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QUALITIES OF THE GREEN LANDSCAPE IN PRIMARY SCHOOLS, DEFICIENCIES AND OPPORTUNITIES FOR HEALTH OF THE PUPILS

R. Tafahomi

Department of Architecture, School of Architecture and Built Envirment, College of Science and Technology, the University of Rwanda

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ABSTRACT

The aim of this research is to analyze and demonstrate the deficiencies and opportunities of the green landscape in primary schools, Kigali, Rwanda. Despite the recent research on significant positive effects of green spaces on public health such as mental, physical, and social, the landscape design with green elements has less taken into account as a priority in schools. The methodology of this research was based on the qualitative method by applying structured observation, photography, and site analysis techniques. The findings identify that the schools face the deficiencies to apply hardscape, softscape, and interaction of the pupils with the green spaces. Despite the open spaces in the schools for design as great opportunities, the deficiencies of hardscape, softscape, and limited accessibility of the pupils to the green spaces could influence the general health of the users.

Keywords: Green Landscape, Hardscapes, Health, Softscape, Pupils, School

Author Correspondence, e-mail: tafahomi@gmail.com

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1. INTRODUCTION

Kigali city as the capital of Rwanda in the East Africa region includes a rich background to locate in tropical forests. Despite the city developing rapidly, still, the green mountains in the surroundings and wetland branches in the inner part of the city could remind these rich experiences. The population of the city increases rapidly with a high expectation from the quality of life, education, health, and green spaces. With the development of the city, the level of green spaces reduces dramatically; however, the master plan of the city emphasized the protection of the forest areas with less achievable implication policies and strategies [1].

Study about the landscape of schools is a significant topic for the researchers in the landscape architecture [2-4], education [5,6], and psychology [7,8]. For example, the study of Zhou et al addressed that landscape studies have encompassed a variety of themes and topics in landscape design such as ecological, planning, health, and sociocultural aspects to enlarge the landscape e about the urban environment [9].

Schools as a foundation for the education, training, and development of the next generation of inhabitants in the city play important roles in the achievement of the expected quality. The schools vary in the city such as private and public, with different level of education, and either specialist in specific levels such as primary, secondary, or mixed forms in many levels. Those schools constructed on a plot on the hills with a forest, farm, or garden background in the whole parts of the city. Therefore, part of the construction process was the deforestation stage.

Seemingly, the landscape of school is important to study for some reasons. First, this landscape is part of the general landscape of the city to constitute urban climate, temperature, and quality [10]. Second, it is also part of the general green spaces of the city that it forms the urban landscape of the city [11]. Third, it includes positive effects on the health and wellbeing of the users [12,13]. Fourth, the schools serve the children and teenagers need for the future, which that importance created reasons for this study.

2. THEORETICAL FRAMEWORK

Studies have considered relations between landscape and pupils in schools from both direct and indirect perspectives. In the direct effects, there are studies about reduction of the

temperatures, radiation, and wind circulation and improving the air quality in courtyards [14] and improving the daily moods [15] and effects on health including physical, mental, and social health [13]. For example, researchers have studied the schools in South Africa based on the positive effects of green spaces on the performance of the pupils and reduction of stress in the view of green [16]. In addition, the researcher revealed that the quality of the landscape of schools also nearby natural elements positively associated with the performance of students [17]. There is also another output that demonstrated a high level of reading activity among students based on the green canopy and sheltering [18]. In the same line, the study of Jianga et al identified that trees canopy and density of green spaces have positive effects on the reductions of stress in both genders although with different ratio [19]. Furthermore, the study on the memorizing process of the place revealed that with the increasing of the trees and the flowerbeds, the level of positive memory on the space increased [20] although the study of Kerebel et al clarified that blight landscape scenery had more potential to be highlighted in mind than beauty [21]. Studies of Ali et al [5] emphasized integration of the furniture components with the green spaces as the high quality of the landscape in schools and facilitating educational process such as leisure time and open class activities in green landscape [10].. Playing and engaging of pupils with the plants and landscapes in schools reduce the negative emotion through physical contact with plants [22]. In this direct view of the green, they are sufficient evidence to approve the visual qualities of mental health [23-25]. In the indirect studies, the study emphasized the three key values of landscaping for users including outdoor recreational activity, aesthetic values, and social interactions [11]. The researchers achieved that the schoolyards have been a great opportunity to conserve green spaces including both exotic and indigenous species in the urban landscape platform [26]. The context of school is one of the important factors to form the experience of learners from the learning times [27].

There are another group of studies that targeted the urban climate, dynamic, sustainability, and livability in cities through an analysis of the landscape. For example, Ward at al criticized that the urban landscape and green spaces have a wide range of effects on the livability in cities [28]. The study pointed out the effects of planning the green landscape on climate dynamism

in different parts of city [29] although the landscape of schools like urban green areas need more protection from the toxemic elements due to the high level of urban pollutions [30].

In addition, studies on the evaluation of health quality demonstrated a strong association between natural elements and the health quality of users [31]. For example, Tafahomi and Nadi recommended an analytical structure for the study of landscape based on hardscape, softscape and behavioral patterns of patients and staff in open spaces in the study about the quality of landscape of hospitals in Kigali. The findings highlighted a positive possible effect of allocation of the therapeutic landscape and healing gardens in the designing of the green spaces, which was constructed on the eatable and herbs gardens, gathering areas for social interactions, blue spaces for contact to waterscapes [13]. The findings in another study highlighted that well interspersed green spaces by design have a positives effect on the quality of the health of inhabitants although poor green spaces reduce the level of health condition [32]. However, some studies theorized that the poor landscaping rooted in a weak design process. For example, the results of the study highlighted that there is a weak association between architectural design and green spaces in the designing process [20]. This problem was addressed by Filor [33] in his study on the process and procedure of the landscape design to highlight the effects of design by the vision, skills, and plan in high-quality design project.

Tsunetsugu revealed the natural environmental sitting positively influenced the human senses [34] and they were interested to visit more natural areas with positive moods [35]. The landscape could be passive to present a cultural background or active to form a cultural value [36]. It also revealed that the first purpose of the landscape for users is recreational activities and then other fundamental purposes select [4] and those simple landscapes with an easy way to understand increase the tranquility [37]. Nevertheless, the low quality of the landscape in the study on the European cities called a ‘shrinkage of urban landscape’ that is going to end with different interventions [38].

In summary, the landscape of the schools included hardscape and softscape those arranged based on the mass-space proportions, the context of the city, and the climate. The landscape has both direct and indirect effect on the mood and behavioral patterns of users in daily contact with the green spaces that was discussed widely. The quality of the landscape and the

behavioral patterns of users interplay continuously to form the general conditions of schools green landscape quality.

3. METHODS AND MATERIALS

The methodology of the research applied the qualitative methods [39-41] with the structured observation [8,42,43], photography [44-46], sketching [47-49], and mapping through graphical analysis [50-52] to analysis the landscape qualities [53,54,13].

Other researchers also applied structured observation technique to test how users use the landscape in the schools [17,16], hospitals [13], and open spaces [43,52] with a checklist of the hardscape and softscape as the composition and the configuration [5]. In addition, Mears et al listed the site analysis, photographs and simulation as common methods in landscape studies [32]. Graphical analysis that is also called communicative skills in the landscape architecture field [55]. Othman et al also applied the photographs for both data collection and simulation in the landscape research [56]; also, in another research, Cheng applied the photography for the simulation visual qualities for users [57].

Research process: In the first stage, some schools were selected by the researcher based on a five-kilometer radius of accessibility from the city center. Through official letters were requested to allow fourth-year students in the landscape class in terms of trained researchers, visit the schools for inventory activities specifically, the green landscape through structured observation, photography and sketching. However, the level of acceptance was so low, therefore, the areas of the research extended to the whole city. Finally, among the long list of the schools, just 22 schools accepted the request in the research time. The schools that did not reply to the letter of the department, were excluded from the research process. The schools accepted the visiting and reporting of the quality of landscape based on some conditions such as visiting in the off-time of the school, afternoon, and outside than inside of the classrooms and open spaces than private spaces. Nonetheless, this opportunity paved the path to collect important data for analysis.

Applied Methods: the structured observation applied to collect physical elements in the sites such as hardscape and softscape. A checklist of the key factors provided and through of the

research team all data recorded via photographs, sketches, or note-taking. Researchers collected the data through photographs based on serial vision, panorama, and pupils activities. The research team members were trained that if the photography changes the behavioral pattern of the students, they can apply the sketching and drawing to record the data. Sketches applied to schematic drawing of the physical elements in the site to convert to the map for the site analysis. The site analysis encompassed many layers of the data such as hardscape, softscape, and interaction of pupils with the green landscapes in the sites. Overlying the data provided an analytical map for each school to present the relationship between the hardscape, softscape and the interaction with the green landscape. The research team members talked with the person in charge of the landscape of the schools to discover the planning, designing, and maintaining processes of the landscape in the schools.

Data: the data of the research was combined from three main clusters of information including first, hardscape such as mass, space, paths, and shelters, second, softscape such as trees, vegetables, flowers, and grasses, and third, the interaction of the pupils with the green spaces such as stop, playing, and grouping. The data collected through structured observation, photographs, and sketching.

Process of Analysis: to present a comparison study, the data arranged in an analytical table of the data including alphabetical code for the schools from A-Z, one exemplified site photo to represent the form of the site, a landscape photo to exemplify a portion of the landscape, site analysis layout, and key quality observed through the site analysis. Despite the site layouts were arranged on a small scale, the form of the site arrangement and data provided comparative analysis between the maps. To explain and highlight the main quality of the green landscape in each case, the explanatory table designed to describe both specifications of sites and landscapes.

Time and location: the time of the data collection took place from September to December 2018 that was included both dry and rainy seasons in the region. The research team visited the schools based on the appointment with the manager of the school to see the quality of the green landscape in the sites, which all of them located in Kigali city.

4. RESULTS

The physical elements in the sites were analyzed to discover the key factors of the landscape quality in the schools through graphical analysis. In this process, all data through observation, photographs, and sketching overlaid to demonstrate behavioral pattern in the site, hardscape and softscape, and pattern of the green spaces as table 1 and 3. For each graphical analysis designed an explanatory table to discuss the content of the maps as table 2 and 4.

Table 1. Analysis

No	Schools' Code	The Site Photo	Photo of landscape	Site Analysis	Key Qualities
1	A				Sufficient integration of hardscape and softscape.
2	B				An integration of green spaces and eatable trees with areas for recreational activities
3	C				Conservation of old mango trees and integration wood trees shrubs and grass eroded due to overused
4	D				Rich green spaces with gardens and covered areas, good maintenance, open spaces and gardens
5	E				High sloppy areas with rich decorative green spaces but less spaces for the activities
6	F				High footprint area with less open spaces and green spaces but good maintenance of small green spaces
7	G				Wide spaces with less sheltering and the place for behavioural activities, less direct connection to green spaces

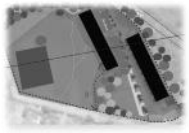
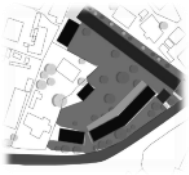
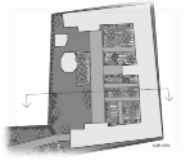
8	H				Sloppy land with separated green spaces and limitation of activities on green spaces.
9	I				Trees as protection of winds and lighting in the surrounding of buildings, less function for the green activities bases.
10	J				The areas included wood trees and place for the activities
11	K				The centralised green spaces with some decorative green frontages with integration of green space with the courtyards

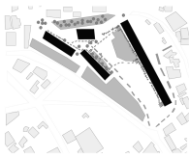
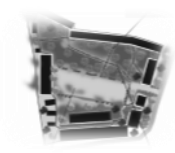
Table 2. Explanation of Graphical Analysis in Table 1

No	**Schools' Code**	**Specification of the Site**	**Specification of the Landscape**	**Key Issues with the Landscape**
1	A	Linear forms in three lines with extension to create courtyards, paved, all buildings were included eaves as shelters	Linear trees around buildings including Pine and jacaranda, one avocado trees, shrubs as edges and decorative (duranta and gold edge duranta)	Less variety in trees, shrubs, and grasses particularly the eatable species
2	B	The buildings integrated forms linear and pentagon forms, central courtyard was paved and surroundings normal land.	The grevillea and Pine trees in a linear structure surrounding of roads and buildings, and a few avocado, mango, guava trees, truck of trees painted by with color, shrubs (duranta) as edges	The linear structure of tree and green spaces less allow the pupils to spend tines with the landscape although view of green exist in the structure.
3	C	Linear structure on the contour lines with cluster form, high level of footprint, paved, connected with stairs, buildings and corridors supported by shelters.	Avocado and mongo trees, grevillea and Pine trees as linear structure, covered with grass, shrubs as decorative, edges, and beautification.	The landscape was designed based on building and just one old tree remained from blended form.
4	D	The structure of school based on the square courtyards in a cluster forms among green spaces. Open spaces covered,	variety of trees including, Pine, jacaranda, acacia, eucalyptus, ficus benjamina, guava, mango, yucca, palms (queen, Areca,),	The landscape is not included gardens, but the view of green and variety of the green spaces provided. This variety

		paved, and designed.	umbrella tree (African talisay), banana garden, flowers, grass, and shrubs (duranta and gold edge duranta)	provided opportunity for the pupils to engage with nature.
5	E	Linear structure of construction with terracing based on high topography, the paths paved with stone, buildings with wide eaves, and courtyard and open spaces unpaved.	Trees and shrubs arranged based on the roads, particularly, jacaranda, Pine, African talisay, banana, lemon, sugar cane, and duranta for the decoration and the edges of roads.	The landscape has spread in the whole school although with a view of green than engagement in. the eatable green spaces was obvious.
6	F	Two floors building with linear structure of construction with terracing based on high topography, high footprint, the paths paved with concert, buildings connected with stairs and a wide eaves, and courtyard and playground covered and paved.	Pine, papaya, banana, jacaranda, mango, and palm (palmier) trees arranged as decorative elements, grass, shrubs (duranta), and flowers support congested site with green spaces.	Hardscape than softscape with less view of green and engagement. The landscape could less provide the green space for the social interaction.
7	G	The school constructed on the hill with a central courtyards form. The structure created central courtyard and other yards in the surrounding areas. All buildings are one floor. Paved and unpaved areas.	The linear structure of the trees particularly decorative such as Mexican fan palm, jacaranda, Pine, and frontage design with the shrubs as hedges and grasses in side	Despite the available land the landscape of the school is weak due to the poor variety of green spaces for pupils' interaction.
8	H	The building constructed on the linear form in two lines, courtyards in between and surrounding, two floors, unpaved courtyards and paved roads and frontages.	Linear style of the trees with jacaranda, grevillea, and Pine, grass and a few flowers	Poor hardscape and softscape made the school weak to engage the pupils with the green spaces and activities.
9	I	Buildings of school located in juxtaposition of one corner to create L form and the courtyard on the front,	The trees arranged in the backside of the building and the frontages of buildings were less green. In the courtyards Pine, grevillea, and jacaranda observed and a few lemon and mongo trees backyard. Less grass and flowers.	Using of trees with the function of cooling system of buildings, sufficient shadow with less paved or grass areas for activities of pupils
10	J	A radial structure based on the topography with the courtyards in front and linear connection between buildings. The roads	Variety of wood trees such as umbrella, jacaranda, octopus, Pine, grevillea, acacia, with flowers, and rich grass	Integrated hardscape and softscape for pupils but without bring the garden concepts in the structure of

		and paths covered and paved.		landscape
11	K	The building designed square forms with courtyards in between, two and three floors buildings with paved and covered paths.	The green spaces followed the structure of the hardscape with the linear form such as Pine, jacaranda, Roble Amarillo, cluster of banana trees, shrubs and grasses	Hardscape and softscape in support of the buildings with less variety in green spaces such as eatable species.

Table 3. Analysis

No	Schools' Code	The Site Photo	Photo of landscape	Site Analysis	Key Qualities
12	L				Despite the garden and farm in the school, separated green spaces with the structure of the buildings.
13	M				Functional green spaces for the protection of buildings, less activities based on green spaces
14	N				Rich wood trees in surrounding building for protection, bur less green spaces for activities and haunt.
15	O				Decorative green spaces but less based on the activities of users for recreational
16	P				Rich open areas but with less quality and less connection with large green spaces and gardens
17	Q				Linear form for passing than stopping and using in the area
18	R				Wood trees in surrounding areas with high density to protect buildings but eroded grasses and shrubs

19	S				Trees as edge and frontage decoration with small garden in front but with limited access to green spaces
20	T				Rich wood trees but less grasses and shrubs due to over used
21	U				Trees as supportive elements for buildings but less grasses and shrubs for activities due to poor green spaces
22	V				Jacaranda as buffer, Grevillea and Pine as decorative elements, Two mango trees, Shrubs as edges A lot of unpaved lands

Table 4. Explanation of Graphical Analysis in Table 3

No	**Schools' Code**	**Specification of the Site**	**Specification of the Landscape**	**Key Issues with the Landscape**
12	L	The schools designed with two interlock L forms buildings with one floor to create two uncompleted and unpaved courtyards.	The school included a small farm with maze and sweet cassava, grass and shrubs for as hedge and edge. A green grassland takes position in the west part of school for playing.	A separated landscape and isolated garden. The pupils less connected to a geen landscape and natural view to green
13	M	The site includes five linear buildings in a parallel from on the contour lines with one and two floors. In between courtyards took the position. Courtyards and paths paved with sheltering.	The trees followed the form of buildings as background and frontage. Pine, jacaranda, and acacia planted with shrubs as hedges and edges with support of rich grassland.	An integration of hardscape and softscape based on the support of the buildings, despite of rich open spaces, variety of landscape such as gardens are missing.
14	N	The building is square form on the contour lines with one floor and courtyard in the central part and small yards in the surrounding.	Pine, jacaranda, African tulip, and mango trees planted in the same line with buildings, shrubs (golden duranta) as edge and hedge, low grass	The landscape applied as hedge to manage the spaces with less integration with the pupils activities
15	O	The structure of the site designed based on the square and cluster buildings with one	Trees took position in the central courtyards and surrounding areas as	Despite the open space the areas are less developed to apply green landscape concept. Grasses in the

		and two floors including central unpaved courtyard and other areas in surroundings.	background of the buildings. Pine, jacaranda, African tulip, and queen palm covered the areas. Square form of grasses and shrubs added to buildings as frontages.	areas created a wide view although view of green was less provided.
16	P	Six linear buildings one and two floors in cluster form formed the school with central courtyards and playground in the south part. Courtyards and playground were unpaved and without cover.	Jacaranda and Pine trees surrounded the school from outside, shrubs (golden and green duranta) applied as edge and hedge, the quality of grass was poor, small forest in the south with grevillea and jacaranda trees.	Application of wood trees a boundary and small forest areas created refugee although a major part of common activities took place in the courtyards without paving and grasses
17	Q	Linear structure, of building, one floor, central courtyard, old building, without paving, small eaves in surroundings	Pines trees in the surroundings, some grevillea, shrubs as corridor of paths	Unintegrated structure of hardscape and softscape with less application of landscape
18	R	Square form one floor buildings on the contour lines with the central courtyard and paths unpaved and unsheltered.	Pine, jacaranda, and tulip trees dominated the areas with following the structure of the building on the frontage. Shrubs and grasses eroded dramatically.	The green elements applied for to protect the buildings from sunlight and winds. Green spaces were poor due to overuse and erosion.
19	S	The school designed with square form of building with one and two floors with the central paved courtyard. Paths paved and covered.	Trees as frontage and background of buildings mostly Pine, jacaranda, and ficus benjamina, shrubs (golden duranta) for edge and hedge of small frontage green spaces	Application of trees as edge for buildings and the site with limited green spaces for accessibility of the pupils
20	T	Square form one floor buildings on the contour lines with the central courtyard and paths unpaved and unsheltered.	Trees as frontage and background of buildings mostly Pine, jacaranda, and palm, grass on the slopes with poor shrubs	Wood trees as edge of buildings and site with less green spaces for activities
21	U	A linear structure in the square from with some clusters of building, between them yards paved and unpaved.	Pine, jacaranda, tulip and Croton trees were located in the surrounding of buildings but poor grasses and shrubs.	Application of trees in the surrounding of buildings but with poor grasses and shrubs.
22	V	The school constructed on the topography lines with three	Apply jacaranda trees as a buffer, the pines (whistling)	Application of trees and shrubs to create frontage and backyards to

		linear structures to create courtyards. Some connected roads and central courtyard were paved.	and grevillea trees around buildings. Two isolated mango trees, shrubs (golden duranta) as edges	control accessibility but with poor grasses and vegetation.

5. EXPERIMENTAL

The findings of the research reveal four categorical attributes of data including physical specifications of hardscape, softscape and green landscape qualities, the interaction of pupils with the landscapes in the schools, and the possible effects of the landscape conditions on the users.

The physical form of the schools followed the one-floor building with the juxtaposition of the adjacent classes in a linear structure although four schools have two floors and two schools have three floors buildings. This linear construction followed the contour lines, which is created slopes areas with the possible threat for runoff and erosion in the absence of either technical hardscape or rich green landscape elements. In some cases, the schools are designed based on some terraces with ramps as walkway or stairs to connect different levels of the school although a few of them have applied shelters to protect the pupils from both sunlight and rain. In some schools are observed an incremental development process to add buildings to form courtyards. This structure creates the central courtyard and other yards in the surroundings of the buildings. The central courtyard in the four examples has been paved and others unpaved land as an open playground that increases dust pollution in dry and runoff of waters in the rainy seasons. The roof of buildings is irons sheets and a few of them use ceramic tiles. Application of this material creates small eaves as shelter or verandas in the length of buildings as a protected area for passing, waiting, resting and chatting of the pupils.

The green landscape of the schools is designed based on functionality than purpose-based. The schools do not include a detailed landscape plan, which realized through discussions by the person in charge of the landscape in schools, and so the planning, development, and maintenance are based on the occasional decisions. Mostly, schools apply wood trees in a linear form as a symbol of the boundary of the plot also in the surrounding of buildings. Despite the roles of trees in the boundary of schools and buildings to mitigate winds, sunlight

and cooling, seemingly quantity and quality of the trees could less archive to the purposes. The applied trees in the schools commonly include Jacaranda, Pine, and Grevillea. These three trees are common in all schools as wood trees with high speed of growth and less maintenance. The second group of trees are Eucalyptus, Ficus Benjamina, and Talisay. Other trees such as palm, flower trees decorative trees are limited to one and two schools respectively. Climbing trees just is observed in one of the schools as remained from the old land. Fruitful trees are limited to a few numbers of Mango, Avocado, Guava, Lemon, Orange, and Banana although the quality and condition of the trees are not sufficiently based on both vandalism and maintenance. Just in two cases, a banana garden and a small farm are observed respectively. Therefore, the concept of a variety of green spaces based on gardens, decorative trees, and flower trees less exist in the schools.

The level of the application of grasses and flowers in the majority part of schools is so low, and just three schools use some kind of flowers, grasses, and pots or flower boxes. The Duranta (golden, green, piebald) is applied commonly for the edges and hedges in schools with different height and width. Just in two cases, the areas for pots and flower boxes is fenced for visual quality. The majority of the schools used the shrubs as edges and hedges to direct pupils' movement and protection of the small gardens although with failure results. The variety of grasses and flowers are not observed due to vandalism and overusing by the pupils. The variety of green spaces is so low based on the absence of a landscape plan in the schools.

Interaction of the pupils with the green landscape follows the availability of hardscapes such as paving, playground, and recreational tools, and green landscape such as open spaces, green spaces, and specification of trees arrangement. In some of the schools, the pupils have accessibility to a paved playground that makes it possible to use in different seasonal conditions. However, in others with the land playground, limitation of the accessibility, and possibility of pollution, shift the pupils to use other spaces such as grasses areas or shelters. A few of the schools have open green spaces without limitation to access, other schools use Duranta as a hedge to create a feasible edge to limit accessibility to the green spaces. Both hedges and edges directly influence the pupils' interactions with the green spaces. The quality of maintenances of the green spaces generally is low due to overuse and erosion and just four

schools include decorative pots and flowerboxes to facilitate the introduction of the pupils with the flowers.

The structure of the application of the wood trees in the schools less provides opportunities for pupils to interact positively. Both location and structure of trees are out of the accessibility of the pupils to use as important elements in interactions. A major part of the schools applies columnar and oval trees such as Grevillea and Pine that are less applicable to use for shadow and gathering area. The schools do not apply the garden concept in the designing of the schools except in two cases that the areas are isolated from the accessibility of the pupils.

This structure and attribute of schools may influence the students' performance, activities, and health. Major parts of the selected schools are faced dust pollution in the whole areas of the school and this dust penetrated into classrooms. The pupils also may face less sheltered areas for the hot sunlight shining and raining seasons. The less direct connection with the green spaces, beauties, and natural elements in some cases could increase the possibility for negative effects on the emotional and stressful activities of the pupils. In addition, poorness of the landscape of the schools may negative effects on the good memory about school and it may reduce the sense of places and the sense of belonging to the area.

The low quality of the landscape of the schools in the city will negatively influence the urban green landscape and the quality of the townscape in the city. It means that schools have effective roles in the balance between open, constructed, and green spaces in the city. In addition, the areas of schools also have the potentials to conserve natural elements and species and support the flora and fauna in the city. Therefore, seemingly, the landscape of schools includes a wide range of scales also functions in the whole city context that could play the role in the local, district, and urban scales.

6. DISCUSSION

The quality of the landscape included three parameters importantly hardscape, softscape, and interaction of users, which previous studies discussed the issues separately [10,16,13]. Despite the hardscape was included all constructed part in the schools, importantly the playgrounds, paths, shelters, and open spaces were significant to serve the pupils needs,

which were less highlighted in the studies [11]. The green landscape was less integrated with the schools that reduced the effectiveness of the interaction of the pupils in the open spaces. The green open spaces, shrubs, trees, forest, gardens, and farms did less design based on a landscape plan and purpose-based but more ad hoc activities, which made the results far from the finding of Ward and Liu [28,29].

The findings clarified that mostly schools applied a protective boundary with wood trees in the surrounding of schools and building to protect from rush climate condition. This application of landscape adapted to the findings such as experiences in Egypt [10], however, this protection could less effects on the wind circulation based on the dust pollution in most cases and creation shading for public activities. Therefore, seemingly, the quality, quantity, and structure of planting were less effective of the purposes. For this reason, the activities such as reading in the canopy of trees [18] did not observe. In this case, the comparison between studies of Jianga, Li, and Matsuka was less adapted to the findings of this research [17,19,15] in terms of improving moods and health conditions of the pupils.

Despite the level of the memorizing about the landscape was out of scope of this study, however, overusing, vandalism, and eroded areas in the schools identified that the pupils had direct contact with landscapes in daily activities and the action, reaction, and interaction could possibly influence shaping the memory about the place [20,21]. In a major part of the cases, the pupils had a direct view to the green although these green spaces were the boundary of the school, out of school, or part of the city. Nevertheless, direct contact, daily use, and high quality of visual green spaces according to those guidelines need to take into account seriously through landscape plans [23-25].

Old trees were less observed in the schools except for a few old trees particularly mango, avocado, and jacaranda. This condition revealed that the theory of design with nature and blend in landscape did less apply in the designing and implementation processes of schools, which was reduced the possibility of using the positive effect of nature on the performance of pupils [17]. The findings disposed the replacing the forest trees with wood trees particularly with oval and columnar shape degraded possible positive effect of canopy trees as the findings of Jianga et al to control the stress of the students [19].

Nevertheless, those investigated schools in the Kigali had the potential to keep green spaces in the city as positive effects on the general condition of the climate dynamism [28,29]. Despite, in some cases, planting process of trees in the open spaces was observed, those schools need a landscape plan with detailed information to guide them in the effective process for design, development, and maintenance of landscapes [33,20].

7. CONCLUSION

The results of the study highlight three key factors in the landscape of the primary schools including hardscape, softscape, and interaction with the green spaces that could influence the health conditions of the pupils including mental, physical, and social. The city as the context of the schools includes a rich green landscape in a tropical climate that is expected also the schools include those specifications. However, the results identified that a few schools take into consideration the green landscape as key factors in the educational environment. In fact, the current condition of the landscape of schools in the absence of a detailed landscape plan for the educational function reduces the possible positive effect of the green landscape on the pupils.

The schools are far from the theory of the design with nature and blend in the landscape. The structure of the schools imply that the sites constructed based on the excavation and then adding some wood trees to the site. Just a few olds trees remain in the schools that could recall from the memory of the user the rich background of the areas as forest, agroforestry, and agriculture in the tropical climate. Nonetheless, some wood trees added to the school as the boundary of the site or protection of the buildings particularly the administration. This form of planting creates opportunities for the view of green as key criteria in the design of landscape in the schools.

Despite a major part of the schools takes into consideration improvement of the hardscape parts such as paving, sheltering, and paths to facilitate the accessibility and activities, the softscape of the schools play a significant role in the enhancement of the perception and sense of place of the pupils in the schools. Variety of trees, shrubs, and grasses not only creates opportunities for the pupils to gain experience of interaction with the nature but also such

variety increases the level of general knowledge of them about the landscape and species. For this reason, integration of fruit, decorative, and flower trees and grasses and vegetation as part of the structure of the schools could improve their interaction with nature in the context of the schools.

Application of hedges and edges could limit the accessibility of the pupils to the different areas for social interaction in the break times. Despite the fact that sometimes such kind of physical barriers apply to direct the users to specific way, application of the green edges and hedges to limit accessibility to the green spaces reduce the opportunity of the pupils to interact with green spaces.

Those examined schools have good potential to play a significant role in the conservation of the urban green landscape. The size of the plot, topography, and open spaces could take into account as possibility for enhancing the general quality of the climate through green spaces. Those schools in a wider perspective could create a chine of green spaces to support the urban green landscape through link different neighbors and districts in the city.

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