the case of two observed men, their destination was a begging point, where they normally spend all day. A blind lady was observed to be aided by a young boy throughout her way in the street sidewalk. The challenge facing the visually impaired, especially at the intersection, can be solved by avoiding the visual-based public space for the sighted. Navigational information needed from other multisensory sources (Jenkins et al. 2018:8646-8648) and interactive multisensory cross walks that use sound, texture and light (AIGA DC 2018: Online) to help safe street crossing. The tactile or vibro-tactile signals seems to be the most attractive and most inclusive since it is rare for humans to be tactile disabled and the tactile sense can use any part of the body to detect the signals.



It was observed that the uneven sidewalk, especially the abrupt fall at the end of a block or where the sidewalk interfaces the service lane (Figure 6), has been totally observed to push away self-driven wheelchairs out of the sidewalk into the traffic surface. The observed problem is not only social exclusion from the sidewalk but the danger and threats from vehicles, the perception that the pedestrian is not safe, and the difficulty the affected person faces when he or she intends to get back to the sidewalk through its steep-sided edge. The only wheelchairs that use the sidewalk are driven by helpers who add extra effort to take it through the uneven terrain. Where the wheelchairs are self-driven upon reaching the sidewalk edge, they would ask for aid.

Similarly, one adult male with difficulties raising his feet and one lady with elephantiasis were observed to literally fall into the deep service lane as they walk along the sidewalk and had even more difficulties when they attempted to rise over the steep sidewalk. Faced with the abrupt gradient, one old lady had to first sit on the sidewalk and rose through the support from a pillar and a gentle hand-pull from a volunteer. It was observed that one adult male who disembarked from a car at the side car park intended to rise up the sidewalk edge but failed doing so on his own. He had to use a non-functional parking meter pedestal for support. Although, it disturbs flow by the disabled, the vertical edge of the sidewalk is necessary because it protects the people on the pavement from vehicular accidents and flooding.

A preferred streetscape must support human stationary activities and ordinary human movement for all. Tactile supporters must be promoted and barriers to movement removed. The sensory impaired are supposed to be supported by creating a multisensory-based streetscape. The texture, hardness and shapes for the physical elements (such as pillars and park meters) in the streetscape must be such that they support the sensory impaired to navigate through with minimum aid.

3.4 Re-engineering Public Space: The Street Tactile Roof

Drawing from the previous discussions, the streetscape can be reengineered through improvements on the underfoot surface, building façade, the roof and streetscape detailing. The need for a tactile street roof is one major finding of the study. Just like the sidewalk, the canopy system has to be continuous. Basically, a situation whereby either side of the street are exposed to the sun simultaneously, is to be avoided. There is need for a continuous canopy protection at least on one side of the streetscape to be known as the '*sheltered sidewalk*'. For important streets and avenues that carry a large number of pedestrians – for example the Leopold Takawira that links to the main high-density terminus, Egodini, and the main long-distance. Renkini bus terminus as well as the proposed pedestrian mall – it is proposed to extend the '*sheltered sidewalk*' over the pedestrian crossings (over streets) and over the service lanes to link and provide continuity to form a '*tactile street roof*' such that people can continue to walk comfortably under the sun and under rain. Figure 7 shows the '*tactile street roof*' comprising of a continuous canopy system (blue bands) and extensions over the streets and service lanes (green). Even filling stations can possibly extend their roofs to the pedestrian sidewalk, both in line with the

existing sidewalk and the offset convenience building. The first *'tactile street roof'* is therefore proposed along Leopold Takawira Avenue, given its importance.



Figure 7: The proposed tactile street roof along Leopold Takawira Avenue. Blue shows the canopy system and green is the extension over streets and service lane.

The *'tactile street roof'* is important because it is an attempt to design for the tactile sense which is the whole body, that is the skin, including the eyes because they also get affected if exposed to the sun or rain like any other part of the skin. Besides the time wasted while waiting under a discontinuous canopy during a rainfall, especially by the poor who do not have a car or even a raincoat, another justification of the *'tactile street roof'* is in light of extreme climatic conditions that come with climate change in the face of people in special circumstances such as albinism. Even people with cars can be in the same situation because they will have to wait if the car is not nearby. The roof will help people who do not have or cannot handle an umbrella such as people with a disability with both hands needed for pushing a wheel chair, or who did not bring one from home. The proposed street roof will help even the visually impaired with touch and support points, and the disabled who cannot run in the rain or under adverse climatic conditions. The street roof will motivate people to cross streets at designated crossing points and thus avoid unnecessary pain when accidents occur. The street roof is a springboard towards what Pallasmaa (2005) calls the tactile city which is one "one of interiority and nearness".

Given that the *'street roof'* is a new concept in urban design terminology, its proposed functioning has to be discussed in detail. In any existing CBD urban setup, the first step is to identify the sidewalks for sheltering on one side the streets, and secondly, to identify the most important streets in terms of people flow, upon which a roof may be inserted following the *sheltered sidewalk* as not all the streets or avenues need a roof. One factor



to be considered on the choice of the sheltered sidewalk is a balance between sunshine in winter and shade in summer. Given that the roof will be supported along the pedestrian crossing lanes with an impact on visual continuity, it has to be articulated for the benefit of the people facing it at the street level, for example with use of street televisions and adverts. Solar panels, while they are not visually beneficial, may also be carefully attached to the same roof to energise the traffic lights. To avoid clutter, the roof may be anchored on pedestals that also carry traffic lights on traffic lanes.

The conditions under which the roof may function are as follows: For avenues running east–west, the sun will not significantly displace the shade out of the sidewalk throughout a given day and throughout the year. For the streets running south–north, the roof may be only functional around midday. It is true this may be part of the critical time but for a smaller period of time depending on the height and the width of the roof. Building characteristics and placement may be carefully done to supplement the roof at crossing points in terms of shade. It may serve, as far as rainfall is concerned, depending on the characteristics of the rain, the width and height of the roof. In this case, it therefore has to be extra wider than the pedestrian crossing or sidewalk to cater for sun movement variations, especially during the extremes of summer and winter solstice and the rain coming at a slanting angle. To avoid the wet street floor underneath the roof on streets and service lanes, engineering designs have to be made such that storm water is discharged into the underground to drain before entering either the pedestrian crossing markings on the street or the sidewalk–service lane interface. The roof may be guttered to channel storm water into the same swallow drains or rainwater harvesting tanks. Big trucks may not be allowed to pass through under the roof so that the roof is as low as possible to be effective (height restriction to be determined). The Bulawayo Master Plan (2000:90) requires that heavy vehicles are not allowed in the CBD. For the concept to work, all the buildings in the proposed sheltered sidewalk with no canopy have to be inserted in the plan. At the plan approval stage, buildings with no canopy have to be located outside the sheltered sidewalk (including perimeter walled) and corresponding perimeter walls either side of a given street or avenue have to be avoided. Where the street walls need to be punctuated or articulated to bring sensory diversity to an important street, the designers must be conscious of the sheltered sidewalk and street roof. The street roof concept is in line with the streetscape continuity and enclosure principle as emphasised on the definition of the street by Moughtin (2003). However, it is not confined to the visual dimension but has emphasis on tactile quality of the streetscape.

4. Conclusions and Recommendations

This paper examined how humanistic streetscaping can be improved from the tactile planning and design standpoint in Bulawayo Central Business District. The study was based on the users' tactile experiences and aspirations. However, this paper does not encourage the study of individual senses but multiple senses since the senses are interconnected and cannot be easily separated (Carmona et al., 2010; Freeland, 2012). This study was necessary because the tactile sense is least investigated in relation to streetscape quality, yet it is the modality that that directly links the human and the environment.



The users, whether stationary or mobile, preferred shade during summer, especially in the afternoon and as expected, they reported and were seen to enjoy exposure to sunlight in winter, especially in the morning and evening. The users preferred a public space environment that protects them from rain, rain effects such as floods, the sun, wind and exposure to comfortable microclimates. Generally, the users found pleasure in contact with comfortable seats (formal or informal), outdoor features, direct physical contact with nature, and a smooth and continuous underfoot design that avoids pain. They preferred a managed landscape to avoid natural and human safety threats. The sensory handicapped preferred continuous pathways with minimal barriers, presence of touch points, textural landmarks and tactile supporters. Such necessary tactile environments for all, including special groups, make the public spaces inclusive. People aspire an environment that is able to promote social touch, that is contact with others and socialisation. As would reasonably be expected, people dislike pain, death, unbearable pressure and threats to safety. A public space environment that eliminates or minimise the foregoing is preferred.

The observational and interview findings showed that such expected environments were not satisfactorily met. Formal street sidewalk seats did not exist throughout the streetscape. People reported and were observed to depend on informal seats and formal seats were found only in the City Hall garden. The majority of the interviewed participants preferred seats in the street sidewalk, whereas a minority did not expect to find seats on the sidewalk. In light of the differing aspirations, care has to be exercised in the location and type of seats but seats are necessary to cater for people waiting and relaxing, the weak, the old, the tired and the disabled. These may be placed where there are gardens or other public spaces in the streetscape, may be informal or formal as part of buildings or other physical elements, or may be placed where there are building setbacks such that they do not create sensory clutter.

Drawing from their experience and behaviour in the streetscape, people prefer the use of shortcuts between two points. The users preferred an inclusive and active engaging environment which may be both natural and artificial. In summary, people preferred a street environment that promotes ordinary, stationary and active engagement. However, the current environment was deficient in terms of the foregoing expectations. Improvements on the underfoot and introduction of games and play equipment of good tactile quality for both adults and children are called for if people are to enjoy both necessary and optional activities.

In light of the foregoing, the paper makes recommendations for the improvement of humanistic streetscaping through tactile planning and design. The recommendations, which can be usable in Bulawayo and elsewhere, are as follows:

- i. A streetscape environment with tactile supports, tactile landmarks and no tactile barriers is required especially to aid the movements of the visually impaired. Such supports include pillars, park meters and distinctive surfaces that are arranged in alignment with the walkway without causing sensory clutter. Non-visual pedestrian crossing control may be introduced, for example, the auditory or vibro-tactile to cater for all the people, in particular the sensory disabled.



- ii. The tactile quality of materials to be used in the streetscape has to be considered at the design stage, especially the shape and texture and placement. Tactile friendly elements must be used while the physical elements that can potentially cause pain or are safety threatening must be avoided. The height and texture of seats must be such that they are comfortable to use. Where the perimeter fences, the steps at the entrance of buildings and other physical elements are deliberately designed to provide informal seating, they must be ergonomic to avoid pain.
- iii. The street environment must be planned and designed to consciously promote human social interaction, that is, the golden touch. The provision of green spaces, pedestrianisation of some parts of the streetscape and introduction of market places are some good examples. The introduction of movable play equipment for children of good tactile quality during the weekends can also enliven the streetscape.
- iv. The streetscape layout and characteristics must satisfy tactile coherence, tactile continuity and tactile containment. For example, the sidewalk underfoot surface must be continuous, safe and have precedence over vehicles even at filling stations. This helps to avoid accidents and allow the sensory impaired to use the sidewalk without disruptions. The buildings, the street trees and other physical elements shall be laid out in such a way that they protect the humans from the adverse effects of whether such as wind, rain and the sun. The street layout, be it the grid or any other layout; the block size and orientation; the building, height, massing and canopy characteristics; and street trees must as far as possible ensure protection of the users from adverse whether elements and ensure exposure to favourable whether elements.
- v. The final recommendation is the introduction of a 'tactile street roof. Plainly, the proposed roof can potentially take cities a positive step towards being inclusive, usable, and liveable cities. The foregoing guideline applies to cities under the harsh tropical sun and with incidences of heavy and long duration rainfall as observed, including tropical cyclone-related rainfall. The roof is important in the CBDs and other main business centres where people congregate and are supposed to walk in search of goods and services from the buildings, or to their transit points. The street roof concept is the first major step in the creation of 'tactile cities'. It leads to a connected streetscape and a system of blocks that will stand like a giant shopping mall covering and linking major streets and avenues in the CBD. The approach promotes a system of a seamless urban fabric instead of a disjointed urban object. The result is a desirable public space setting supported by Muleya and Dube (2019). The street roof concept injects tactile coherence, tactile continuity and tactile spatial containment into the streetscape. This approach is relevant in light of the climate change that intensifies the effects of natural calamities such as temperature, heat waves and flooding resulting in human suffering. In this way, the streetscape design cushions the effects of such calamities and provides an environment that supports human comfort.



In conclusion, this paper managed to introduce and popularise the use of psychological language within the built environment circles. The most frequently used terms in this study are 'tactile environment', tactile city, tactile street roof, 'sheltered sidewalk', tactile coherence, containment and continuity' and 'temperature critical period of the day' used in the description of both human experiences or aspirations and a quintessential streetscape. Such terms serve to enrich the streetscape terminology and provide basic tactile design principles and stand as a point of departure for public place quality assessment criteria from the tactile perspective. The language promotes the creation of a human responsive environments by creating a bridge between people and streetscape. It links the physical environment with the human bodily aspirations. Being a link between psychology and the built environment, the approach takes into account environmental considerations as experienced and aspired by humans.

5 Direction for Future Research

Further research is required on the tactile quality of the streetscape in other urban settlements. The continuous research in different settlements will allow for the establishment and refining of the streetscape tactile quality principle. A quantitative research of the street tactile quality will also be beneficial. The practical testing of the 'tactile street roof' concept in different cities is likely to bring interesting results. The possibility of an automated and or solar powered 'tactile street roof' that functions when necessary for example during a rain event is a fertile ground for future research. Innovative engineers and architects are called upon to research on the specific engineering design of the proposed street roof, its robustness, integration with the streetscape and the corresponding storm water drainage.

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