

## TRANSITION PROCESS OF LANDSCAPE THROUGH CHANGING TROPICAL GARDENS FROM PRODUCTIVE FUNCTION INTO RECREATIONAL PURPOSES

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### Abstract

The urban gardens are under transformation that results in the modification of function, activity, hardscape, softscape of gardens. The aim of this paper is to analyse the transitional process of the gardens from the productive function to recreational purposes in Kigali city, Rwanda. The methodology of the research was designed qualitative methods such as interview, observation, photography, sketching, mapping, and graphical analysis. The findings identified that the transition process has affected both the configuration and composition of gardens. The configuration refers to the hardscape including buildings, walls, paving, and accessibility, and composition includes the softscape such as trees, shrubs, flowers, pots, and furniture. Additionally, this transition resulted in changing functions and activities in the gardens from productive to leisure and from private to semi-private and semi-public. This transition could be addressed to the new generation of social middle classes in the city who are raising new needs, desires, and expectations from the urban area to increase social interaction through semi-public activities.

**Keywords:** *Gardens, Hardscape, Softscape, configuration, Composition, Function*

## 1. INTRODUCTION

Nowadays, Kigali city as the capital of Rwanda is in the process of urbanization and development rapidly (OZ, 2007). The city area is under expanding and the city integrates villages, farms, and hills, gardens, and natural areas into the urban fabric under name of new development, redevelopment, and reconstruction. This development includes a significant effect on the surrounding forests, agroforestry, and gardens in the area (Noordwijk, et al., 2014) that is going to change the character of the gardens from the productive character such as agricultural, horticultural, and agroforestry into a new hardscape with buildings such as restaurants, wedding gardens, and bars that changes urban form (Crowder, 1993). Seemingly, a new style of architectural design, settlements (World Bank, 2012), and devillagization (Backeus, Lindberg, & Stromquist, 2009) take the position in the city with a wide range of varieties of form, style, and footprint. For example, both reports of the typology of housing in Rwanda (World Bank, 2012) and the affordable housing (CoK, 2015) referred to the high density particularly the footprint of houses in the plot. However, those reports no referred to any case of mixture the housing with trees, gardens, or farms in the urban areas based on the missing evidence in the survey time. In this case, apparently, the green spaces are shrunk toward more constructed areas. Just governmental departments schools, hospitals or and a few public, semi-public, or semi-private plots include green spaces with courtyards, yards, or frontage. The masterplan of the city remarked on the wetlands and surrounding forests as issues to discuss and the inner gardens and farm of the city are dependent on a new detailed plan (OZ, 2007).

Nevertheless, the city includes rich background as an area in the forest context with agricultural and horticultural experiences. The last report of REMA (Rwanda Environment Management Authority) highlighted that 63% of the urban land occupied with kitchen gardens and urban farms (REMA, 2017) and urban policies support urban farming and gardening (MININFRA, 2015) despite the problem of the land fragment in the city (REMA, 2017). Nevertheless, the detailed district physical plan (CoK, 2013) just remarked the agroforestry in the macro-scale in the city without highlighting urban gardening (Newbury, 1992).

Seemingly, both configuration such as size and form of the land, and composition based on the species and trees in the city are under the transformation (REMA, 2017) to change the concept of the garden and the landscape forms in the area. Robinson (2004) in the study on the structure of gardens concluded that trees have been significant elements to create form and space by defining edge, centre, and corner to construct the meaning in terms of the architectural functions. Trees have been a major element in gardening due to size, shape, volume, and durability in the composition part (Paganová & Jureková, 2012); however, studies of Baard and Kraaij (2014) emphasized a continuous process of increasing some alien trees such as Pinus, Acacia, and Eucalyptus to change the softscape in the African region. In the opposite point of view, studies remarked that emphasizing ecological planning and the native plants implied some ideological racialism than landscape (Hall, 2003). Therefore, despite a long debate on the native and nonnative plants, studies have shown a political, ideological, and nationalistic tendency than naturalistic and ecological (Groning & Wolschke-Bulmahn, 2003).

Apparently, gardens have been under pressure of transforming form and species. This changing process has been permanent or temporary diverted; however; studies demonstrated that all changes resulted to modify both composition and configuration of the ecological landscape (Gökyer, 2013). Technically, the composition term refers to land coverage and the site layout in terms of softscape form of the landscape such as green, blue, and open spaces and the configuration term refers to the structure and connection in terms of hardscape such as buildings, roads, bridges, and infrastructure (Tafahomi & Nadi, 2020; Tafahomi, 2021). For this reason, critical comments challenged the concepts of composition and configuration in detailed landscape studies in terms of microscale and recommended to the ecological studies through digital mapping in macroscale (Steckel, et al., 2014; Dufлот, Ernoult, Aviron, Fahrig, & Burel, 2017).

### 1.1. Insight into the Gardens as a Manmade Element

The history of gardens includes rich documentation and background in Europe, North America, Asia, and some part of Africa. The gardens have been analysed in the perspective of the development process of personalisation and conceptualisation the nature into manmade production due to the need and the pleasure in the study (Spirm, 1998). In this human intervention, the recreational and decorative elements performed as an important role to create scenery, pleasure, and relaxation in the construction of gardens (Bell, 2008; Moughtin & Shirley, 2006) under influences of environment, climate, and culture (Shin, Chen, Lee, & Kim, 2015). In this case, the concept

of the gardenscape proclaimed in terms of the specific cultural meaning in the relation to the time and location based on the inhabitant requirements and the desires (Alexsander, 1977; Spirn, 1998); however, simultaneously, there is a wide range of debates on the other political, ideological, economic, and social aspects of gardens (Helmreich, 2002).

In this debut, gardens have included considerable varieties of function, form, and character in the world (Wilkinson, 1994). The studies for example referred to some specifications such as the spiritual function of gardens in ancient Greece temples (Morris, 1979), decorative and leisure activities in the Roman style (Gleason, 2010), and amplification of houses (Groening & Schneider, 1997). In addition, in Asia, studies referred to the echoes of paradise in the Persian garden (Khansari, Moghtader, & Yavari, 2003), reflection the world in the small-scale with beauty and contrast in Chaises gardens (Keswick, Hardie, & Jencks, 2003) or Zen in Japanese styles (Young, Young, & Yew, 2011). However, in the Africa context, this background is limited to the Egypt precedents as nature and mythology (Wilkinson, 1994) and some new studies in South Africa with detailing of gardening in the colonial times (Bairnsfather, 2012), and finally, African-American gardens in United State experiences (Westmacott, 1992).

Studies also claimed that the leisure, productive, and decorative aspects have affected the changing of the forest into gardens. For example, the study identified that the original forest converted to a new function such as agroforestation, farm, or garden with different functions such as productive, decorative, leisure and entertainment, and other economic aspects (Noordwijk, et al., 2014). For this reason, Owusu argued that deforestation and agroforestation have been two common processes of designing gardens in the world (Owusu, 1993). Noordwijk reinterpreted that this process may be called by means of the linear process of changing forestry, to agroforestry, and then to agriculture, and consequently changing the general form of landscape in the global south (Noordwijk, et al., 2014).

In fact, the study has articulated that three factors have played a significant role in this transition of landscape including history, geography, and culture (Shin, Chen, Lee, & Kim, 2015). Another study (Fu, Xiao, & Wu, 2016) identified that stakeholders and the residents have had a significant role in the urban green transition in both positive and negative aspects. For this reason, Goldsmith addressed a common process of destroying the historic gardens in New Zealand with emphasizing as the common problem of the global south (Goldsmith, 2014). Seemingly, some essential elements of both hardscapes such as walls, paving network, and accessibility, and softscape particularly green spaces have been changed to facilitate the function for new purposes which, those called the configuration and composition (Gökyer, 2013) and hardscape and softscape (Tafahomi & Nadi, 2020; Tafahomi, 2021) aspects in landscape design.

The studies in the definition of both landscape and garden highlighted that they have demonstrated manmade innovation (Spirn, 1998) something that differs from nature in various meanings and interpretation (Mugerauer, 2014). The meaning of gardens has referred to the other contextual parameters such as social, political, personal, spiritual, and national aspects. The studies have theorised that both the meaning and form of gardens have changed from a spiritual form into the functional and political forms in the whole of the history of the world (Pregill & Volkman, 1999; Eyres, 2013). For example, the study of Jackson proclaimed that the landscape represents the political and cultural aspects of society more than an ecological concept (Jackson, 1979), in terms of unseparated part of the social and political condition in a specific period based on the ideology (Wolschke-Bulmahn & Groening, 1992), and sense of patriotism based on the nationalism movement (Milam, 2017).

In the opposite viewpoint, Groening demonstrated that the garden represents the image and dream of the owner of the garden (Groening & Schneider, 1997). In this regard, the interpretation of Tessin (Tessin, 1994) revealed that the meaning of the garden is so personal idea based on subjectivity than objectivities. Moreover, it was discussed that the meaning of landscape refers to the territorial demarcation features on the land and the cultural values and believes in different cultures (Bigell & Chang, 2014). Seemingly, there is a tendency from beautification as the aesthetic achievement to the personal form as a variability in the gardening process (Groening & Schneider, 1997), which created varieties of transformations.

For example, the study emphasised three general forms of gardens including the architectural gardens, agricultural plots as a manmade effort, and conserved natural areas (Micoulina, 2010). Another study has addressed to particular trend to express the landscape as the natural utopia (Groening, 2007) although looking for the naturalistic gardens and landscape no longer could be conceded as the issues of landscape topic with

fading all forms of nature, and so garden and landscape have been in the changing position all the times (Groening, 2005). At this point, the study resented a classification for the gardens including formal-informal, peasant-aristocratic, and naturalistic-artistic due to the enlightenment and nationalism movements and based on the polarization in the nineteenth and twenty centuries although the formal gardens refer to the architect-designed garden; however, the rural-gardens have been one style of designing in the countryside (Helmreich, 2002). The evidence reveals that the micro landscape idea was formed in the enlightenment times in Europe in which some concepts of the rural landscape were integrated into the city such as fruit landscape and courtyard garden (Groening & Hennecke, 2014).

Furthermore, the social, cultural, and political trends have been the important reasons for changing gardens. For example, Hermand (1997) revealed that the new movement of garden designing has been under influences three factors particularly “middle-class enhancement, political relations with other countries, enlightenment movement, and marginalizing of bourgeoisies” power in Europe particularly England and France in eighteen and nineteen centuries. Additionally, Schenker argued that the rationalisation and industrialisation movement introduced a de-naturalistic approach in garden designing (Schenker, 2013) to be more productive and decorative than contextual. In addition, the studies about the transition of the landscape in the global south have addressed the urbanisation, industrialisation, and mechanisation processes as the most effective factor to change the form and scale of the landscape (Swaffield & Primdahl, 2006; Antrop & Eetvelde, 2008; Antrop M. , 2013).

Nevertheless, the garden story was different in the Africa context. Studies of Owusu (1993, pp. 317-19) revealed that the traditional and aboriginal agriculture and horticulture were destroyed in the colonising time based on the preference and policy for “export of productions, priorities to develop the urban areas, the bureaucratisation of the production, and changing of production management from women to men”. In detail, the main ecological problem of African countries in the colonisation and after that time has been in three main categories such as “endangered, deforestation, and desertification” (Mazrui, 1993, p. 910). In this process, landscape features and elements were colonised to distribute language, culture, and ideas in the new locations (Bowring, 2014). There have been trends in the social and economic values to affect landscape and forestry (Buyinza, 2004). Therefore, the cultural values as a protector of biodiversity were decreased gradually in Africa (Munyaneza, Bizuro, Nshutiyayesu, Bigendako, & Minani, 2009).

In an opposite view, studies on the history of Belgium colonisation style identified that the colonialist kept the system of local chief management among peasants particularly in Rwanda and Burundi; hence, the style was more traditional in the area (Crowder, 1993). Therefore, the transition process of the natural environment more was adapted to the agroforestation, deforestation, cultivation than garden designing based on the non-productive aspects in the country. It seems the landscape studies have been explained in the region as three major concepts of analysis including, chronological, ecological, and morphological (Bashir, 2007) trends with different purposes and intentions. Recently, the studies by Tafahomi and Nadi (2020) and Tafahomi (2021) revealed that the green spaces followed an ad hoc approach for landscape design in the area and important projects like hospitals and schools did not follow a systematic process of design for landscape and gardens. Therefore, despite the rich green spaces background in the region, the structure of the landscape design, maintenance, and development less followed a landscape knowledge. Therefore, the hardscape and softscape of the landscape presented an eclectic style than the purposed base design.

In summary, gardens in term of the constructed landscape have been included some aspects of hardscape, softscape, function and activity, and meaning as Table one summarizes the topics. The applied hardscape and softscape elements demonstrate the trends of changing the gardens in the areas. Despite the contradictive ideas on the traditional form of gardens in the context of Africa, the available gardens in the context probably could demonstrate the specification of gardens with respect to the time and location. However, the current study emphasizes that the landscape concept is going to change in the changing world (O'Donoghue, Sandoval-Rivera, & Payyappallimana, 2019).

Table 1. Summary of the literatures

Author	Form	Functions	Refer to
(Morris, 1979)	(unspecified)	Spiritual	Greece Garden
(Wolschke-Bulmahn & Groening, 1992)	(unspecified)	Political, ideological, economic, and social	Ideology and patriotism
(Mazrui, 1993) (Owusu, 1993)	Destruction of natural form in Africa	Garden	Colonization, export of production
(Crowder, 1993)	Traditional form in Rwanda	Garden	the system of local chief management
(Tessin, 1994)	General Form	Garden	Subjectivity
(Wilkinson, 1994)	Natural form	Garden	Mythology
(Groening & Schneider, 1997)	beautification as an aesthetic form	Variety	image and dream of the owner of the garden as a personal form
(Hermand, 1997)	European garden in the eighteen and nineteen centuries	garden	middle-class enhancement, political relations with other countries, enlightenment movement, and marginalizing of bourgeoisies
(Spirn, 1998)	Unnatural	Productive and pleasure	Personalization of nature based on innovation
(Helmreich, 2002)	formal-informal peasant-aristocratic naturalistic-artistic	Garden	enlightenment and nationalism movements, Architect designed
(Keswick, Hardie, & Jencks, 2003)	(unspecified)	Beatification	Decoration
(Moughtin & Shirley, 2006)	Variety	Relaxation	Natural connection
(Groening, 2007)	landscape as the natural utopia	Garden	Ideal image
(Bell, Design for outdoor recreation, 2008)	Scenery	Pleasure	Visual quality
(Gleason, 2010)	(unspecified)	Decorative, leisure	
(Micoulina, 2010)	architectural gardens, an agricultural plots as a manmade effort, and conserved natural areas	Garden	Process of changing
(Young, Young, & Yew, 2011)	Central courtyard	Zen	Personal perception
(Gökyer, 2013)	Composition and configuration	Landscape design	Proportion
(Schenker, 2013)	de-naturalistic approach in the garden designing	garden	rationalization and industrialization movement
(Noordwijk, et al., 2014)	(unspecified)	Forestry, agroforestation, agriculture and farm, or garden	deforestation and agroforestation
(Groening & Hennecke, 2014)	Rural Landscape	Fruit Garden	Countryside pattern
(Bowring, 2014)	Colonization of landscape form	Garden	To express new language, culture, and ideas
(Shin, Chen, Lee, & Kim, 2015)	Adapted with the climate and culture	Garden	Contextual
Tafahomi & Nadi (2020)	Natural from of gardens	Therapeutic Landscape and Healing gardens	Therapeutic landscape for hospitals
Tafahomi (2021)	Integrated landscape with gardens	Recreational and eatable	Landscape for the pupils in primary schools

## 2. METHODS AND MATERIALS

This part explained the methodology, research design, research process, data specification, and time and location of the research.

### 2.1. Methodology

The methodology of studies in the garden, landscape, and green spaces was included both quantitative and quantitative methods. The quantitative method was applied for large scape analysis particularly ecological studies with application of pattern analysis, spatial analysis, and spatial modelling (Turner & Gardner, 1994;

Turner, 2015) that were mentioned in terms of macroscale for green space and land coverage studies (Steckel, et al., 2014; Duflot, Ernout, Aviron, Fahrig, & Burel, 2017). The methodological studies also recommended correlation studies between phenomena in the studies such as water and soil based on the quantitative data (Deming & Swaffield, 2011). However, the qualitative method was applied to study the landscape elements in the context of the study (Groat & Wang, 2002; Deming & Swaffield, 2011; Niezabitowska, 2018) with emphasizing the quality of the data. This method applied for focusing on the deep understanding of facts (Silverman, 2004) to evaluate both current conditions and transformed gardens with the descriptive and interpretative approaches (Deming & Swaffield, 2011; Mugerauer, 2014; Krippendorff, 2003).

The studies applied qualitative research with a wide range of techniques such as the historic analysis (Groat & Wang, 2002), storytelling (Given, 2008; Koskinen, Zimmerman, Binder, Redstrom, & Wensveen, 2011; Denzin & Lincoln, 2018), structured observation (Bonnes & Bonaiuto, 2002; Tafahomi & Nadi, 2020), site analysis (Moughtin & Shirley, 2006; Baard & Kraaij, 2014), graphical analysis (Antrop M. , 2013; Tafahomi & Nadi, 2020; Tafahomi, 2021), photography (Sampson & Gifford, 2010; Georgoula, Stannas, Patias, Georgiadis, & Fragkoulidou, 2013; Tafahomi & Nadi, 2016), and sketching (Laseau, 2000; Trancik, 1986; Regis, 2003; Sperlregen, 2003; Tafahomi & Nadi, 2020). For example, the study recently evaluated the current condition of the landscape in the psychological hospitals in the city with emphasizing on the qualitative method through the interview, structured observation, sketching, mapping, and graphical analysis (Tafahomi & Nadi, 2020). Another study analysed the quality of the landscape in the primary school through the graphical technique to highlight the quality of the hardscape and softscape and effect on the users (Tafahomi, 2021).

## 2.2. Research Design

This research was designed based on the qualitative method (Mugerauer, 1995; Silverman, Doing qualitative research, 2010; Neuman, 2006) with the objective to analyse the data in the real context (Groat & Wang, 2002; Niezabitowska, 2018). The applied techniques in the research were included in the structured observation to discover the hardscape and softscape in the gardens such as studies (Tafahomi & Nadi, 2020), photography to record key factors in the gardens (Sampson & Gifford, 2010; Georgoula, Stannas, Patias, Georgiadis, & Fragkoulidou, 2013; Tafahomi & Nadi, 2016), sketching (Laseau, 2000; Regis, 2003; Sperlregen, 2003; Tafahomi & Nadi, 2016; Tafahomi, 2021) to illustrate the structure of the gardens. Other techniques were applied to analyse data such as site analysis to overlay data (Groat & Wang, 2002; Moughtin & Shirley, 2006; Tafahomi, 2021), interview with elder people to find out the location and information for the gardens through the snowball technique (Neuman, 2006; Marshall & Rossman, 2006), and graphical analysis to transfer data into analytical illustration (Laseau, 2000; Trancik, 1986; Regis, 2003; Sperlregen, 2003; Tafahomi & Nadi, 2020; Tafahomi, 2021). Figure 1 represents the research design of the research.

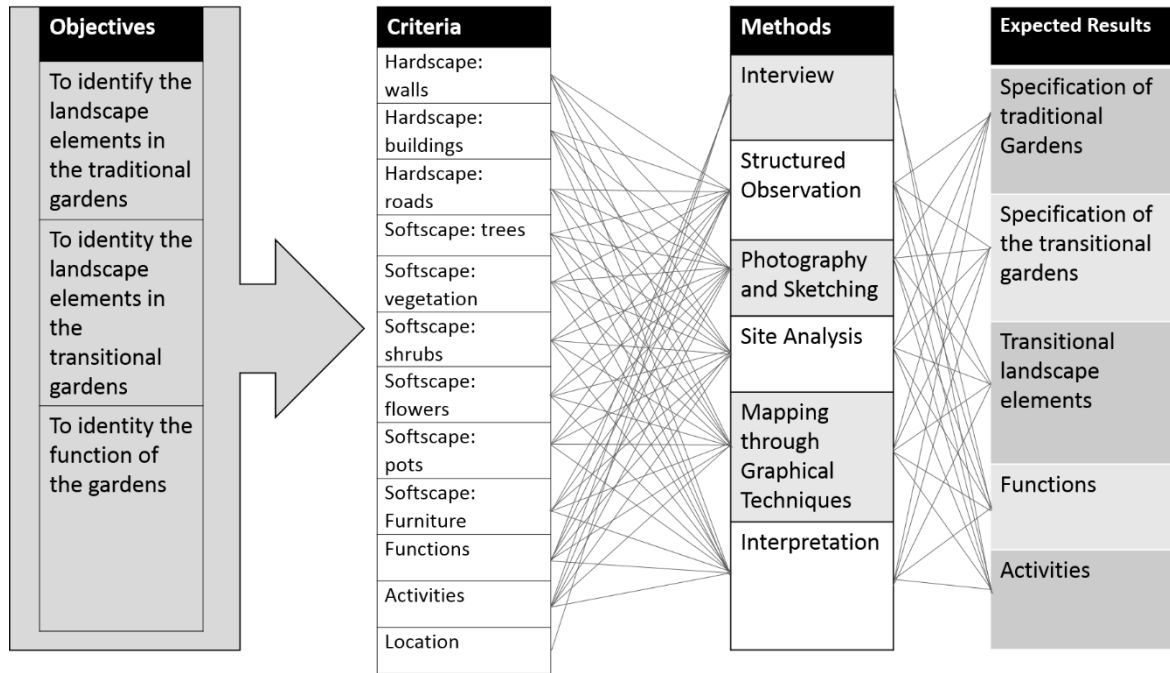


Figure 1. Research design of the study

### 2.3. Research Process

Data were collected in two important stages in the research process. First, locations of the old gardens were identified through a depth interviewing with elder's people to track addresses whatever contextual gardens in the city based on the snowball technique (Miller, Dingwall, & Morphy, 2004; Marshall & Rossman, 2006). To discover essential data for the research, the research team attempted to identify an informative person and for the interview to ask the location of a traditional or old garden for visiting and documenting in each urban cell. The questions were simple questions including whether they could know any traditional or old garden to introduce. Where does it locate? In addition, whether are other people that they could introduce for an interview in terms of an informative person?









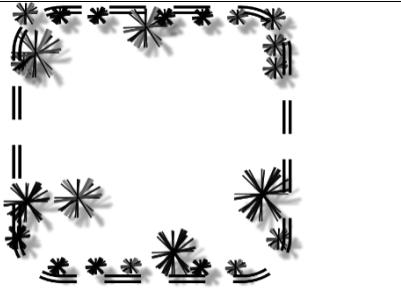
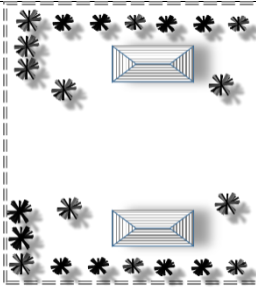
Second, those addresses were visited to confirm the existing of the gardens in the proper condition. The garden must be included active and at least with some of the green space elements such as trees, shrubs, and vegetation. If the garden was active, the physical features recorded and mapped in the survey based on the hardscape and softscape data (APA, 2006; Tafahomi & Nadi, 2020) otherwise, the garden was removed from the list of the potential garden for analysis. It was clarified that some of those gardens no longer exist, some of them changed, transformed, and some of them were just farms. Therefore, among 37 addresses, just sixteen gardens were included minimum criteria based on the proportion of green space, open space, and productive-leisure character in different visiting (Bell, 2004; Groat & Wang, 2002; REMA, 2017). They included either historical, natural, physical elements as a traditional garden or the functions and activities as a transformed garden.

### 2.4. Data Specifications

To construct a unique format for the analysis, some semi-geometric forms of the land converted into a basic form of the square to enable comparing of the structure and landscape elements and features as the process of mapping (White, 1983; Paganová & Jureková, 2012; Gökyer, 2013; Laseau, 2000; Tafahomi, 2021). For this reason, iconic symbols were designed based on the hardscape particularly houses, buildings, and other constructions, and softscape included trees, flowers, vegetation, and decorative elements. All physical features converted into graphical symbols to illustrate spatial structure and relationships between landscape elements (White, 1983; Laseau, 2000; Tafahomi, 2021). Key criteria for the analysis were included three main components including 1) the site structure, site layout, and mass and spaces, 2) the site green spaces arrangement including trees, vegetation, flowers, and grass coverages, and 3) the site function such as productive, recreational, institutional and so on. In the analysis process, the main objective of the analysis was to discover significant elements in all instances of the research.

Despite the shape of gardens included a wide range of size, slope, and form, but those entire samples were so close to the rectangular shape due to two main elements constructed this shape. First, contour lines of topography formed the lengths side of the lands based on the two latitudinal lines. Second, the runoff traces on the land in the rainy seasons formed the longitudinal lines in the slopes of those contour lines as the widths of plots. Therefore, the conceptual latitude and longitude lines formed rectangular shapes with gentle corrugations in which were supported and enforced by trees, shrubs, and other elements to fix, address, and highlight as the cornerstones of the boundaries of gardens as Table 2. Hence, it normally could be observed varieties of shapes between those contour lines such as rectangles, squares, trapezoid, and parallelograms.

Table 2. Example of the forms of Gardens and Plots in the city and Surrounding areas

No	Location	On the land photos	Aerial Photos
1	City surrounding areas		
2	In the City		
3	In slopes and valleys		
4	In the check-square form of farms, gardens, and plots		
5	Schematic Drawing the form of plots to analyze based on landscape architecture elements particularly hardscape and softscape		



To harmonize the structure of the analysis three specifications were selected as the benchmark of analysis including the hardscape as the form, softscape as the structure of the green spaces, and the main function of the garden. The hardscape included hardscape such as houses, boundary, the void, reference point, and paving networks, those formed the hardscape part of the garden. The softscape included softscape such as trees, vegetation, flowers, and decorative elements. The function defined as the main possibility or purpose of the plot could serve human need. This function included a range of typology between public-private activities in the garden as a house, office, restaurant, or other activities. Data converted into graphic standards for the landscape design, analysis, and evaluation (Harris & Dines, 1998; Hopper, 2007).

## 2.5. Limitation and Implication

This research did not use quantitative data and methods to evaluate and measure the green spaces and the numbers of the specific trees, vegetables, shrubs, flowers, and decorative elements in the gardens. Perhaps such quantitative data could open a new perspective for the research that was missed. In addition, the number of users and production of the gardens did not estimate and was not part of the scope of the research that certainly adding information could be useful for the specific users.

Despite data were collected based on the high level of precision, the research did not cover all of the gardens in the city due to the limitation of the accessibility and agreements of the owners for the site visiting and data collection. Therefore, the possibility to visit all the gardens and the sample in the city could perhaps include some effects on the results and trends in the research that prediction of the level of effects was not possible.

## 2.6. Time and Location

The study took place in Kigali as the capital of Rwanda. The city is located in a tropical climate with the background as a forest at 1°57'S 30°4'E. This transformation all occurred in one century so; the speed of change was so high. The city included a 1.22 million population, inhabitants, and professions such as agriculture (24%), industry (21%), and trade activities (20%), others (36%). The city also has been faced a high level of immigration from rural areas due to urbanization policies. The green spaces, farms, and forest areas took the position in the urban area with almost 67% (REMA, 2017) and surrounding areas of the city (OZ, 2007). Despite the recommendation of the master plan to integrate living areas with green spaces, however, implementation policies or guidelines were missing in the document. Data collected through teamwork with the landscape students between September and December in 2018. Figure 2 represents the location of the study.

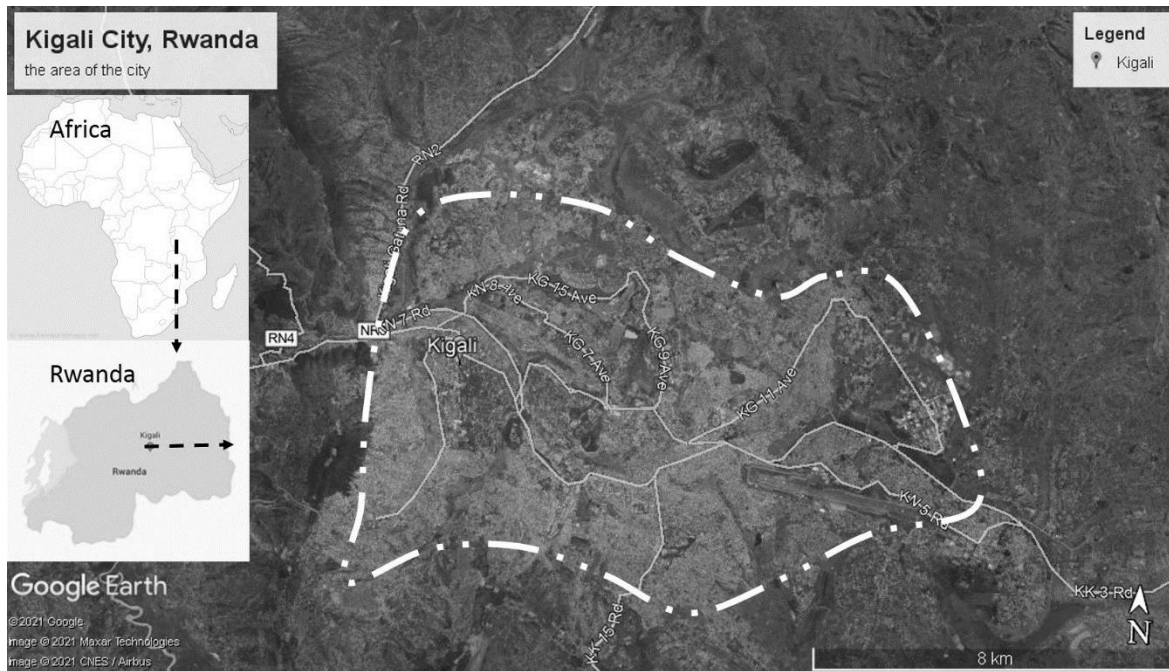


Figure 2. the area of the study

### 3. RESULTS

All gardens analysed based on the layout of information and graphical analysis and result of the analysis as the explanation in tables 3 and 4.

**Traditional Gardens:** traditional gardens were included in three categories comprising the gardens integrated with the buildings, the garden with the farming activity, and the gardens as a leftover part of the forest. First, in the gardens integrated with a building, the building took the position in the corner of the land as a reference point to define the area for better monitoring and managing of the plot. Therefore, the form of the garden defined as an integrated part of the softscape in the plot to serve the hardscape structure as a most permanent element. This building normally took the position in the most height part of the land for visibility and protection of runoff in the rainy seasons. The frontage of the building encompassed a void space and the surrounding areas were covered by green spaces. Second, the gardens with a farming area were comprised of varieties of forms in the integration with agricultural and horticultural activities based on the topography and the form of the land similar to activities in villages in terms of productive-wood trees and vegetables such as root, seed, and flower. Third, the garden in the form of a leftover of the land or forest, normally they were surrounded with some wood trees for more protection than gardening. The schematic form of the traditional gardens compared in Table 3.

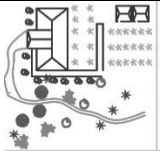
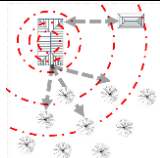
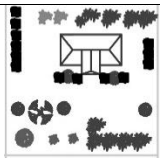
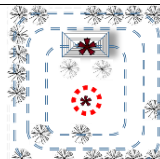
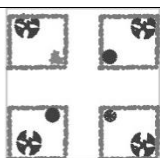
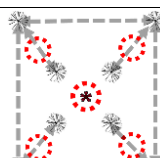
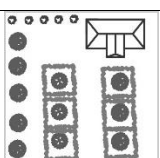
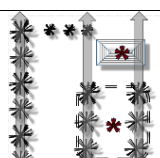
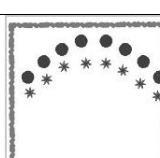
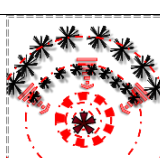
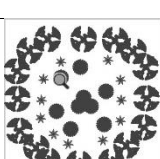
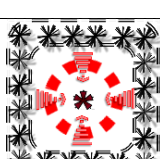
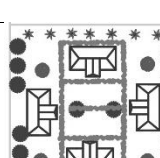
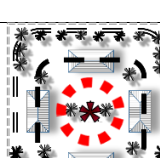
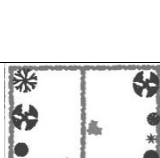

The attribute of the traditional gardens included four specifications. Firstly, the gardens areas unseparated from farming areas with both geometric and non-geometric forms. Secondly, some fruitful trees planted in the place as a reference point to separate the garden from other farms or ownership specifically mango, avocado, and banana. Thirdly, the forest trees also conserved as an edge of the plot to define the territories, surrounding areas, and to occupy the land or plot majority with some Grevillea, Pine, and Yucca trees. Fourthly, the interior paths with the paving structure were not constructed, observed, or detected in the examples and just different accesses from the outside roads were provided.

**Transformed Gardens:** the data highlighted seven important specifications in the transformed gardens. First, a geometric structure: the geometric structure emerged through a rectangular form of the plot based on the land subdivision pattern due to the contour lines also the features in the boundary of the plot such as walls, fences, and trees. Second: the building as the predominated element: the buildings were important manmade elements in the transformed gardens to define the structure such as linear, cluster, and surrounded forms based on the indoor-outdoor activities. In some of those samples, the building was the main element of the structure of the garden to arrange the central courtyard and the green spaces in the surroundings. Third, applying flowers and vases to define spaces: flowers, decorative shrubs, flowerpots, and furniture were applied in the transformed gardens to define the space, subspaces, beauty, and a place for hangout. Those elements were used to complete the main forms of the plot and develop it into a recreational attribute for more enjoyment than production. Fourth, integration of trees with the plot: a mixture of the fruit, forest, and decorative trees were observed in the transformed gardens, however, those fruit and decorative trees took the position in the central part of the gardens than in the edges as hedges. According to the samples, the trees were included a wide range of ages that could refer to a new plan for the planting in the plots to increase the level of the variety. Fifth, a void in the central space: all transformed gardens implied emphasising on the central part of the plot to delineate a void form of space in term of a key element in the structure of the garden through the arraying of open space in the middle. Sixth, applying linear structure: the linear structure was the major form in the transformed gardens. Despite the orthogonal form of some of the precedents with the iteration of the linear form, the linear form was the major character of those gardens to shape a connection of all parts of the plot together. Seventh, roads as the main element of the structure: the paving roads connected all part of the gardens together based on the linear form of the structure. Indeed, the paving, road network, and accessibility created a circulation opportunity for users to access the plot. Tables 3 and 4 summarise, illustrate, and represent all information for comparison.

Table 3. Analytical table for the Traditional Gardens

No	Location and Activity	Layout of the Gardens	Graphical Analysis of the Structure	Explanation
1	A: Garden with farming activities			Hardscape: the trees as a reference point in centre and greenery in the surrounding as the territories Softscape: avocado and guava trees in centre and beans vegetable in surrounding Function: a productive and private area Activities: framing, production
2	B: Garden with building			Hardscape: the buildings located in an open area and the opposite side a mass of garden trees. Softscape: the vegetable and gardening were divided by mass of Grevillea and Banana trees Function: education and hostel Activities: private users
3	C: Garden as reminded part of a forest			Hardscape: garden as leftover part with forest trees to create a boundary with a central void Softscape: forest trees such as Grevillea and Pine with natural lawns in centre Function: private, reserved area Activities: conservation of the land
4	D: Garden as reminded part of a forest			Hardscape: garden as a leftover part with forest trees to occupy land Softscape: apply the trees with Grevillea and Pine in the gridding structure. Function: public, as a forest resource Activities: conserved area
5	E: Garden with horticultural activities			Hardscape: arrangement of the cluster of trees and tree as a cornerstone or a reference point Softscape: integration of trees and vegetable for production with banana trees and avocado Function: farm and garden Activities: productive, private
6	F: Garden with farming activities			Hardscape: defined the boundary of the land using of the tress with a central void, this format also creates an internal space for other activities. Softscape: a bunch of fruit and non-fruit trees in surrounding with vegetable in between Function: farm and garden Activities: productive and private
7	G: Flower Garden with ceremony activity			Hardscape: trees as hedges in the centre to define sub-space for flowers planting Softscape: fruit trees in the centre and the flowers gardens in the surrounding Function: flower garden Activities: private and productive, and ceremony events
8	H: Garden with building			Hardscape: sample of a colonial villa house in the city, filling the corners with natural elements and house as a reference point with an open centre Softscape: wood and decorative trees, flowers, and pots such as Grevillea, Pine, and Shrubs Function: housing Activities: living area, private

Table 4. Analytical table of the Transformed Gardens

No	Location	Layout of the Gardens	Graphical Analysis of the Structure	Explanation
1	I: Garden as a student's centre			Hardscape: The building as the main element, the greenery as the second layer of the garden, lawn, Softscape: lawn and separated trees for more visibility Function: office and students visiting Activities: playground, community centre, interaction, short course training, private
2	J: Garden and Office			Hardscape: The building as main element and the linear planting created boundary with open space in the middle Softscape: wood trees in surrounding such as grevillea, Jacaranda, and Bamboo, and fruit trees in middle such as avocado, guava, and banana, also shrubs and flowers as edges Function: office Activities: private, business,
3	K: Garden as a Wedding Garden			Hardscape: space and subspace in geometric form based on the accessibility with a central void Softscape: wood trees planted as reference points to address the boundary of subspaces such as Grevillea, Pine, and Talisay and shrubs as hedges to define subspaces Function: Recreational and cultural Activities: semi private-public, wedding garden, ceremony
4	L: Garden as a Resultant			Hardscape: a parallel-linear structure with hangout spots as subspaces in a clear geometric form Softscape: The surrounding trees included barren species, however, interior trees composed from fruitful such as mango, avocado, and guava. Function: restaurant Activities: semi-private, leisure time, interaction
5	M: Garden as a leftover part of land			Hardscape: This structure is so defensive to protect the inside of the garden as the central void. Softscape: the garden included a densified façade with decorative trees such as Jacaranda and Palm and lawn in center. Function: garden, green space Activities: private, reserved
6	N: Garden as a Roundabout			Hardscape: This structure also is another style of defensive form of planting those trees. The surrounding area of the old roundabout occupied. Softscape: trees and inside row of palm trees with some decorative flowers and seats Function: roundabout Activities: public service, traffic, accessibility
7	O: Garden as an office for church			Hardscape: the central courtyard based on the arrangement of houses and trees, subspaces in the surrounding, the central void as a focal point. Softscape: decorative trees and shrubs in a geometric and symmetric form for more transparency and visibility Function: church, office Activities: semi-private, official activities
8	P: Garden as a wedding garden			Hardscape: The natural grass as open space and subspaces, and a linear structure with two functional parts with a central void and surrounding boundary Softscape: Grevillea, Talisay, and Pine as wood trees in the surrounding and shrubs as edges Function: Recreational and cultural Activities: semi private-public, wedding garden, ceremony

### 3.1. Analysis of the Results

The form of the landscape of the city is going to change through the process of deforming the gardens. The functions of the gardens are varied from private-productive to semi-private-non-productive specifications. The traditional gardens are more productive and private with some specific purposes such as farm-garden, house-garden, and church-garden. However, the transformed gardens are more semi-private or semi-public, which are transferred for recreational activities such as restaurant and wedding garden, or official activities such as office, institution, and religious centre. Apparently, the transformed gardens prioritize public activities, which are open to the public than limited to the individual or a single family. In other words, the traditional gardens serve just a limited activity as production for the minimum number of users such as farmer and the family; however, in the transformed gardens the activities are varied based on the purpose of users including consumers, visitors, and owner. The new group of the garden facilitate activities of users to spend their times in the gardens based on the different schedules, payment for activities, and an administrative process for services. Therefore, in the transformed gardens the function of the garden could serve more wide range of the inhabitants than a traditional garden. The payment of the attendees reveals to the specific social class of the users who are ready to pay for leisure times the transformed gardens. Therefore, the new form of the landscape is more penetrated physically by the users than traditional gardens.

According to the results, the general form of the gardens is included a trend toward the geometric or semi-geometric shapes in both traditional and transformed gardens based on two elements including the natural contour lines and the traces of water runoff (Tables 3 and 4). In fact, both upper and lower contour lines formed a sample way to subdivide the land based on the topography without terracing. These two elements construct the general form of the landscape in the city and surrounding areas with check-square shapes. In this regard, the boundaries of gardens are determined with two different trends based on the function and activities inside the gardens. For the productive gardens, the boundary of the land is highlighted by some separated elements such as trees, shrubs, or other natural elements due to the visibility and lighting in the gardens. Seemingly, the trees as a boundary include the character as a reference point. Despite the traditional gardens are open for the visual penetration of the passerby, the transformed gardens are surrounded by walls, fences, and multilayers of trees as physical elements to reduce the possibility of the observability, visibility, and monitoring the garden from outside for the more specific activities such as restaurant, wedding garden, and or institutional activities in Table 4. Therefore, the new form of landscape with both hardscape and softscape hedges appear in the city to protect the restaurants, offices, and wedding gardens from outside visibility.

In addition, the hardscape of gardens is followed by the main function of the gardens. In fact, the gardens with a productive function just include land and area with some trees and vegetables as productive goods, which are no or less included any decorative elements of infrastructure. However, the transitional gardens are more semi-public, in which the owner invest budget for the improvement of both hardscape and softscape to attract users to attend in the garden. For this reason, the materials and species include a variety in transformed gardens such as pavement, paths, decorative flowers, colourful hardscape and softscape, flowerboxes, pots and vases, and furniture. Apparently, new groups of owners and users pay more attention to the beatification, aesthetic, enjoyment, and attraction of the new generation of gardens than productive.

The softscape in both gardens includes varieties of green spaces. The traditional gardens encompass both forest and fruitful trees, however, a bunch of trees are the common characteristic of those gardens such as banana and avocado trees. The forest trees normally take the position in the surrounding areas of the gardens as a reference point of the land. Vegetation covers the whole part of the land commonly beans, maize, flower, and vegetables. While, in the transformed gardens, some decorative elements are added to the softscape to make variety such as decorative trees, flowers, and shrubs, also some hardscape such as walls, gates, paving, sitting areas. Metal fences and walls are new materials to define transformed gardens those normally cover with vines such as *Ficus Pumila*, *Bougainvillea*, and Trumpet Vine. Despite the increase of the decorative elements in the softscape, the fruit trees conserve in the location as one of the main element in the softscape structure in the transitional gardens although vegetation is converted to the flowers. It is significant to highlight that the trend to add decorative elements to the gardens reveals the interests of new users and owners to spend money on the softscape for leisure activity as a new social class.

Additionally, the shape of the central void in both gardens is a permanent concept, which is appeared with a different form and character. In fact, in the transformed garden, this void focuses the main activity in the central

part as the main character of the areas. Therefore, transparency, visibility, and permeability are three functional aspects of the voids in the transformed gardens. The void also should be accessible and observable by the users as the most important part of the area to create a sense of exploration and curiosity in users. However, in the traditional gardens, the central void encompasses the function as the reference point to arrange the productive activities in the other parts as the cornerstone.

### 3.2. Discussion

Studies on the garden identified that the concepts of spiritual (Pregill & Volkman, 1999; Eyres, 2013), ritual (Gleason, 2010; Wilkinson, 1994), and leisure activities (Huang, Tuan, & Wongchai, 2014) contrasted with the meaning of the traditional garden in the area. The traditional gardens have been in line with Micoulina theory, as the agricultural plot with manmade efforts (Micoulina, 2010). Therefore, traditional gardens were full of edibles species like fruits and vegetables than decorative. Hence, the theory of Owusu based on the distortion of agriculture and horticulture (Owusu, 1993) was not achievable in the study. Additionally, the theory of the natural pattern of gardens in the context of Affric had a little bit of deviation based on the Gokyer idea (Gökyer, 2013). In detail, the naturalistic form of gardens in the context was more dependent on the softscape than the hardscape. Indeed, the form of the land conserved particularly in the case of the topography and form of plots, but the coverage changed based on the current tendency similar to the results of Shin and Goldsmith (Goldsmith, 2014; Shin, Chen, Lee, & Kim, 2015).

The results of studies demonstrated that the function of those transformed gardens majority adapted to the recreational and semi-private-public activities; those were tended to increase the advantage from both land and green spaces based on the new functions and activities. This result was so similar to Hermand theory as the effects of middle-class enhancement and enlightenment movement in the changing of gardens (Hermand, 1997). This new class also as the resident, owner, and stakeholder changed the form of the garden due to the hardscape and softscape to form new composition and configuration based on their want, desire, and new cultural aspects that were so close to the ad hoc and eclectic theory were discussed by (Tafahomi & Nadi, 2020; Tafahomi, 2021). The intervention was included two parts containing the softscape part with adding decorative elements, trees, and flowers, also the hardscape part with adding walls, furniture, gates, and particularly roads as the right to accessibility. This observation was similar to the findings of Fu and Ruggeri as the changing of the urban green spaces by stakeholders results of Bigell and Chang as the cultural influences for changing of the gardens (Fu, Xiao, & Wu, 2016; Bigell & Chang, 2014). Furthermore, the results confirmed the outcomes of the study of Paganova and Jurekova to change trees in the softscape by users, and Baard and Kraaij on the effective factors of changing both hardscape and softscape of landscape (Ruggeri, Mazzocchi, & Corsi, 2016; Paganová & Jureková, 2012; Baard & Kraaij, 2014).

For this reason, also those transformed gardens have been more geometric to present a new aspect of the public activities and behavioural patterns as a cultural and historical transformation. The level of transparency in terms of permeability and accessibility increased the variety of users, and the public found the right to attend in the spaces in the major part of the transformed gardens. Therefore, this result diverged from arguments of both Owusu and Mazrui as the negative effects of modernisation (Owusu, 1993; Mazrui, 1993). In fact, stakeholders conserved the green spaces and then added decorative species to adapt the gardens to semi-public-private activities than private productions. Therefore, the new form and function of those transformed gardens could more support the social and public activities as the symbol of urbanisation, analogous with results of Swaffield as the own designing of the personal form of the garden and Antrop by means of the urbanisation and modernisation process of the landscape (Swaffield & Primdahl, 2006; Antrop & Eetvelde, 2008; Antrop M., 2013).

According to the analysis and findings, the amazing aspects of the research was to discover the void in the central part of the gardens, as a symbolic meaning of the arranging, planning, and designing of gardens. In fact, the central void in the traditional garden highlighted a symbolic space in the central part as the reference point including activities such as production or connection such as ownership and gathering activities. This character by means of referring to the location was similar to studies of Bigell, Chang, and Micoulina as the cultural effects on the landscape; however, the findings did not reach any aspect of the spiritual or recreational aspect similar to Cannon and Kua (Bigell & Chang, 2014; Cannon & Kua, 2017; Micoulina, 2010). Additionally, the central void redesigned based on the recreational activities, visibility, and transparency in the transformed gardens than the ownership aspect. This specification could demonstrate the rising of a new

middle social class with recreational and leisure tendency (Gökyer, 2013) in the semi-public spaces due to the cultural and historical movement (Shin, Chen, Lee, & Kim, 2015) and hinterland specifications (Crowder, 1993) in the city.

#### 4. CONCLUSION

The transition process of gardens in the city has been a continuous trend with diverse specifications particularly from forest to agroforestry and farms. Importantly, the current process of change has been more a procedure of integration, adaptation, and accessibility due to the public need than transformation. Indeed, this process has tended to renovate the gardens from the product types such as farm, agroforestry, agricultural plot into recreational trends such as the restaurants, wedding gardens, and intuitional offices for social interaction.

The current study finds that transformed gardens tend to be more semi-private and semi-public than traditional gardens as private. The main objective of the transformed gardens changed from production to leisure activities, so, the accessibility of other people facilitated these gardens particularly those who could afford the payment for leisure. In fact, leisure and recreational activities are important functions in the transformed gardens. For this reason, all transformed samples encompass a geometric accessibility network to facilitate walking, stopping, watching, and leisure activities. This specification of the transformed gardens makes the gate open to the public at certain times. However, in those traditional gardens, a single-family or group of families use the land to produce vegetation and fruits for the self-consumption or market.

The process of transformation also refers to the social classification of the city. Indeed, the city has confronted with investment, service jobs, and international centres, so this integration of the country in the global economy has created a new middle-class of inhabitants with the urban level of need, desire, and expectation from landscape design. Therefore, the former structure based on self-productive and self-consumption can no longer answer to the need for these new groups of users in the absence of recreational facilities, functions, activities, and centres. Besides, the process of changing the functions and activities in the gardens result in changing the accessibility, permeability, and legibility of those gardens from private, limited, microscale to the semi-public, open, and macro-scale in the city.

The landscape of the area faces a new configuration in the gardens based on the application of new materials and constructions to determine the territory of the gardens by the physical elements and manmade symbols. The form of the new gardens improves based on the inside visibility, transparency, and legibility. It means the transformed gardens reduce the density of green spaces with a paving network to fill the space with more users. Inevitably, this action results in increasing hardscape with more openness as an important factor of permeability. Furthermore, the central void has been kept in all precedents with varieties of openness without any contradiction with the new functions of the gardens.

This transformation not only enhances the decorative aspect of gardens with adding flowers, pots, and seats and benches for sitting but also, with conserving most parts of fruit trees and adding some ornamental species to the composition, the owners innovate a new softscape that could be called as an eclectic form in the context. In this regard, analogous trees are observed in both kinds of gardens such as forest trees like Grevillea, Pines, and Palm, or fruit trees like Banana, Avocado, guava, and Mango. In addition, other trees such as Jacaranda, Acacia, and Talisay trees also are added to the structure. Decorative pots, flowers, and shrubs as hedges apply in this new composition. These simple elements change the atmosphere of the landscape from productive gardens into a new generation of semi-open and semi-public gardens in the urban areas. This specification changes the character of reference pointing of the gardens from a micro-scale in the just portion of the city into functionality in a macro-scale in the whole scale of the city. Although the traditional gardens have more connection with the suburb configuration and composition as an agricultural function, the transformed gardens play the role in the urban level with the new generation of the landscape, hardscape, softscape, and public activities.

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