

**RE- CONFIGURING THE LANDSCAPE OF LEISURE
VALLEY PARKLANDS, CHANDIGARH**

Submitted

*In partial fulfillment of the requirements for the
award of the degree of*

**MASTER OF ARCHITECTURE
(LANDSCAPE)**

By

MANJINDER KAUR
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**SCHOOL OF PLANNING AND ARCHITECTURE, BHOPAL
NEELBAD ROAD, BHAURI, BHOPAL – 462030
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Department of Landscape
School of Planning and Architecture, Bhopal



Declaration

I Manjinder Kaur , Scholar No.2017MLA019 hereby declare that the thesis entitled Re-Configuring the landscape of leisure valley parklands Chandigarh, submitted by me in partial fulfillment for the award of Master of Architecture (Landscape), in School of Planning and Architecture Bhopal, India, is a record of bonafide work carried out by me. The matter embodied in this thesis has not been submitted to any other University or Institute for the award of any degree or diploma.

21/05/2019

Manjinder Kaur

Certificate

This is to certify that the declaration of Manjinder Kaur is true to the best of our knowledge and that the student has worked under the guidance of the following panel.

RECOMMENDED

Assoc. Prof. Saurabh Popli

ACCEPTED

Prof. Sanjeev Singh
Head, Department of Landscape

ABSTRACT

Every time you think of a city which is planned, you think of it as an ideal city where you find buildings and open spaces. And when you find open spaces, make it so people can get to them. Nature in all its forms is free from boundaries of any sort. So why do we bind them amongst tangible elements in spaces where it is most important not to.

-Author

Chandigarh City has a beautiful natural landscape used comprehensively by Corbusier in city planning. The site comprised of a scenic frame of shivalik hills ; the slightly sloping landform ; seasonal rivulets on its north-western and south-eastern flanks ; and an eroded valley running through its heart called "leisure valley."

Leisure valley was conceived as a long parkland curving through the city centre, from the very beginning to maintain a central green space in the heart of the city, order to allow an unbroken view of the profile of the capital complex's "buildings" against the beautiful backdrop of the hills of Shivalik. It was supposed to form an uninterrupted stretch of 'verdure,' more viewable on Chandigarh master plan's color renderings than on the actual city site. The city's green space is distressed, which was aimed to nourish body and spirit. In reality, leisure valley is a space that is disconnected. Disconnect between similar spaces creates a barrier and space discontinuity. The parkland runs confined and restricted through the city, away from actual use.

The landscape and open space design of Chandigarh began to take shape in response to the combined impacts of the idealized vision of Le Corbusier, subsequent evolutions of the city involving the product of designers such as M.S. road planting. Product of Randhawa and Non designer like Nek Chand's new lake. In 1952, a Landscape Advisory Committee for Chandigarh capital project was founded at the planning stage, but no master plan for the new city's landscaping was developed. (Bhatti, 2014) The existence of the city has been 66 years and no master plan for landscape design has been developed to date. The landscape master plan is important to re-examine the landscape of the use of green rendered spaces in the city master plan in order to create a cohesive, viable landscape and provide direction for the future use of green spaces in the landscape. Landscape is the ground from which needs and intentions are abstracted to Patrick Geddes. It is the city-in-evolution's real ingredient. Landscape, in other words, is the life-force that connects people to the city.

The leisure valley is mentioned as a designer product to be transformed into a receptacle. The first designer's product has been transformed into new theme gardens, parks, stadiums, and recreation spaces. (Cunha, Landscape as an active ingredient-Patrick Geddes in Chandigarh, 2002) Le Corbusier is said to have failed to recognize his town today¹. Many judgments are passed and learnings on the basis of

¹ Madhu Sarin, criticizes him for a "preoccupation with visual form, symbolism, imagery and aesthetic rather than the basic problems of the Indian population.

the stated intentions of the designer or, more generally, the case, intentions reasoned or assumed by a theorist, a criticisms or a reflective designer. But not all of them have so negatively judged Le Corbusier. Charles Correa credits him for making the people of India aware of the power of the designer's intention to transform a given receptacle into a city-in-evolution product (Cunha, Landscape as Active Ingredient— Patrick Geddes in Chandigarh, 2002). The polarized viewpoints on Le Corbusier and Chandigarh are a more extreme version of what happens since most designed products are evaluated. Underlying the controversy over whether they are good or bad, successful or unsuccessful, useful or useless is crediting designers ' ability to drive the city with forethought in evolution. Need has found a voice within the community, or maybe paradoxically. It divides the entire concept into two: city-in-evolution driven by the needs of people and the intention of designers as urban drivers (Cunha, Landscape as Active Ingredient-Patrick Geddes in Chandigarh, 2002). This intention-need divide is illustrated in its least severe form in the gap between the visionary and the problem solver, the impositional and participatory design. In each case, the second is informed more by the need of people than by utopian principles or individual aspirations.

The parkland is an essential part of the heritage of the city. It is intended to provide a natural environment by building associations with people living in Chandigarh and enhancing the quality of life. The parkland should provide coherent and open accessible space that can be shared by city people as part of their daily lives.

Chandigarh came into being as a result of partitioning Indo Pakistan. It was designed primarily for five lakhs population spread over 114sqkm of site area. Informal housing and urban expansion pressures arising from population growth of 11 lakhs (2018) over time resulted in growth in the number of private vehicles that has increased the traffic flow on the V4 and V3 road links of Leisure Valley, interrupting its continuity at the surface level. Leisure valley, 8 km parkland that was supposed to be developed as one park was fragmented into smaller pockets as individual identity parks. The introvert planning has led the Leisure Valley to disintegrate further. The individual pockets are designed at different times by different authorities (Technocrats, currently on the decision-making chair, i.e., UT administration's Chief Architect and Chief Town Planner and Municipal Corporation). It has introverted planning that leads to disconnecting rather than an integrated approach.

This academic thesis will look into the interfaces between parkland of Leisure valley which are the physical and visual disconnects to re- configure² the landscape of leisure valley as a sustainable landscape in terms of social, ecological, cultural and economic

Norma Evenson points out that “almost any older Indian town, with its narrow streets and inward-oriented courtyard houses , demonstrates a more satisfactory method of coming to terms with a predominantly pedestrian environment, a tropical climate and a high population density than is evidenced in Chandigarh”

² Re- configuring means to change the shape or formation of; remodel; restructure. the design as per today's needs and requirements. It is a process of interpreting design as evolution.

benefits and propose landscape strategies for the city level open space as a new vision which sustains next fifty years in terms of nature and cultural association. The outcome will focus on looking beyond grid life, enhancing the experience with new found edge-free green open space.

सार

हर बार जब आप एक शहर के बारे में सोचते हैं जो योजनाबद्ध है, तो आप इसे एक आदर्श शहर के रूप में सोचते हैं जहां आपको इमारतें और खुली जगह मिलती हैं। और जब आप खुली जगह पाते हैं, तो इसे बनाएं ताकि लोग उनसे मिल सकें। प्रकृति अपने सभी रूपों में किसी भी प्रकार की सीमाओं से मुक्त है। इसलिए हम उन्हें उन स्थानों में मूर्त तत्वों के बीच बाँधते हैं जहाँ यह सबसे महत्वपूर्ण नहीं है।

चंडीगढ़ सिटी में एक सुंदर प्राकृतिक परिदृश्य है जिसका उपयोग शहर की योजना में कोरबसियर द्वारा किया जाता है। साइट में शिवालिक पहाड़ियों की एक विशाल श्रेणी शामिल है; थोड़ा ढलान भूमिर्माण; इसके उत्तर-पश्चिमी और दक्षिण-पूर्वी इलाकों पर मौसमी दरारें; और एक छोटे से नाले के साथ एक मिट गई घाटी जिसे "अवकाश घाटी" कहा जाता है।

शहर के केंद्र के माध्यम से शहर के केंद्र के माध्यम से एक लंबी पार्कलैंड क्यूरिंग के रूप में अवकाश घाटी की कल्पना की गई थी, शहर के केंद्र में एक केंद्रीय हरे रंग की जगह बनाए रखने के लिए, राजधानी के "इमारतों" की सुंदर के खिलाफ प्रोफाइल के एक अखंड दृश्य की अनुमति देने का आदेश दिया गया था। शिवालिक की पहाड़ियों की पृष्ठभूमि। यह चंडीगढ़ शहर की वास्तविक योजना स्थल की तुलना में मास्टर प्लान के रंग रेंडरिंग पर अधिक देखने योग्य है। शहर का हरा-भरा स्थान व्यथित है, जिसका उद्देश्य शरीर और आत्मा का पोषण करना था। वास्तव में, अवकाश घाटी एक स्थान है जिसे काट दिया गया है। समान रिक्त स्थान के बीच डिस्कनेक्ट एक अवरोध और अंतरिक्ष में असंतोष पैदा करता है। पार्कलैंड वास्तविक उपयोग से दूर, शहर के माध्यम से सीमित और प्रतिबंधित है।

चंडीगढ़ के लैंडस्केप और ओपन स्पेस डिजाइन ने ले कोर्बुसीयर की आदर्श दृष्टि के संयुक्त प्रभावों के जवाब में आकार लेना शुरू किया, बाद में शहर के विकसित होने जैसे डिजाइनरों के उत्पाद शामिल थे, जैसे एम.एस. सड़क रोपण। रंधावा के उत्पाद और नेक चंद की नई झील की तरह नॉन डिजाइनर। 1952 में, चंडीगढ़ राजधानी परियोजना के लिए एक लैंडस्केप सलाहकार समिति की स्थापना योजना स्तर पर की गई थी, लेकिन नए शहर के भूमिर्माण के लिए कोई मास्टर प्लान विकसित नहीं किया गया था। (भट्टी, 2014) शहर के अस्तित्व को 66 साल हो गए हैं और लैंडस्केप डिजाइन के लिए कोई मास्टर प्लान आज तक विकसित नहीं किया गया है। परिदृश्य मास्टर प्लान एक सुसंगत, व्यवहार्य परिदृश्य बनाने और परिदृश्य में हरे रंग के रिक्त स्थान के भविष्य के उपयोग के लिए दिशा प्रदान करने के लिए सिटी मास्टर प्लान में हरे रंग की प्रदान की गई जगहों के उपयोग के परिदृश्य की पुनः जांच करना महत्वपूर्ण है। लैंडस्केप वह जमीन है, जहां से पैट्रिक गोड्स की जरूरतों और इरादों को पूरा किया जाता है। यह शहर के विकास का वास्तविक घटक है। दूसरे शब्दों में, लैंडस्केप, जीवन-शक्ति है जो लोगों को शहर से जोड़ता है।

अवकाश घाटी को एक डिजाइनर उत्पाद के रूप में उल्लिखित किया गया है जिसे एक रिसेप्शन में तब्दील किया जाना है। पहले डिजाइनर के उत्पाद को नए थीम गार्डन, पार्क, स्टेडियम और मनोरंजन स्थानों में बदल दिया गया है। (क्यून्हा, लैंडस्केप एक सक्रिय संघटक-पैट्रिक गोड्स के रूप में चंडीगढ़, 2002) में कहा गया है कि ले कोर्बुसीयर आज अपने शहर को पहचानने में विफल रहे हैं। कई निर्णयों को पारित किया जाता है और डिजाइनर के घोषित इरादों के आधार पर या अधिक सामान्यतः, मामला, इरादे तर्क या एक सिद्धांतकार, एक आलोचना या एक चिंतनशील डिजाइनर द्वारा ग्रहण किए जाते हैं। लेकिन उनमें से सभी ने ले कोर्बुसीयर को इतना नकारात्मक रूप से नहीं देखा। चार्ल्स कोरेया ने भारत के लोगों को डिजाइनर के इरादे की शक्ति को एक शहर-में-विकास उत्पाद (क्यून्हा, लैंडस्केप के रूप में सक्रिय संघटक- पैट्रिक गोड्स चंडीगढ़, 2002 में) में बदलने के इरादे से अवगत कराने का श्रेय दिया।

Le Corbusier और चंडीगढ़ पर ध्रुवीकृत दृष्टिकोण सबसे डिजाइन किए गए उत्पादों के मूल्यांकन के बाद से होता है का एक अधिक चरम संस्करण है। इस विवाद पर काबू पाने के लिए कि वे अच्छे हैं या बुरे, सफल हैं या असफल, उपयोगी हैं या बेकार, डिजाइनरों की क्षमता का श्रेय शहर को विकास में चलाने के लिए दे रहे हैं। आवश्यकता को समुदाय के भीतर एक आवाज मिली है, या शायद विरोधाभासी रूप से। यह संपूर्ण अवधारणा को दो में विभाजित करता है: लोगों की जरूरतों और शहरी ड्राइवों के रूप में डिजाइनरों के इरादे से संचालित शहर-विकास, (चंडीगढ़, 2002 में सक्रिय संघटक-पैट्रिक गोड्स के रूप में लैंडस्केप, क्यून्हा, लैंडस्केप)। इस इरादे-जरूरत के विभाजन को दूरदर्शी और समस्या हल करने वाले, थोपने वाले और सहभागी डिजाइन के बीच की खाई में कम से कम गंभीर रूप में चित्रित किया गया है। प्रत्येक मामले में, दूसरे को यूटोपियन सिद्धांतों या व्यक्तिगत आकांक्षाओं की तुलना में लोगों की आवश्यकता से अधिक सूचित किया जाता है। पार्कलैंड शहर की विरासत का एक अनिवार्य हिस्सा है। इसका उद्देश्य चंडीगढ़ में रहने वाले लोगों के साथ जुड़ाव और जीवन की गुणवत्ता को बढ़ाकर एक प्राकृतिक वातावरण प्रदान करना है। पार्कलैंड को सुसंगत और खुला सुलभ स्थान प्रदान करना चाहिए जिसे शहर के लोग अपने दैनिक जीवन के हिस्से के रूप में साझा कर सकें।

इंडो पाकिस्तान के विभाजन के परिणामस्वरूप चंडीगढ़ अस्तित्व में आया। यह मुख्य रूप से 114 लाख वर्ग किलोमीटर के क्षेत्र में फैली पांच लाख की आबादी के लिए डिज़ाइन किया गया था। समय के साथ 11 लाख (2018) की जनसंख्या वृद्धि के परिणामस्वरूप अनौपचारिक आवास और शहर के विस्तार के दबावों के कारण निजी वाहनों की संख्या में विस्फोटक वृद्धि हुई है, जिन्होंने लीजर वैली के V4 और V3 सड़क लिंक पर यातायात प्रवाह को बढ़ाया है, जिससे उनकी सतह-स्तरीय निरंतरता बाधित हो रही है। अवकाश घाटी, 8 किमी पार्कलैंड जिसे एक पार्क के रूप में विकसित किया जाना चाहिए था, व्यक्तिगत पहचान पार्कों के रूप में छोटी जेबों में विभाजित किया गया था। अंतर्मुखी नियोजन ने अवकाश घाटी को और अधिक विघटित कर दिया है। अलग-अलग पॉकेट अलग-अलग अधिकारियों (टेक्नोक्रेट) द्वारा अलग-अलग समय पर डिज़ाइन किए गए हैं, वर्तमान में निर्णय लेने वाली कुर्सी पर, अर्थात्, यूटी प्रशासन के मुख्य वास्तुकार और मुख्य नगर नियोजक और नगर निगम)। इसमें अंतर्मुखी नियोजन है जो एक एकीकृत दृष्टिकोण के बजाय डिस्कनेक्ट करने की ओर जाता है

यह शैक्षणिक थीसिस पार्कलैंड ऑफ़ लीजर वैली के बीच के इंटरफेस पर गौर करेगी, जो सामाजिक, पारिस्थितिक, सांस्कृतिक और आर्थिक लाभों के संदर्भ में एक स्थायी परिदृश्य के रूप में अवकाश घाटी के परिदृश्य को फिर से कॉन्फ़िगर करने के लिए भौतिक और दृश्य डिस्कनेक्ट हैं। शहर का खुला स्थान एक नई दृष्टि के रूप में है जो प्रकृति और सांस्कृतिक संघ के संदर्भ में अगले पचास वर्षों तक बनी रहती है। परिणाम ग्रिड जीवन से परे देखने पर ध्यान केंद्रित करेंगे, नए पाए गए किनारे मुक्त हरे खुले स्थान के साथ अनुभव को बढ़ाएंगे।

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1 BACKGROUND OF THE STUDY

1.1 PLANNED CITIES

Typically, planned cities are built on virgin grounds, with particular population statistics and a self-sustaining model of design. It's however not a utopian concept. The first signs of systematic urban planning date back to ancient times, from Mohenjo-Daro, Indus Valley civilization, to Greece, Rome, and ultimately modernist urban planning concepts such as Garden City, CIAM, based on certain ideologies. Such cities are classified as 'New Towns,' a name defined in the United Kingdom by the New Towns Act of 1946. (Helie, 2009). This ideology contrasts with agrarian influence, or the concepts of medieval cities.

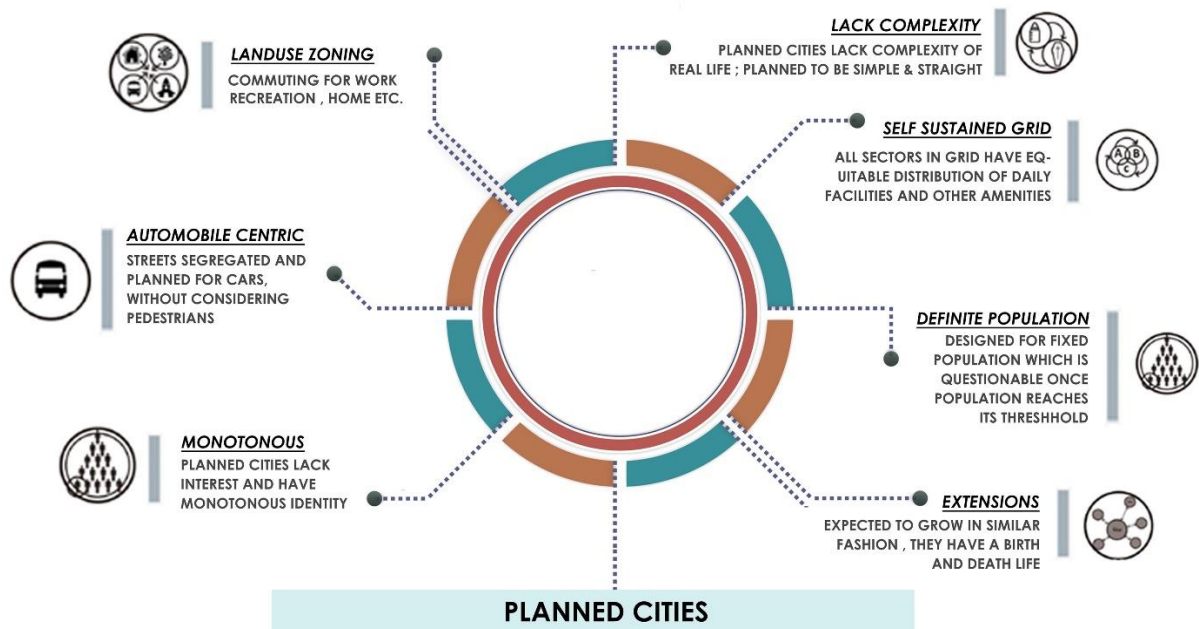


Figure 1: Characteristics of planned cities

Source: Urban design thesis 2016MUD010 SPA Bhopal

In reality, the perception of a successful city is based on contemporary appropriation of old buildings and places in the period they were built, rather than functional success.

1.2 INDEGINEOUS MODERNITY

The built environment of City is a complex interplay between modernism as a deliberate record of space and social, political, and economic organizing form and modernism as the subjective experience of the enterprise or as an expression of its transformative purpose. (Hosagrahar, 2005) The spatial experience of indigenous modernity is marked by formal contradictions and lack of coherence. Grids may be the best geometric response to human psychology for development, but their simplistic / organized design does not replicate the complexities of a city. The network of connections and inter-links between life, buildings and spaces created the need to understand life from a humanized perspective rather than just considering it as a plan.

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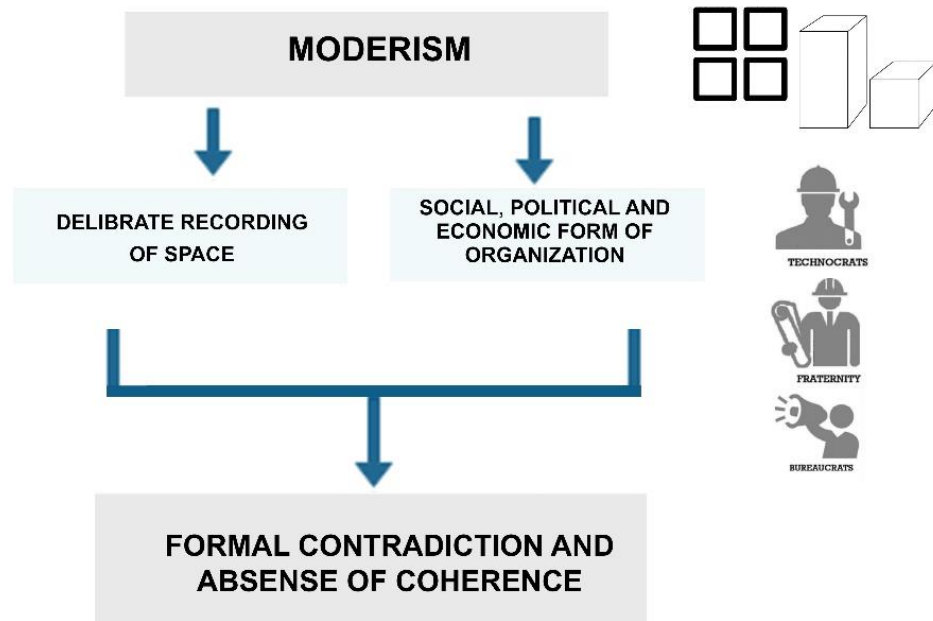


Figure 2: Evolution of indigenous modernity

Source: Indigenous modernity by Jyoti Hosagrahar

1.3 THE CITY IN EVOLUTION: Receptacle/ Product

One read about two landscapes in Chandigarh's design: the receptacle receiving Indian Punjab's new capital city and the product resulting from designers and non-designers' purposeful intervention. (Cunha, 2002) Receptacle and product are linked, given and transformed as potential and creation. This is not just the case when the new city is initiated, but in an ongoing cycle marking settlements. The product is transformed into a receptacle.

1.4 CHANDIGARH THE DESIGNED CITY

Chandigarh was built as a fully planned city with the hope that the city's success would have an impact on other India cities, creating a better environment. The city was supposed to be a catalyst for modernizing India. However, it has not been taken into consideration that innovations are not directly applicable to existing cities in new towns. Chandigarh's initial development is in accordance with a master plan drafted for the city which was more emphasized towards western experience than in socioeconomic realities locally and regionally. Too much importance placed on building designs, individual space design like capital complex, city center, 7-v roads, etc. and long-term planning were practically ignored. Economic and social issues such as productivity, economic use of space, reduction of space friction, improvement of local needs communication, reduction of social tensions, and integration of economically poor classes have never received proper attention. Chandigarh turned

out to be a designed city rather than a planned one in this sense. Unlike most of India's cities, Chandigarh is a formally planned city on a low-rise grid road network. What is lacking through the city's development is an eye for scale, non-motorize environment aesthetics, and an awareness of Indian city life's intimate textures. Chandigarh is a clear indication that simple grid cannot survive the complex city environment.

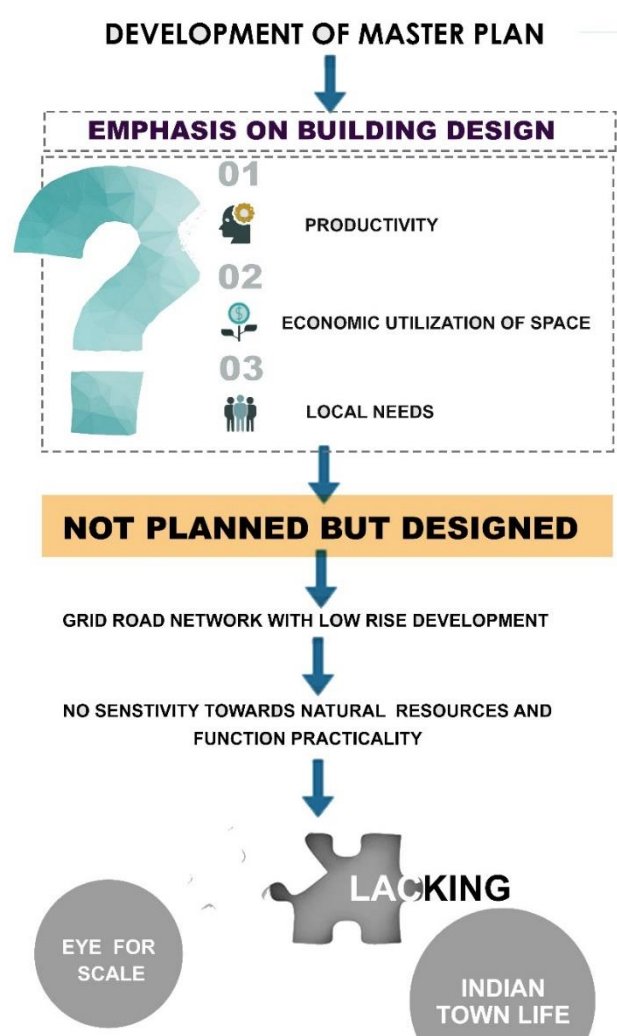


Figure 3: Understanding Chandigarh as designed city

Source: Self (author)

1.5 URBAN PARKS AND PLANNED CITY

The presence of natural areas contributes to a city's wellbeing. Urban nature, in regards to environmental and ecological services, provides additional social and mental benefits to modern societies that help grow human life with meanings and desires. Nature's urban environment experience is a source of beneficial facilities that achieve important human needs that are non-consumptive and immaterial.

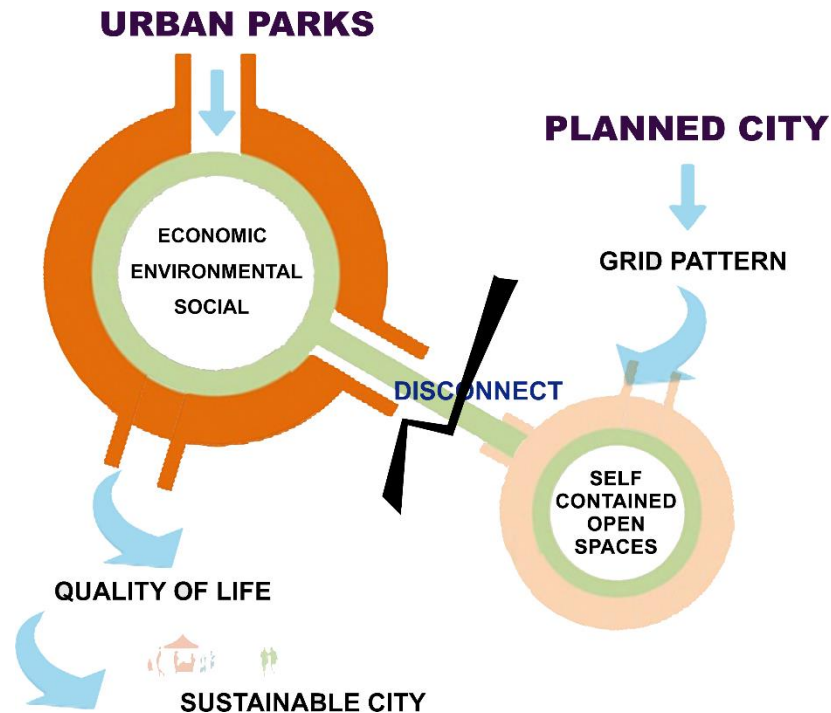


Figure 4: Understanding Urban parks and planned cities

Source: Self (author)

1.6 LANDSCAPE CHARACTER OF ORIGINAL SITE

Located at an altitude of 1300 ft above sea level on the foothills of Shivalik and Kasauli, the site had agricultural fields and 26 villages. The site's lateral aspect had a sweeping horizontal landform profile and was offset by the hills ' backdrop.

The site was a plateau from north-east to south-west with a slope of 1 in 100 ft. This "tilting plane" topography enabled natural surface drainage.

Two seasonal rivulets "Patiala-ki-Rao on the north-west and Sukhna Choe on the south-east delineated the site's vertical boundaries and carried much rainwater" run off "during the Shivalik hills monsoon. Through heart of city ran (and run) a seasonal nallah that had since formed part of an eroded linear valley.

The city was punctuated by mango trees along with kikkar, khajoor, dhak, sheesham and jamoa tree among the vast stretches of crop field. However, the most majestic of the existing trees were full-grown peepal and bor that for a century or more had decorated various parts of the original chandigarh site. Earth mounds, rainwater, ravines, depressions and ponds from 26 villages together with crop fields, trees and mud hamlets created a tapestry of biomorphic and geometric forms mixing the natural and manmade elements together into an organic whole.

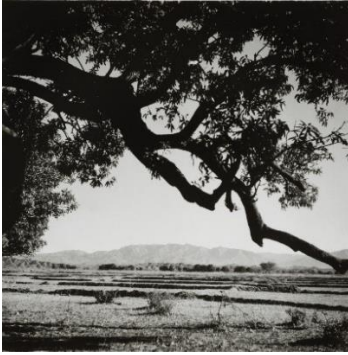


Figure 5: Panoramic view of Shivalik hills



Figure 6: Settlement along Choe



Figure 7: Village settlement around water well

source: Chandigarh college of architecture

1.7 LANDSCAPE CONCEPT OF PLANNED CITY

The aim of Le Corbusier was to concentrate on recreating man through large green parks and opening up to the sky. The landform of the city was not altered where it did not come in the way of the grid iron establishment of Le Corbusier. The city grid, which includes a network of six green fingers across sectors from northeast to southwest, lays across the ground. Together with other landscape features, these garden spaces were sought to be an integral part of the working day existence of the city, not an escape from it.

Le Corbusier, as a member of the advisory committee, proposed preparing a chart showing a trees classification based on their shape, foliage, flowers and shape. This chart was intended to provide the basis for all Chandigarh tree plantations.

In 1952, the tree preservation act was passed, prohibiting the deliberate felling of trees. As a result, Chandigarh was able to preserve its venerable mango, sheesham and other trees groves to a large extent. Le Corbusier identified important areas involving tree planting as: recreational valley, sector-greens forming linear green belts, running in each neighborhood north-east / south-west; architectural squares, viz the capital complex, the city centre, the University of Punjab and the roads. He recommended that V2 and V3 running north-east / south-west should be lined with evergreen trees to create a 'green tunnel' effect in the motorist's eyes to guard against low winter suns. The master planner also stipulated that the V4 (shopping street) should have flowering trees to allow each sector to develop its own character depending on the color of its flowering.

Corbusier classified the components of Chandigarh's landscape design grouped under the four basic city functions:

1. Living
2. Working
3. Care of Body and Spirit
4. Circulation

These components can be discussed with respect to landform, green spaces, water feature and trees.



Figure 8: Four basic components of landscape considered during planning

Source: Self (author)

Living: The city's largest area has been covered by the living sector. Every sector in Chandigarh has a smooth hierarchy of green spaces, be it individual residential private gardens or community green spaces.

Working: Chandigarh's grey office buildings were meant to be covered with the rows of trees to fuse the dull façade and only emphasize its architectural elements. Although, many things went wrong and workspaces ended up without any landscape of thought and depended solely on the side trees of the road— except for the Capitol Complex — in which Corbusier was involved personally.

Artificial mounds were created with the earth excavated from the secretariat foundation and parking trenches around capital complex. According to Le Corbusier, the sculptural impact of "the edifices" had to be dramatized.

Ironically large green spaces were provided in the capital complex where they would be the least useful. Le Corbusier designed two large ponds as an integral part of the Capital Complex one in front of the Legislative Assembly and one in front of the High Court. These water characteristics were intended by shimmering reflections to etherealize the building bulk. But most of the time these ponds and several other water bodies in the city remain dry because there is virtually no water in the city. Capitol Complex landscape design's most striking feature are the existing mango trees grooves that have been preserved. Trees were also planted on artificial mounds in continuation of heterogeneous plantation.

Care of body and spirit: lot of body and spirit care has come down to two best available landforms. One is the eroded valley called the "leisure valley." Sukhna Choe is the other beautiful monsoon torrents catchment area that has been transformed into a lake by damming the rain water.

From the very beginning, the Leisure Valley was designed to develop the Barsati nallah (monsoonal brook) alone in order to maintain a central green space in the heart of the city and to provide an unhindered view of the profile of the capital complex's "buildings" against the beautiful backdrop of the Shivalik hills. Leisure valley is about 8 km long parkland, stretching across the city along its north-west / south-east axis, with a stormy water gorge forming an integral part of it, adjacent to the city center. It extends from the northern end of Chandigarh to its southern extremity in a series of gardens.

Leisure valley

Stretching through Chandigarh's heart is 8 km long parkland, forming an integral part of the leisure valley with storm-water gorge. Part of it, adjacent to the city center provides the peaceful counterpart of nature to urban life's hustle and bustle. It extends from the northern end of Chandigarh to the southern extremity like a garland of gardens. Art college, Govt museum, art gallery and science museum are located in the Leisure Valley cultural area.

Le Corbusier proposed the retention and transformation of the existing valley into a continuous parkland for the "care of body and spirit."

The leisure valley was developed as a continuum of different theme gardens. The first part of the north-eastern end of the leisure valley has been transformed into bougainvillea park spread over 20 acres of land in sector 3. It consists of steel bowers, arcades and pavilion where hundreds of them display their flowers ' ware.

Sector 3 adjacent Bougainvillea Park is an annual flower garden. From here, one moves on to Sector 10's second part of the leisure valley, where it takes on the character of a quiet garden. More than color in this part, it is on display tapestry of the variegated greenery of nature. The most striking element is the thick bamboo grove bordering the seasonal rivulet banks. Which brims during the month of the monsoon with water.

Next is Sector 16-B Rose Garden, perhaps Asia's largest of its kind. It spreads across 30 acres of land and has 1,600 rose varieties. The focal point is a central water feature. The Leisure Valley expresses itself through different personalities beyond the rose garden to the south. It can be Sector 23 Children's Park or Traffic Park and Sector 36 Hibiscus Garden, Fragrance Garden and Dahlia Garden. It ends up in Sector 42's new palm garden and spring garden.

Sukhna Lake

Built on an area of three square kilometers in 1958, Sukhna is a rainfed lake built by damming the sukhna choe from which its name derives. Its catchment area is in the hills of Shivalik where it was fed by three seasonal streams, namely Kansal, Ghareri and Nepli. The concept of Le Corbusier's vision was to create a lake that was large enough to create a spectacle of mountains and sky reflected in the water. An uninterrupted walk of crushed stone and sand at the top of the dam. The population

immediately understood: on Sunday evenings they went there. This was a place for him where pedestrians are a king. No cycles, no cars, no one wheel! No motor boats but sails or oars on the water.

Circulation:

In roadside plantation, one identifiable evidence of planners attempting to design the city's landscape can be seen. Corbusier specified in the following way the series of road networks in the city:

- Cross Continents: the V1
- Arrival in the town: the V1
- Essential Public Services: the V2
- Cross at full speed, without interruption, the territory of the town, the V3
- Dispose of immediate accesses to the daily needs: the V4
- Reach the door of the dwelling; the V5 and V6
- Schools and sports grounds are located; the V7

Trees would be planted in one, double or multiple rows along the road. For fast moving traffic, the V2 and V3 roads were considered for circulation arteries and the foliage pattern was chosen according to varying sun conditions. The V4s, or the shopping streets where the most intensive activities were to be assembled, would be planted with a variety of trees to give each sector different character and personality. Thus each V4 has been planted with different flowers color.

1.8 CHANDIGARH URBAN GREEN SPACES

One of the indispensable elements for city design and development is urban green spaces (UGS). UGS is considered to be the "lung" of cities and one of the elements that reflect the quality of life. Chandigarh's total green cover (forest cover and tree cover) is 54 sq, according to India's Forests Survey. Kms representing 38.8% of the total geographical area.

Chandigarh is one of the few world cities of the 20th century whose initial layout strategy has carefully planned, open space hierarchy, landscaped areas, recreational areas, tree-lined roads, avenues and gardens spread all over the city. The intention of the founders of the city was very clear that the city would be a place where people of the city and people from outskirts would have direct contact with nature. City residents would enjoy open spaces at city level as well as neighborhood level.

1.9 HIERARCHY OF OPEN SPACES

Chandigarh has hierarchy of open spaces ranging from neighborhood to city level open space.



1. City level green open spaces
2. Free flowing green space running through the center
3. Semi private green areas for each neighborhood pocket.
4. Private green space for residential units

Figure 9: Le- Corbusier' vision for green open spaces

Source: Chandigarh administration

1.



Figure 10: Sukhna lake



Figure 11: Garden of peace



Figure 12: Rock garden

2.



Figure 13: Rose garden



Figure 14: New lake



Figure 15: Leisure valley fitness trail

3.



Figure 16: Neighborhood park sector 36



Figure 17: Neighborhood park sector 23



Figure 18: Neighborhood park sector 16

4.



Figure 19: Private open space of residence in sector 10

1.9.1 FREE FLOWING GREEN SPACE

Leisure valley comes under free flowing green space as per above mentioned hierarchy of open spaces. It has total 14 designed theme gardens stretching through the center of the city.

The theme gardens with name, character and area are discussed below in figure 20. The gardens start from sector 3 and ends in sector 53, stretching through Chandigarh's heart is 8 km long parkland, forming an integral part of the leisure valley with storm-water gorge. The storm water- gorge is the only element connecting all the parklands.

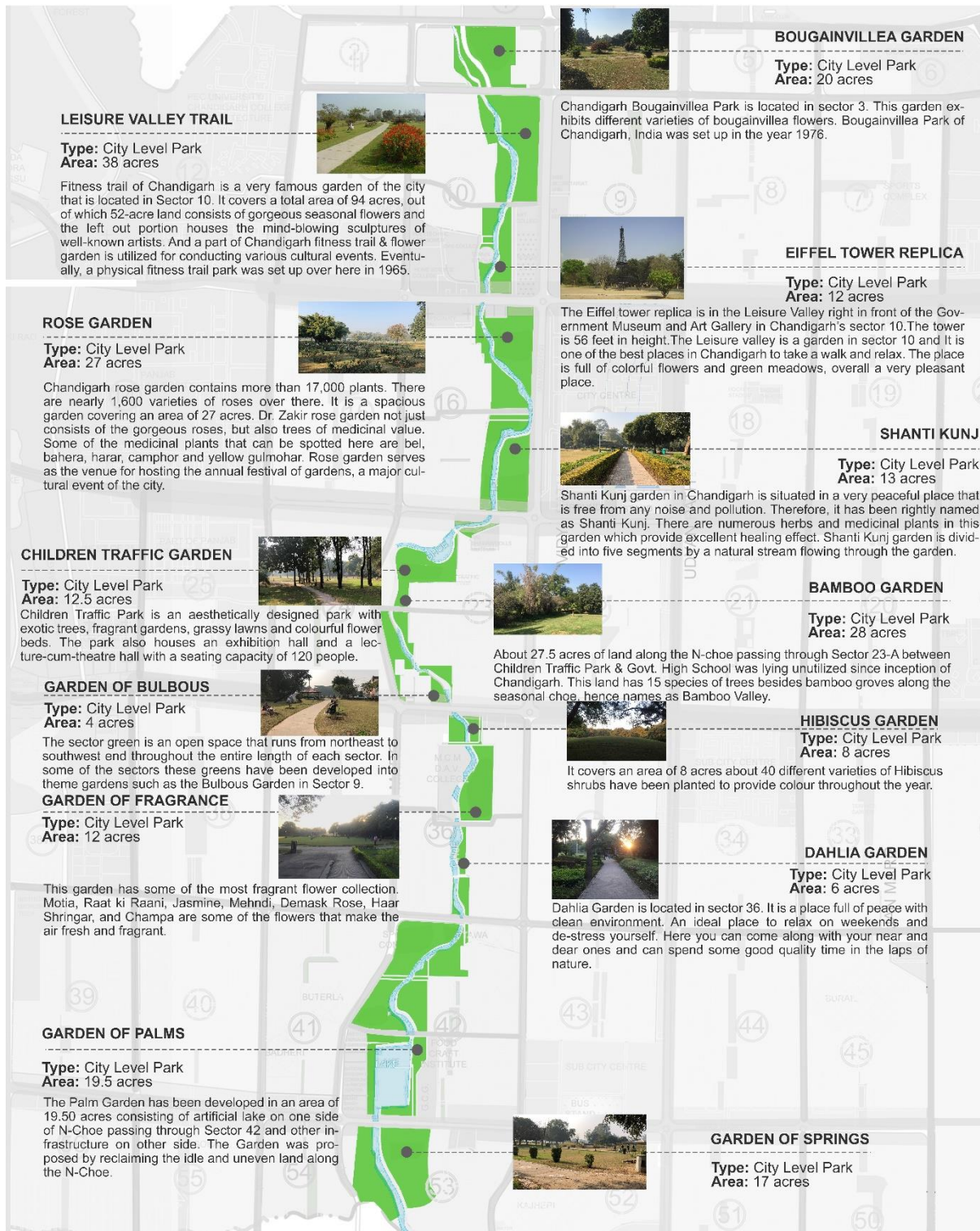


Figure 20: Parklands of leisure valley

Source: Self (author)

2 CASE EXAMPLE

2.1 CENTRAL PARK, NEW YORK

THIN STREAK OF NEWBORN NATURE SET IN MANHATTAN RECTILINEAR GRID.

2.1.1 OVERVIEW

- Located in the center of Manhattan is the great expanse of sculpted nature called as central park, first great manifestation of a new urban landscape vision.
- It covers six percent of Manhattan which is around 341 hectare and is visited by almost 25 million people each year.
- Central park is designed by Fredrick Law Olmsted and Calvert Vaux. They envisioned the park that is embodied “seeming nature” and provides a unified environment for the people of New York City.
- The landscape plan of Central park features English style landscape with large meadows, lakes and hills. It has separate pedestrian roads and huge trees along the boundary serves as the buffer from hustle and bustle of the city.



Figure 21: Bird eye view of the central park

Source: Centralpark.com

2.1.2 TIMELINE OF THE CITY

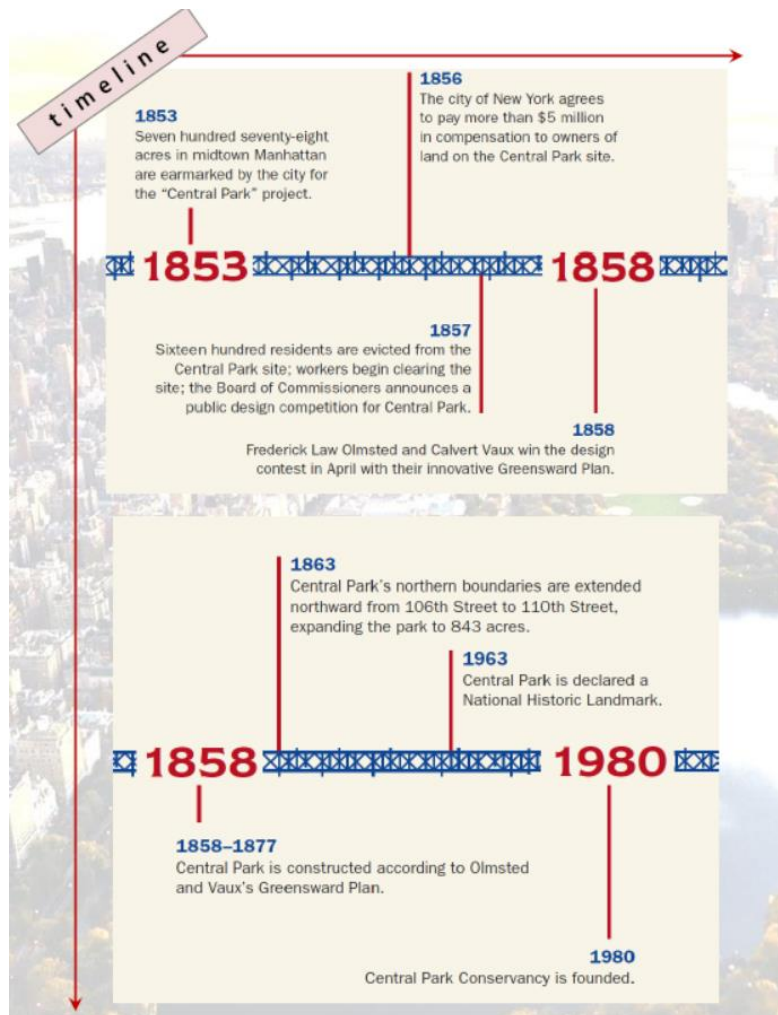


Figure 22: Timeline of the city

Source: Self (author)

2.1.3 DESIGN

- Retained a strong reflection of the natural conditions of the site. Water bodies such as the Lake and the Reservoir (and later, the Harlem Meer) occupied the five natural drainage basins
- Rockier and higher ground, adapted to create areas like the Ramble and landmarks such as the Belvedere on Vista Rock
- Intermediate areas are filled to create meadows. The pastoral elements like the rolling meadows were Olmsted idea of 'picturesque'. Gothic Revival structures were more Vaux' s métier
- Tapestry of pastoral, picturesque and formal (rectilinear) landscape. There were three distinct modes of transportation threading their way through constantly changing scenery

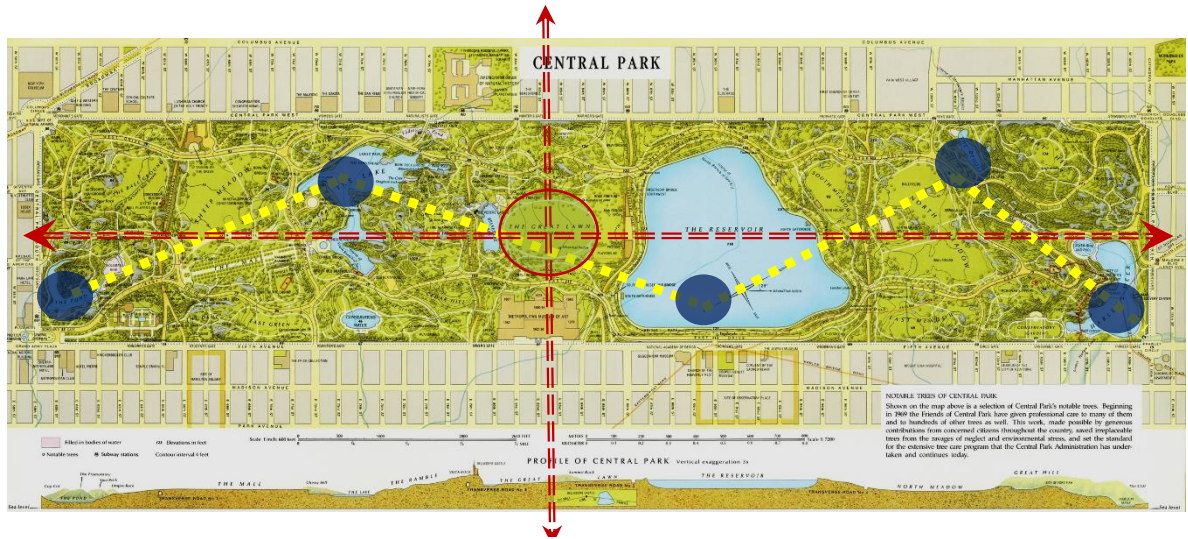


Figure 23: Plan of Central park, New York

Source: centralpark.com

2.2 LEARNING

2.2.1 LANDSCAPES ARE PLACES OF MOVEMENT

Multiple water bodies, huge open meadows, hills, outcropping and small forest spreading throughout to constantly explore the site. Every area is crafted to designed vision.

The path around the water body forces one to choose the way he or she would like to go, each leading to the different parts of the park. Be it the nice grassy hill on one side or pond on other.

2.2.2 THE SUCCESSION OF GRAND LANDSCAPES

BALLFIELDS AND THE POND

The pond is the perfect escape from the city environment, located below street level allows you to take a relaxing stroll along the winding paths bordering the water. Migratory bird species which inhabit the pond

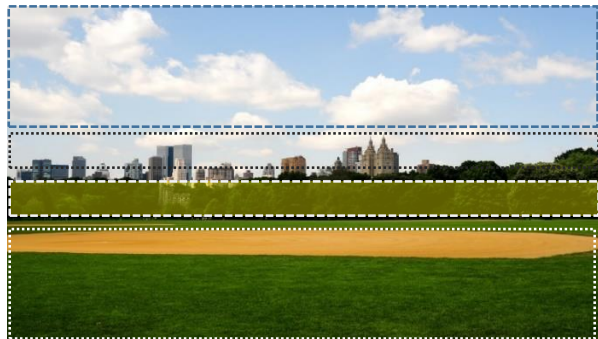


Figure 24: Wall plane _ vegetation _ coarsely textured & merges from the ground _ to an overhead sky plane



Figure25: Sense of 'drawing people' in _ also 'spilling out' enclosure and volume _ expanse of view



Figure26: Hedged enclosure on one end _ tranquil pond on the other _ transition mediated by meandering paths _ stillness & movement

THE MALL AND MEADOW

- It sets in the southern end of the park. It is designed to be viewed as a natural open rolling meadow whereas the promenade has straight walkway unning running down as formally designed section of the park.



Figure27: Topographic Foci



Source: centralpark.com



Figure28: using dynamism of landscape to create visual experience



Source: centralpark.com

- Area departs from the natural environment of long tree benches lined in the Promenade leading to the Terrace and Bethesda Fountain
- Avenue of Tree canopy encloses & demarcates a floor space below line paths, edge of spaces serves as avenues as place to be.

THE LAKE AND THE RAMBLE

- It covers 18 acres of the area in south of the great lawn. The area is designed with water feature as a landmark and foci which has directional movement of flow.
- The Ramble is located on a trans-Atlantic migration route more than 250 different species of birds. It has series of twisting paths along rocky outcrops, the north edge of the park has most rough landscape with dense foliage. The quietness of the area is the actual distance from busy streets around it.



Figure 25: view of the lake_south of the great lawn

source: centralpark.com



Figure 26: Visual narrative of the ramble

source: centralpark.com

THE GREAT LAWN & THE RESERVOIR

- Spaces for calm reflection as well as spaces for connecting with other people, with nature and with the outside. Urban parks offer easy and often daily access to green space for many urban residents.



Figure 27: Waterside paths _ vibrant edge places

source: centralpark.com

THE PLAYGROUNDS

Extensive rural playground designed to allow New Yorkers to "escape" from the city streets at intervals to spend happy hours with nature's beauties. In a more general sense, Central Park was a playing ground. "Play" included all the activities within the Park and offers a necessary contrast to the urban experience, just like its landscape.



Figure 28: Found spaces _ Southern part of the Park _ large rock outcrops _ climbing and playing on them

THE TREES

- The park provides a different rural experience in the city. It was aimed to an artful blends of woodland and pastoral scenery. To achieve this avenue of trees were planned around the park shielding out the view of the city.



Figure 29: Unlimited range of natural conditions.

- Aside from using thick plantings of trees and shrubs along the park's borders as a natural barrier against the city's noise and congestion, Olmsted hoped to make Central Park into one of the world's leading arboretums.

CONCLUSION

"Central Park was the first translation into the public realm in America of the western pastoral tradition - a tradition that has been compatible with the idea of nature as a resource to be manipulated by human enterprise" (Wilson 1991: 95)

The park was perceived as a work of art, with the salutary influence of nature injecting culture.

3 LITERATURE REVIEW

Reference	Author/source	Name of the reference	Key learning
Research paper	Mohammad Mehdi Sadeghian	"A brief review on urban park history, classification and function"	This paper defines city parks as the city-wide provider and includes areas with special natural features, historical significance, or centralized cultural facilities. Usually the facilities are focused on the interests of adults and families.
Research article	Anna Chiesura	"Role of urban parks for sustainable city."	Urban park benefits can be studied in three headings: Environment, Economic and Social All three contribute to the quality of life that makes the city sustainable.
Research paper	PaulH. Gobster	"Urban parks as green walls or green magnets? Interracial relations in neighborhood boundary park."	In this study Urban parks are compared with two studies, one considering parks being green magnet and other as green wall and the usability is analyzed. The park as green magnet has high utilization as it attracts people from all around the city.
Research article	Helen Woolley	Children's interaction with water in city centers	The study shows that children are engaged in both active and passive activities related to the water.
Research article	Karl Kullmann	Thin parks/thick edges: towards linear park typology for post infrastructural site.	In reference to the typology defined in this paper leisure valley can be defined as pre planned edge into the figure ground pattern of the city. Filter typology can work in order to integrate the context with park.
Book	Peter Jacob	Types of Gardens	This chapter talks about the ideas of nature and its existence. It says garden is the first and probably most important expression of conscious act in creating beauty, providing refuge,

		<p>exploring natural processes, designing a space for social gathering. As per the typologies defined by Peter Jacob parks of Chandigarh are characterized and studied. Some of the garden are Gardens that civilize and some of them are gardens that reflects social setting and gardens of memory.</p>
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4 PREMISE

THESIS TITLE: Re-configuring the landscape of leisure valley, Chandigarh

THESIS CONCERN AND INTENT

This academic thesis will look into the interfaces between parkland of Leisure valley which are the physical and visual disconnects to re- configure³ the landscape of leisure valley as a sustainable landscape in terms of social, ecological, cultural and economic benefits and propose landscape strategies for the city level open space as a new vision which sustains next fifty years in terms of nature and cultural association.

VISION

The project aspire to reconfigure the landscape of leisure valley as city urban forest with no defined edges which will enhance landscape of free flowing city park, rejuvenates the residents of the city and give a sense of tranquility of perception.

4.1 AIM:

To design landscape proposal for the edges of the parks and also to re-design the spaces of the park by integrating natural resources on site and needs of the people living in Chandigarh

4.2 OBJECTIVE:

To **study and understand** the changing dynamics of city landscape developed in last 66 years based on people requirement.

³ Re- configuring means to change the shape or formation of; remodel; restructure the design as per today's needs and requirements. It is a process of interpreting design as evolution.

To understand the current use of open spaces in Chandigarh and how the original vision has evolved over time.

To understand the present day context of leisure valley parkland.

To **assess** the functionality of open space through landscape assessment

To **analyze** the ecological potential of the site.

To present the new idea of city level open space according to people’s need.

4.3 METHODOLOGY:

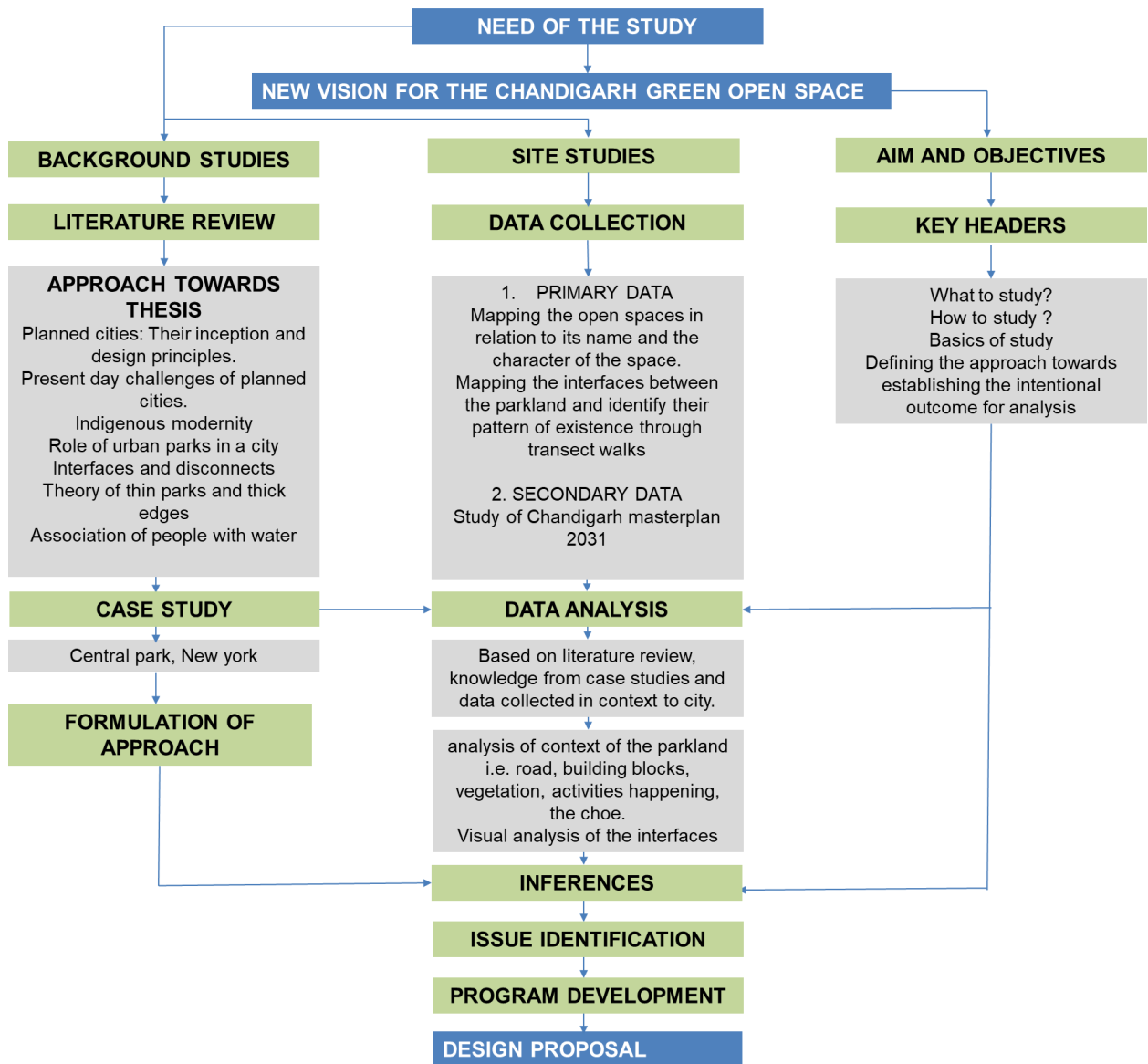


Figure 30: Methodology followed for the study

4.4 Need and Importance of the study

Over time, the Chandigarh landscape has evolved and will continue to evolve—change is a constant, but the results vary. (White, p. 97, 2009). Increasing pressure on the growth of Chandigarh clearly shows that this is a potentially explosive political landscape, representing its environmental quality and providing a life aspired by those seeking to move into town. It's hard to imagine that there's no design capability to create a democratic landscape that can empower more of its citizen. (Blanc, 2009, p. 107) The past was good, but only when the present was good. I like imaginative methodology, not being sure of what ancestors have done, but thinking in new terms about landscape and people. Landscape of Chandigarh is of immense importance along these lines and requires a new approach to design.

5 INTRODUCTION TO THE CITY

Chandigarh is part of an ideal urban conception tradition. As an Indian city, it has always held a controversial position. It was Nehru's expression of 'new' India, and Le Corbusier's work was his schematic master plan; establishing the vision of a future 'unfettered by past traditions'⁴. Its design is closely related to the paradigm of contemporary European modernist planning. Considered the monument of statistics on urban planning, it sees each function in a box and each social type matched to a kind of space.



Figure 31: Nehru's born vision for modern India gave birth to idealistic city



Figure 32: Mayer's plan for Chandigarh

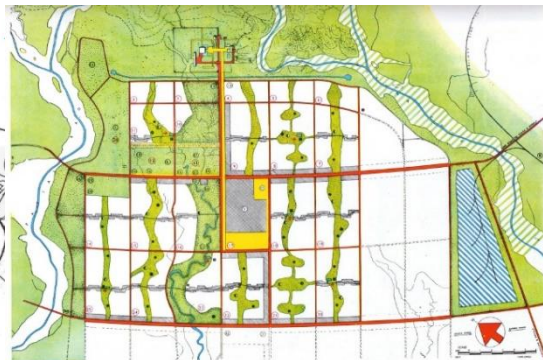


Figure 33: Le Corbusier's plan for Chandigarh

It is an exclusive city where the utopian lens of simple formula has viewed complex urban scenarios. There was no administrative flexibility provision, and Chandigarh is now finding it difficult to handle and positively absorb his new growth. Poor, informal activities and related uncontrolled growth common to other Indian cities have been pushed to the city's periphery, while a successful city thrives on social variety

⁴ (Kalia, 1996)

adjacencies⁵. But what is the future of Indian cities really then? Or should I remember the words as what this static entity's future is. Because a society that stops going forward is necessarily weak. For the population of 5 lakh people, the city's pilot plan was developed to inculcate 1,50,000 people in phase 1 and 3,50,000 people in phase 2. In order to control urban development and preserve the character of the area surrounding the city, under the New Periphery Control Act, 1952, a 16-km green belt was declared no-development zone.

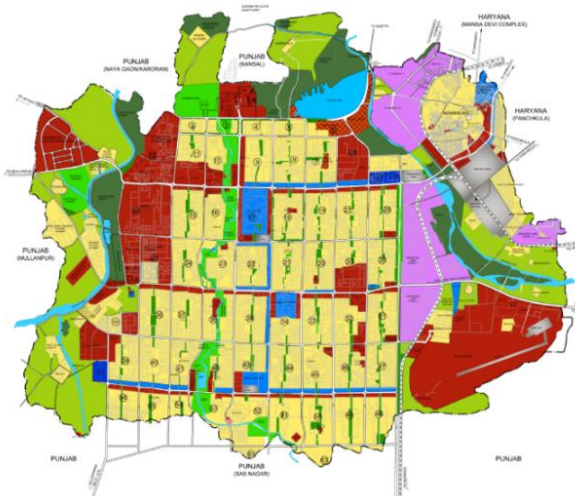


Figure 34: Existing landuse of Chandigarh

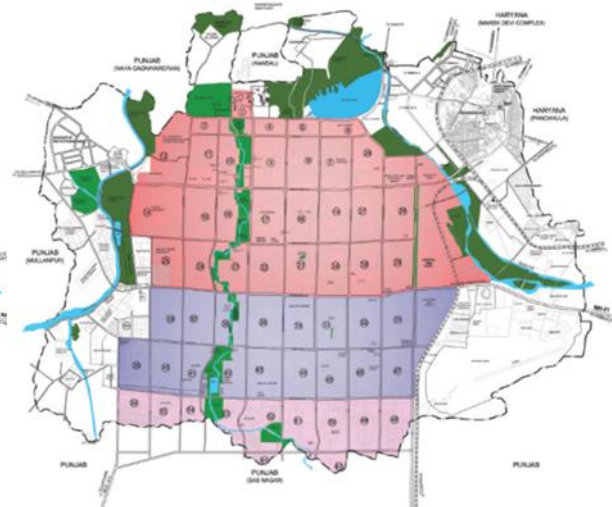


Figure 35: Phase wise development map of Chandigarh

Density – 85ppl/Ha
 Population- 5,00,000(designed)
 - 12,07,450(now)
 Area- 114sq.km +25.6sqkm hills catchment area

Character- Cubist idea, Abstract forms, colonial, combination of skills, modern.
 Blocks- self- sustained neighbourhoods with 15000- 2500 density.
 Monotonous character- 800x1200m.

Landuse Zoning- Low density, low rise city with regular system.

Roads- V7 system of roads, segregated vehicular and pedestrians

Leisure valley- Continuous greens, 16km green belt

Grid- Modular expansion

⁵ (BV Doshi, 2002)

The total area of 114 km² has been declared a Union territory Limit covering both parts of Punjab and Haryana. It was initially thought that when half a million people were expected for the future city, it was too ambitious because no one wanted to live in empty surroundings built on virgin lands. Currently, however, city has already crossed 11, 00,000 people, raising the count to 18, 00,000 in the urban agglomeration of Chandigarh by 2015. Because of unprecedented population growth in the city's rigid plan, problems have emerged with housing, slums, informal sales, squatters, public utilities, infrastructure, traffic, etc. The city is attempting to ease its pressure on Mohali and Panchkula satellite towns on its immediate periphery, which has recently extended its border to Zirakpur, Dera Bassi, New Chandigarh, Baddi. This has increased travel distances, time needs, and sustainable mobility modes for the future.⁶ This uncontrolled sprawl resulted in a combination of the rigid density laws, dwelling units, building controls and land use zoning. Re-densification, metro as a connector, acts of vendors; fuel recent discussions on Chandigarh's future idea. Revealing traffic problems, recognition as a world heritage site, and preserving the city's character as a bible has jammed technocrats' minds. But Chandigarh alone cannot be based on the city's 'robotic idea.' It has life beyond the idea of the machine. It was conceived as a living urban experiment that needs to survive care, nurture, growth, change, and adaptation. It was conceived as a living urban experiment that needs to survive care, nurture, growth, change, and adaptation.

5.1 INTRODUCTION TO THE STUDY AREA

The area to be studied is located in heart of Chandigarh, leisure valley is 8km long parkland, starting from sector 3, the park is named as bougainvillea which have low density residence on one side and government building on the other such as Punjab bhavan and legislation. In sector 10A the parkland is named as leisure valley fitness trail with institutional, residence and administrative land use. Sector 10D has extension of leisure valley fitness trail as open maidan which is being used for different cultural events happening in the city. College of art, Govt museum and art gallery and museum of science are sited on one edge of the park.

The leisure valley has been developed as a range of various theme gardens. The first part of the leisure valley at the north eastern end has been developed into bougainvillea park spread over 20 acres of land in sector 3. It consist of steel bowers, arcades and pavilion on which hundred display their ware of flowers.

Next is the Rose garden and shanti kunj garden in sector 16, rose garden is the largest garden in Asia. Adjoining rose garden is the city center sector 17 which is commercial hub of the city. lined up are the various theme garden such as children traffic park, amla park, garden of graped, bulbous garden in sector 23 and hibiscus garden, garden of fragrance, dahlia garden in sector 34 followed by bamboo valley, new lake and garden of palms in sector 42 and last is the garden of spring in sector 54.

⁶ (BV Doshi, 2002)

The site is majorly allocated residential use as per the land use map of master plan, except sector 17 which is the commercial hub. Within the residential sectors, sector markets and institutions have allocated spaces.

5.1.1 STAKEHOLDERS

The stakeholders involved in data collection, site surveys and prospective site development will be enlisted as:

Administrative:

Technocrats, currently Chair of Decision-making, i.e. Chief Architect and Chief Town Planner of UT Administration. They will help me to know what their perspective on the city was and how they visualize their future. Bureaucrats who are elected as public representatives perform certain works in the city and are involved in the delivery of the project for the public interest in collaboration with technocrats.

Fraternity, i.e. the city's architects, planners and urban designers involved in the city's small and large-scale projects, and are highly responsible for maintaining the integrity of the rules and policies and the overall idea for the city.

Living:

Next are the individuals who live in these sectors. Before we intervene in the area, it is really important to understand their lifestyle, daily routine spots, needs and missing places. These residents are three categories, natives, urban village residents, and migrants who are temporarily living for educational or job purposes.

Work:

The people who use these sectors are next to the residents. Since the city's original idea lies in inter-sector dependence (zoning land use), people move for specialized needs from one sector to another. Some people also use these sectors as their work centers, such as the Sector 9 and Sector 17 administrative belt, Class C and D servants as appointed cleaners, shopkeepers living in other parts of the city, but coming here for business, etc.

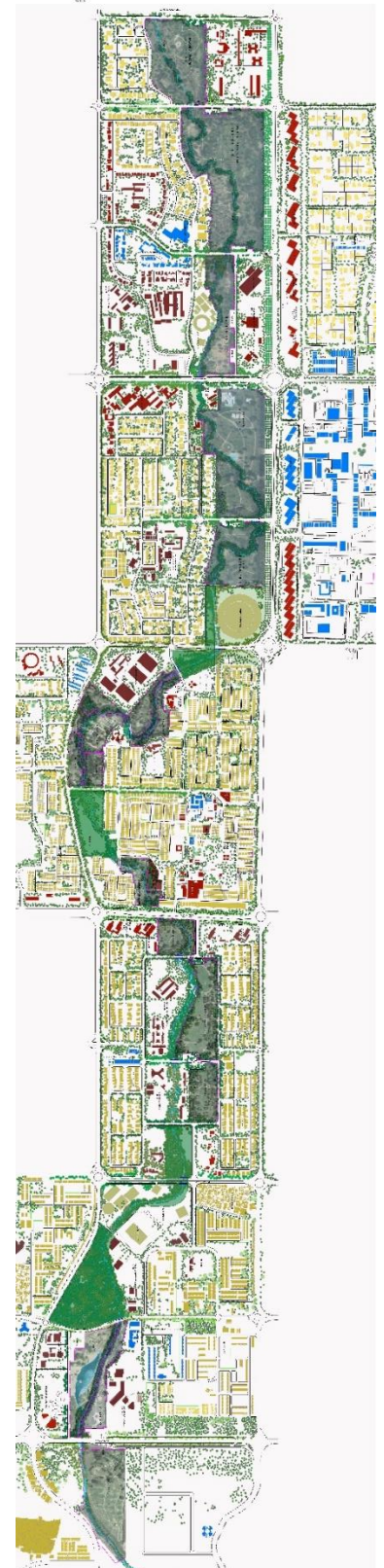


Figure 36: Base plan of Leisure valley along with the context
source: Self (author)

6.2 ROAD

6.2.1 REGIONAL CONNECTIVITY

Chandigarh is well connected to the national capital by the NH-21 that passes through the city. The four highway lanes and the construction of several flyovers and bypasses have made it a fast travel corridor that reduces travel time significantly. The city is also well connected by road to Punjab, Haryana and Himachal Pradesh's major cities.

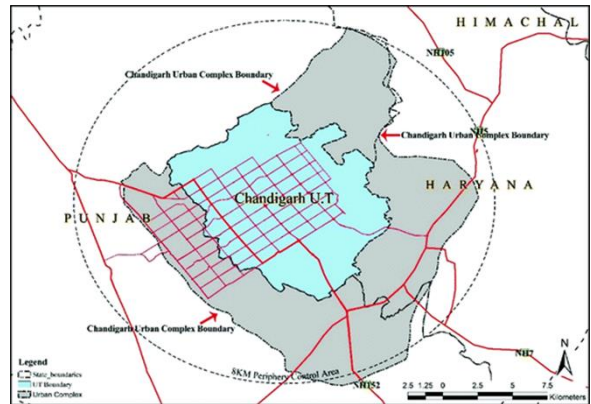


Figure 38: Regional connectivity of Chandigarh to neighboring's states. Source: Masterplan2031

6.2.2 TRAVEL PATTERN

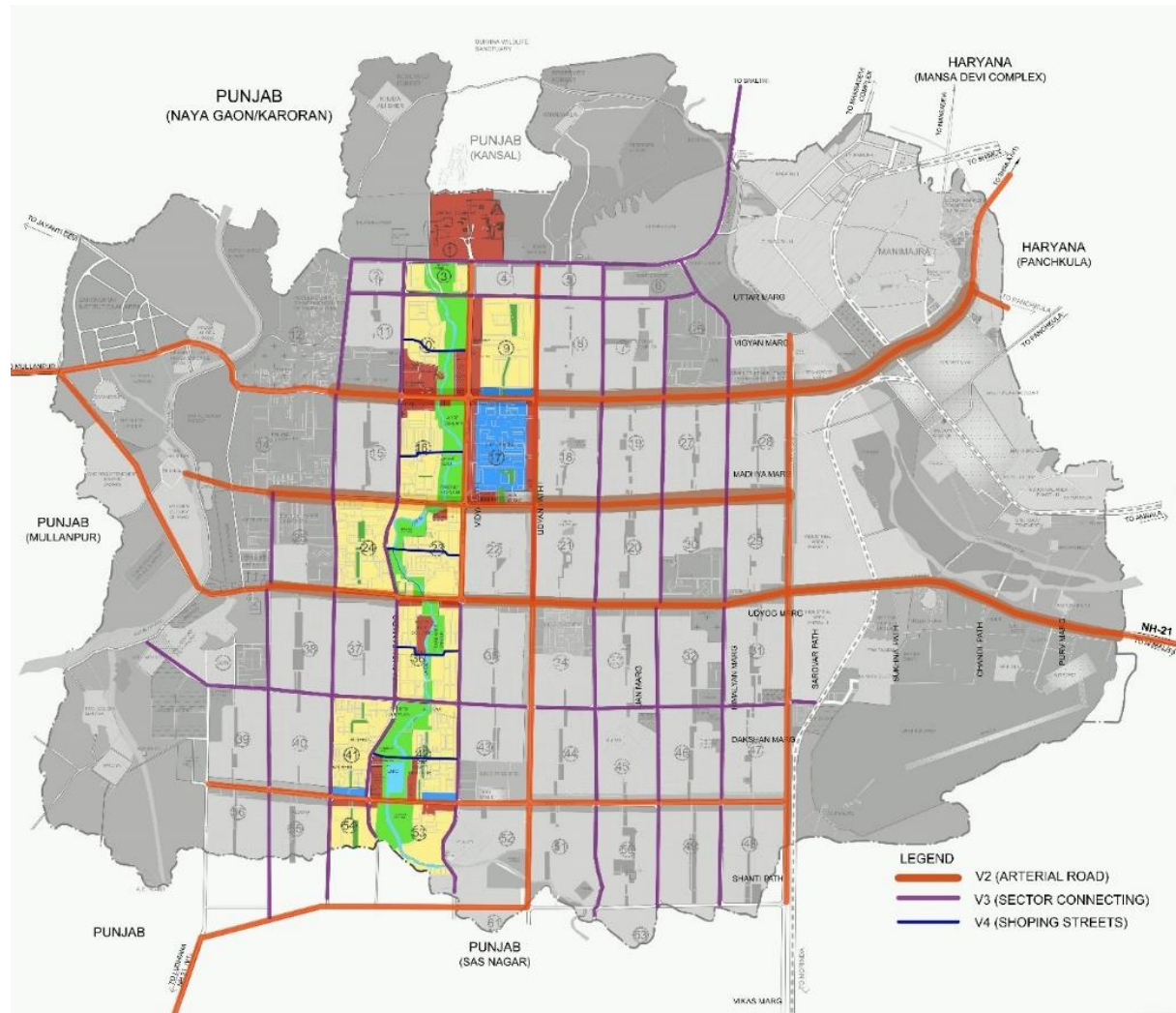


Figure 39: Major roads on site with traffic intensity

Source: Self (author)

The site is designated as a V7 hierarchical road system running in the pattern of grid iron. Travel intensity was mapped based on the travel pattern of people living and working in these sectors marked in primary surveys. Pattern shows that people living in nearby towns and cities are dependent on city for work, education and tourism while the city depends on other towns and cities for living.

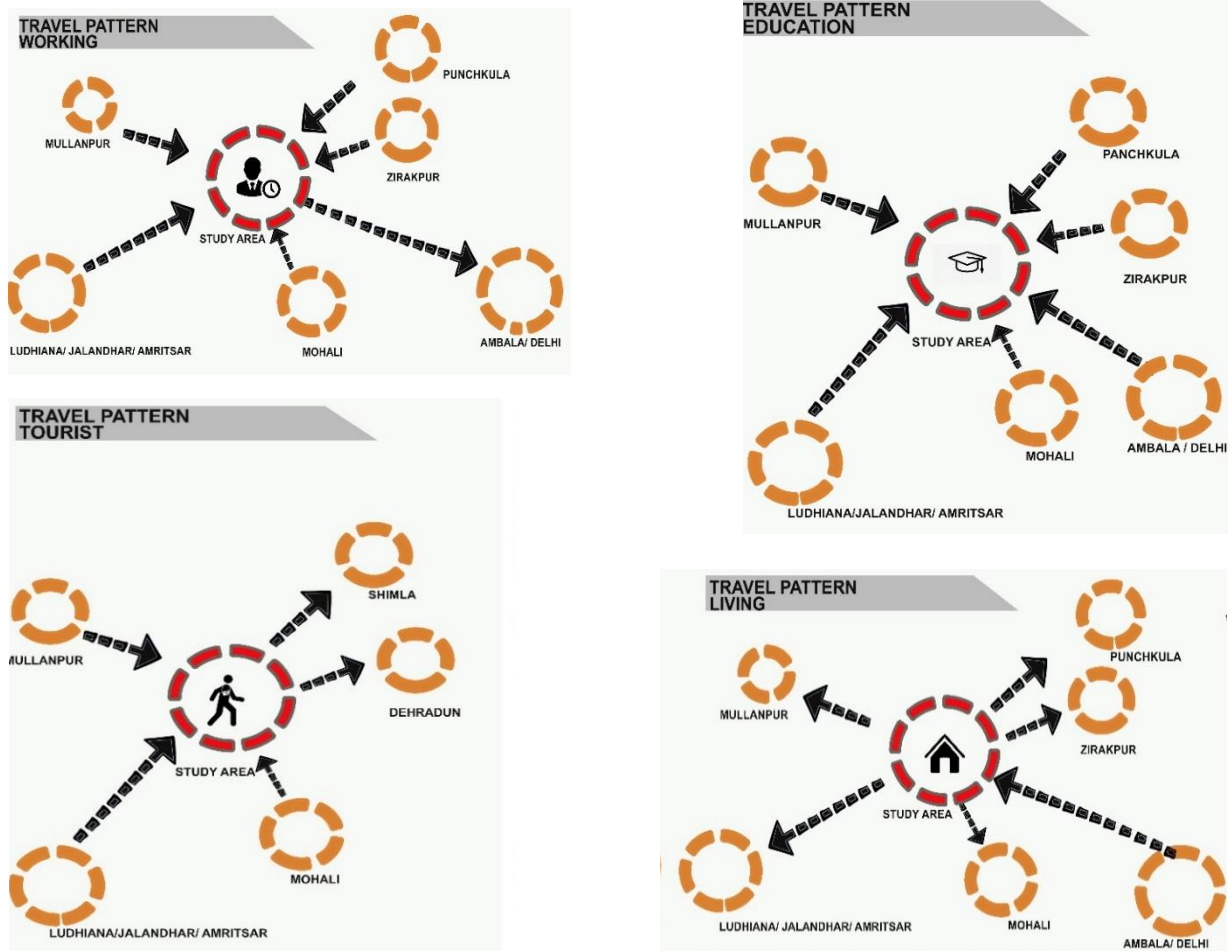


Figure 40: Travel pattern of the city Source: Self (author)

The mode of transport that these people prefer to use has also been quantified to understand the type of traffic that is taking place in this area and who the user groups are all.

The household travel surveys show that cars and two wheelers are highly owned. Currently, public transportation is just 16 percent of total motorized passenger travel, which is much lower than the National Urban Transport Policy recommended. The city has the country's highest motor vehicle per capita. Attracts high volumes of traffic resulting in high traffic congestion, particularly during working hours on V2's of the city

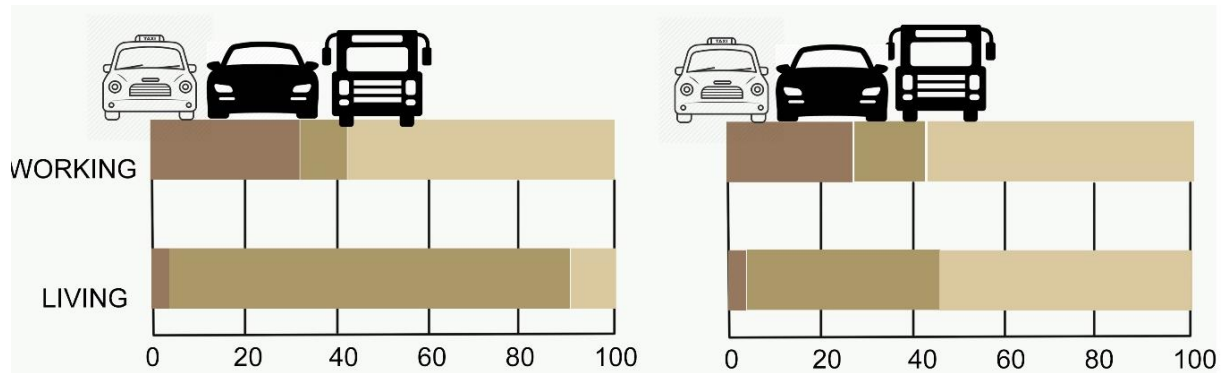
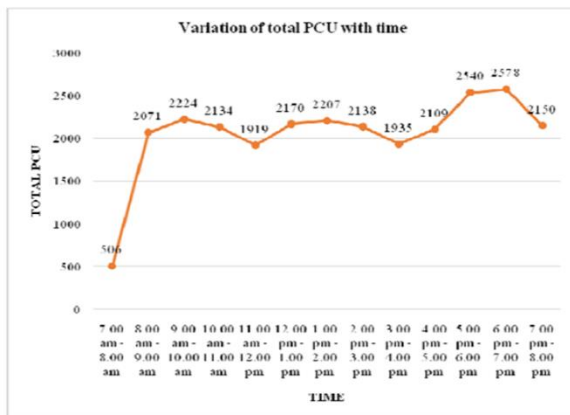
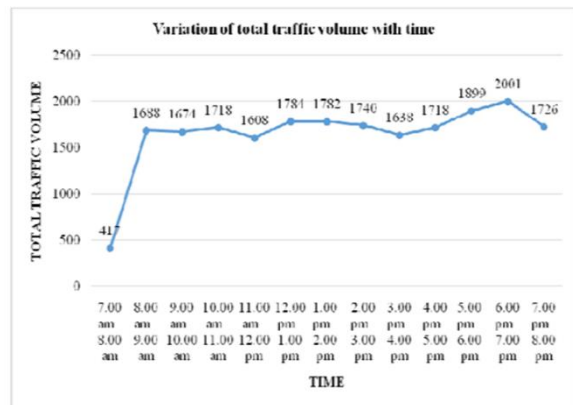
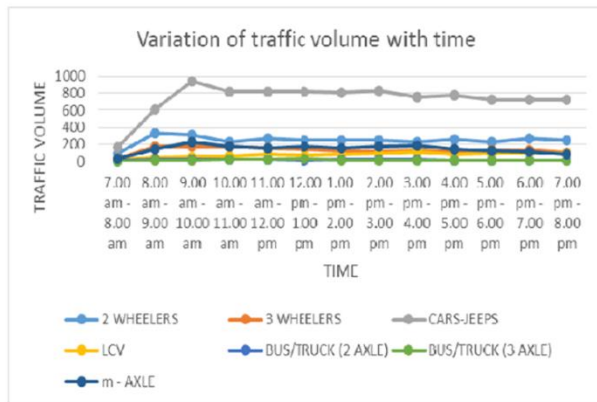


Figure 41: Travel pattern of the users on site

Source: Self (author)

6.2.3 TRAFFIC VOLUME ANALYSIS AT MADHYA MARG



Time	(V) PCU/HOUR
Morning peak hour (10.00am - 11.00am)	2134
Evening peak hour (6.00pm - 7.00pm)	2578

VEHICLES= 21393

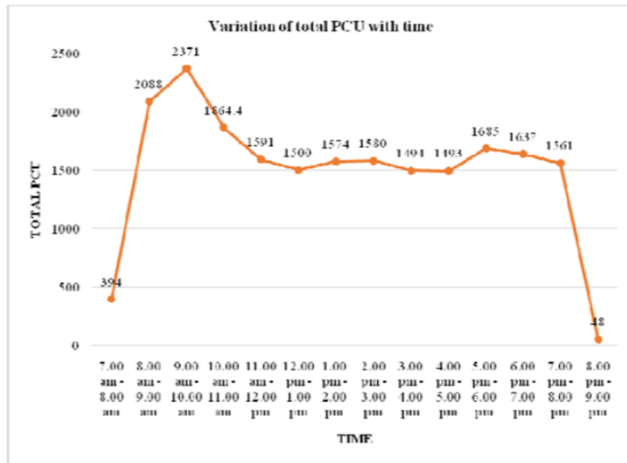
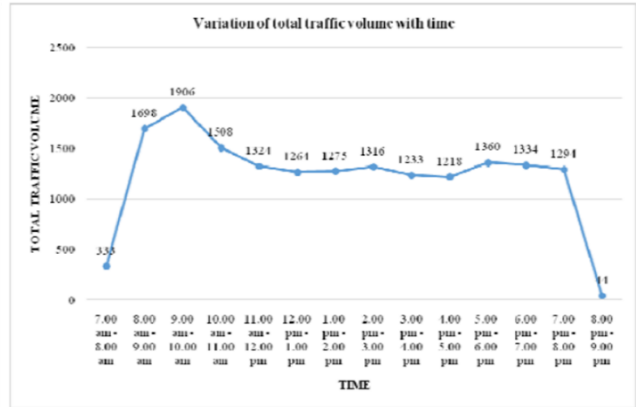
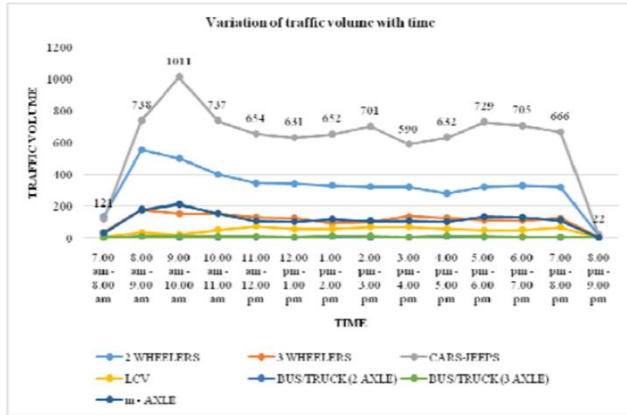
POSTED SPEED LIMIT= 60KM/h

EXCEEDING= 996 (4.66%)

MEAN EXCEEDING= 64.47KM/h

MAXIMUM= 94.3 KM/h MINIMUM= 10.0KM/h

AT DAKSHIN MARG



Time	(V) PCU/HOUR
Morning peak hour (9.00am - 10.00am)	2371
Evening peak hour (5.00pm - 6.00pm)	1685

VEHICLES= 17107
 POSTED SPEED LIMIT= 60KM/h
 EXCEEDING= 2330 (13.62%)
 MEAN EXCEEDING= 67.30KM/h
 MAXIMUM= 144KM/h MINIMUM= 10.2KM/h

6.2.4 INFERENCE

Average vehicles per household in the study area are 2.7, ranging from 5 cars per household in sectors of low density to 1 car per household in sectors of high density. The capacity of the vehicle designed for V2 and V3 is 1.2 and 0.8 for V4 and V5 roads, while on V6 roads it is as low as 0.3. V7 pedestrian and cycling trails throughout the city are still under construction. People from nearby villages and those from categories C and D usually prefer 2-wheelers or cycles as their mode of travel. Due to lower frequency, limited timing and especially long routes, private vehicles are preferred over public transport. Limited infrastructure for pedestrians and cyclists adds to the lesser preference. Also, the culture of shared cabs and cars, cheaper private cabs, are preferred by locals who have connectivity to their places to the last mile.

It is expected that the projected population for Chandigarh and other towns will grow from 21 lakh to 59 lakh in the year of 2041 according to their development plans. City dependence has increased frequently due to work centers, industries, sports, recreational and cultural facilities, resulting in traffic congestion on the city's major corridors, making

the interfaces less pedestrian friendly, making parks illegible. In order to redesign roads, major corridors need to be re-route or traffic calming measures need to be considered.

6.3 VISUAL ANALYSIS

Visual assessment experienced on the roads is important to study because it contributes to the aesthetics of the roads and also the legibility of spaces. The esthetics of the landscape originate from design setup and the viewer's emotions.

In order to analyze the significance of visual effects, visual evaluation of the connection to the park is done.

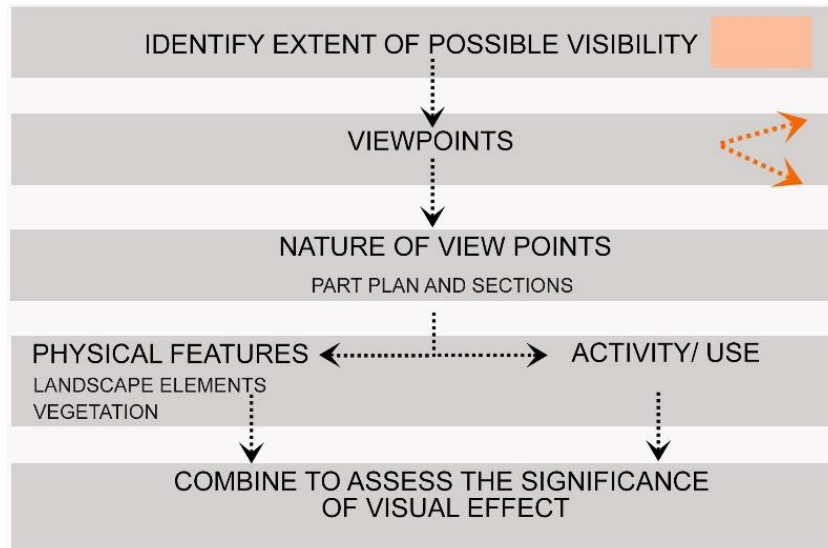


Figure 42: Methodology for visual analysis

Source: Self (author)

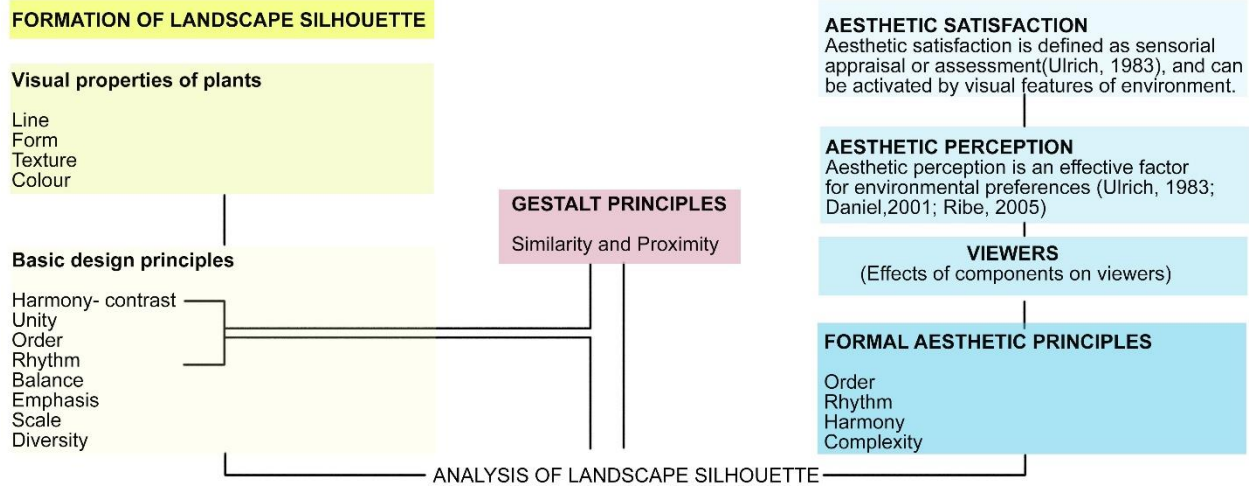
The methodology is given in figure 42

The linear roads offer views of the parks that are identified and marked as points of view. Analysis of physical characteristics and use of space is done to understand the nature of the viewpoints. This gave the connections issues and also determined the importance of planting study as a factor to consider when dealing with the space's visual character. Plants are considered to be the important element of road design which affects the viewer's perception. Visual properties of plants and basic design principles can help in planting design strategies which can make real difference in aesthetics of road. Refer sheet no- f for part plan analysis

6.3.1 AESTHETIC APPROACH TO PLANTING DESIGN ON THE CONNECTIONS

With formal aesthetics and symbolic aesthetics, landscape aesthetics of the road can be evaluated. Formal aesthetics is concerned with profound properties such as order, repetition, rhythm, harmony, and is anticipated that viewers find it pleasing during perceptual process. One can read formal aesthetics with the help of basic design principles that provide a structure of the scenic frame evaluated through Gestalt theory. This study will therefore attempt to analyze how plant silhouettes can be arranged by order, repetition, rhythm, and harmony in the landscape in order to provide aesthetic pleasure to viewers.

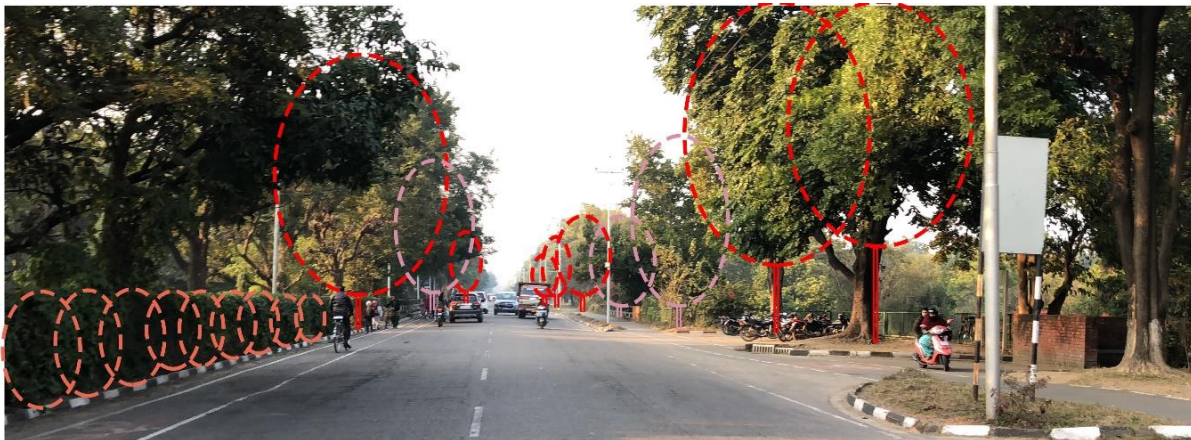
6.3.2 THE RELATIONSHIP BETWEEN FORMAL AESTHETIC, GESTALT THEORY, AND PLANTING DESIGN



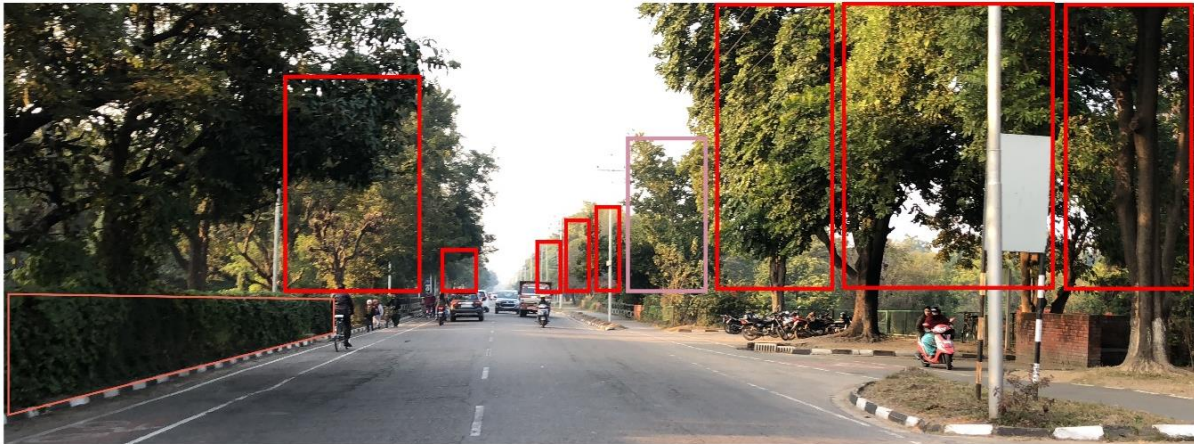
Using this relationship analysis of silhouette is done for the connection between each park to understand their visual aesthetics.

MATRIX USED IN THE STUDY

	Basic design principles			
Visual properties	Harmony	Contrast	Rhythm	Unity (Proximity-Similarity)
Form Texture				



FORM ANALYSIS: The geometrical form of each plant is drawn and the relationships (e.g. repetition of form, rhythm in change of form contrast between forms and sense of unity between forms) between plant forms are determined.



TEXTURE ANALYSIS: Texture features (texture values defined by the colour tone of plant's appearance) of each plant are first geometrically defined and the relationships (repetition of textures, contrast between textures and sense of unity created by textures between plant textures are then clearly determined.

6.3.3 CONCLUSION

Both the forma and textures analysis lacks in Contrast between plant forms which somehow affects the complexity negatively. However, while the existence of harmony and rhythm positively affects 'order' and 'unity' in this silhouette, the lack of contrast between plant forms spoiled the rhythm and thus negatively affected the order resulting in a monotonous silhouette.

6.4 VEGETATION

6.4.1 BIO- CLIMATIC ZONE OF CHANDIGARH

Chandigarh comes under the Cwg (S o u r c e: www.chandigarh.nic.in) category of Koeppen, which shows that it has cold dry winter, hot summer and subtropical monsoon. Weather is usually dry and evaporation exceeds the rainfall most of the time.

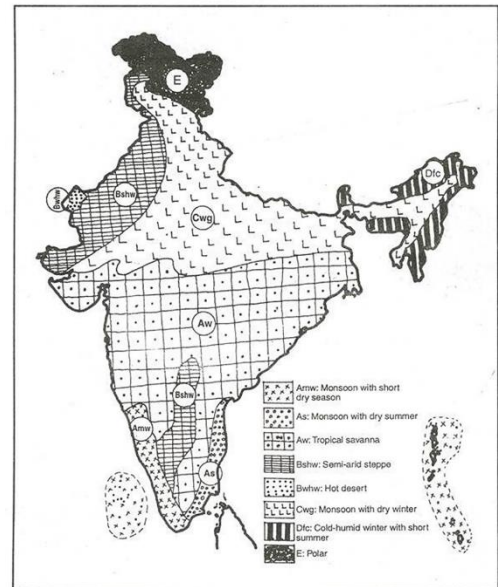


Figure 43: Bio climatic zones of India
Source: www.chandigarh.nic.in

6.4.2 FOREST COVER IN CHANDIGARH

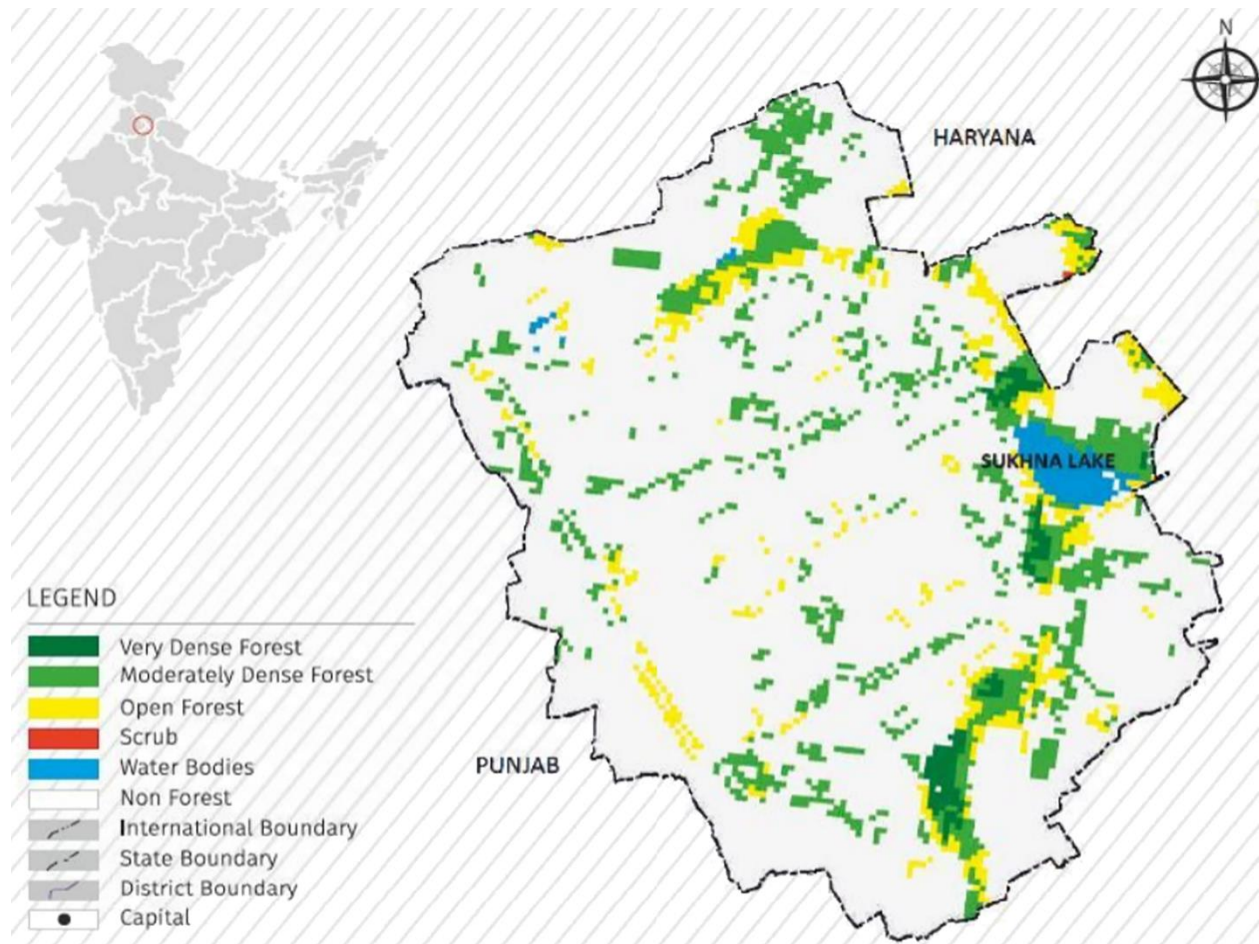


Figure 45: Forest cover in Chandigarh

Source: India state of Forest report 2011

Land Use	Area in '000 ha	Percentage
Total geographical area	11	
Reporting area for land utilization		100.00
Forests		
Not available for cultivation		
Permanent pastures and other grazing lands	0	
Land under misc. tree crops and groves		
Culturable wasteland		
Fallow lands other than current fallows		
Net area sown		

Figure 44: Land use statistics

Source: Ministry of Agriculture, GOI

UT's recorded forest area is 34sqkm, representing 29.82 percent of the geographic area. Forest reserved is 91.17% and forests unclassified 8.82%. Chandigarh has two wildlife sanctuaries covering 26.02 sqkm, 22.82 percent of the geographic area of UT. UT's forest cover based on October 2008 satellite data is 16.78sqkm, representing 14.72 percent of the geographic area. UT has 1.35sqkm as very dense forest, 9.55sqkm as moderately dense forest and 5.88sqkm as open forest in terms of forest density classes.

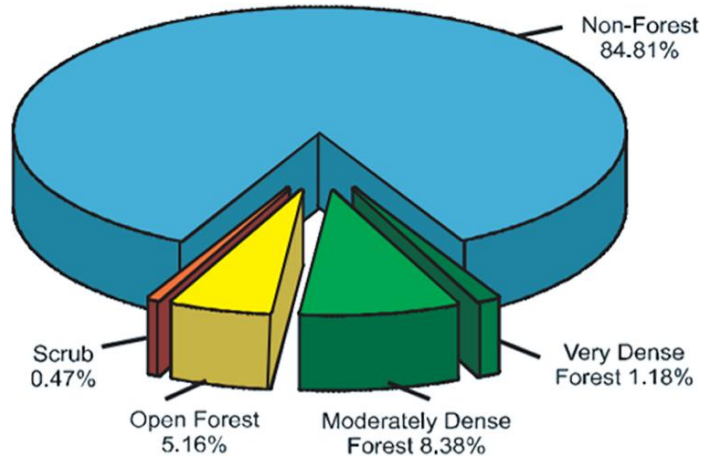


Figure 46: Forest cover of Chandigarh Source: Ministry of Agriculture, GOI

FOREST COVER IN DIFFERENT FOREST TYPES

The Forest Survey of India conducted forest type mapping using satellite data with reference to champion & seth classification. According to this evaluation, the UT has two types of forest belonging to the group of forest type Tropical Dry Deciduous Forest. Pie diagram 2 shows the distribution of forest cover in the forest type group.



Figure 47: Avenues



Figure 48: Open spaces

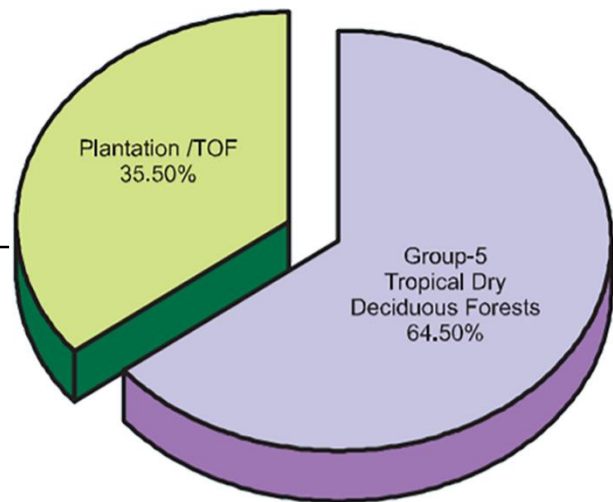


Figure 49: Forest type groups Source: Ministry of Agriculture, GOI

6.4.3 CONCLUSION

There is no natural forest or ecosystem climax in the city. There is also a complete lack of agriculture or the agroforestry component. Similarly, the components of social forestry, commercial forestry and farming are also missing. Nevertheless, Chandigarh's organized green character may be the richest with ornamental, horticultural avenue trees and shrubs

(compared to any other Indian city). A part of the city is expressed throughout the year with colorful flowering trees.

6.4.4 NATIVE TREES OF CHANDIGARH

The location of the city was a part of Ambala District.

Ambala as the name suggests is 'Amb- wala which means land of mangoes.

The land was dotted with groves of seedling mangoes.

Common native species of Chandigarh are:

1. Mango (*Mangifera indica*)
2. Mulberry (*Morus alba*)
3. Kikar (*Acacia arabica*)
4. Ber (*Zizyphus jujuba*)
5. Farash (*Tamarix orientalis*)
6. Shisham (*Dalbergia sissoo*)
7. Dhak (*Butea frondosa*)
8. Pipal (*Ficus religiosa*)

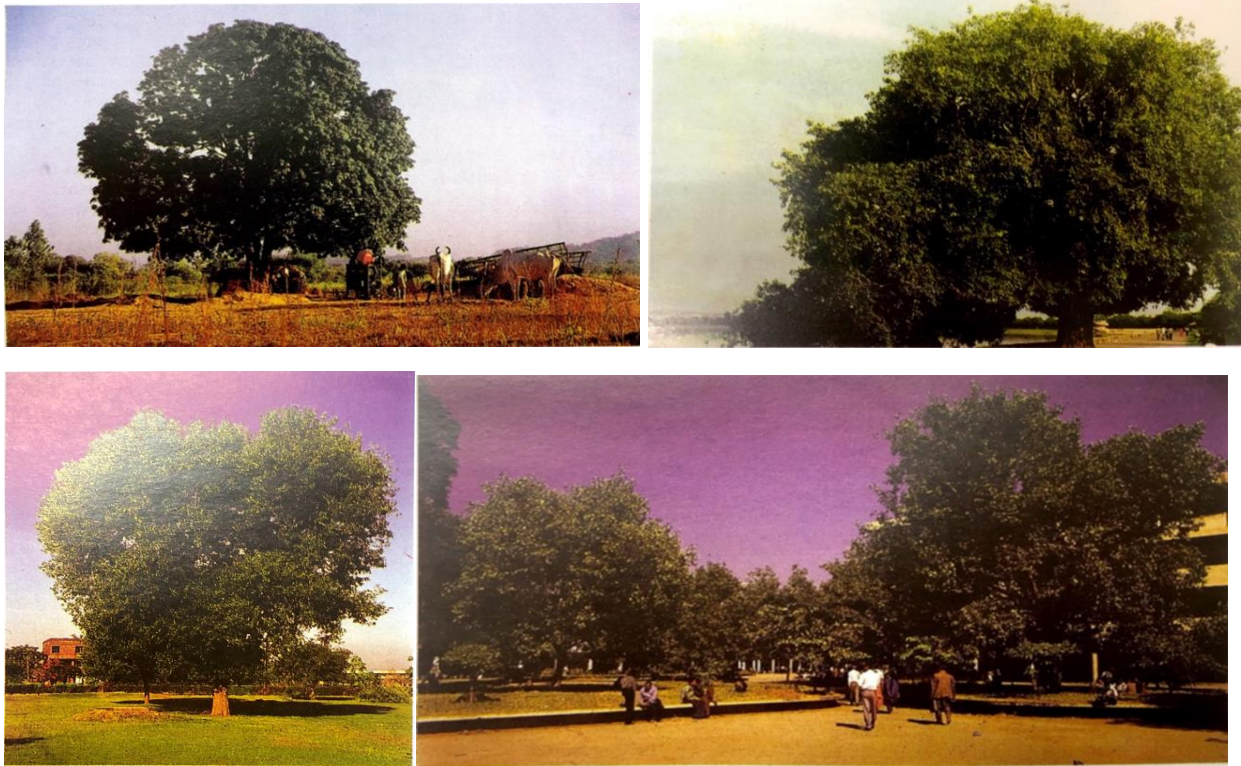


Figure 50: Native trees of Chandigarh on site

Source: Trees of Chandigarh

6.4.5 SOWING THE SEED....EARLY CONCEPT

The basics of tree plantation and other landscape features in the city were laid down by Le corbusier to harmonize the city's natural features. With regard to the shapes, foliage and color of flowers, he took into account the different species of trees. He also outlined the different ways to plant them, in terms of symmetrical order of single or multiple rows as per the location, type and road orientation with respect to sun. Special efforts have

been made to collect a wide variety of plants, including rare urban plants from remote locations in India and abroad.

Dr. Randhawa suggested planting exotic plants that would be obtained as gifts from foreign countries. He felt that such plantations would foster international relations in the city parks. Cheel (*Pinus longifolia*), Kadam (*Anthocephalus cadamba*), white siris (*Albizzia procera*) were particularly recommended. Bamboo(*Bambusa*) and Safeda (*Eucalyptus citriodora*). He felt that "when grown in a different habitat, a tree from a particular habitat serves as a matrial accent"

TREESCAPE

Most of the roads are recognized with the kind of trees planted along their sides. For example:

V2- Southern Drive (Dakshin Marg) is planted throughout with *Terminalia arjuna*

V2- Northern Drive (Uttar Marg) is planted with *Acrocarpus fraxinifolius*

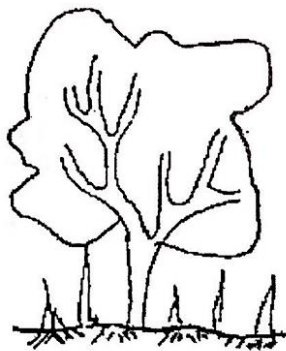
V3- It has *Tamarindus indiae*

V3- Vidya Path is planted with *Heterophragma* and *roxburghii*

V4- It has *Anthocephalus cadamba*+ *Cassia fistula*

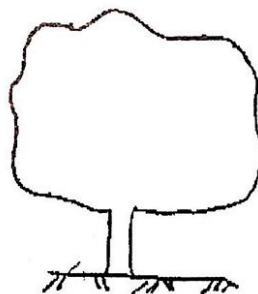
V5- It has *Terminalia bellerica* + *Cussiafistula*+ *Sterculia alata*

The main selection considerations were: leaf and crown shape and size, tree height, tree character of being deciduous or evergreen, aesthetics in terms of flowering color and timing.



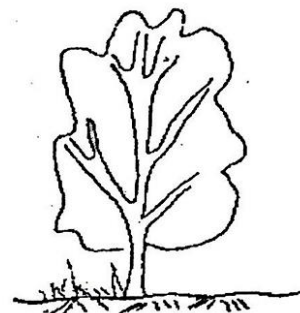
Shape 1

Irregularly rounded
Ex. *Delamia Regie.*
Dillenia Indica (Chilta).



Shape 2

Regularly rounded
Ex. *Ficus Infectoria.*
Ficus Infectoria (Pilkhan).

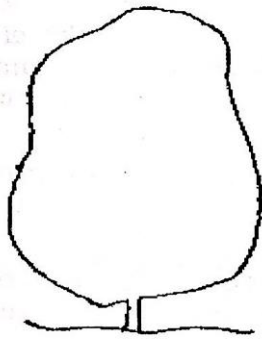


Shape 3

Irregularly Columnar.
Ex. *Terminalia Pirjurne.*
Terminalia Arjuna.

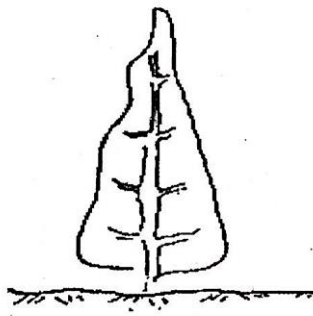
Figure 51: Different shapes of trees considered for road planting

Source: *Trees of Chandigarh*



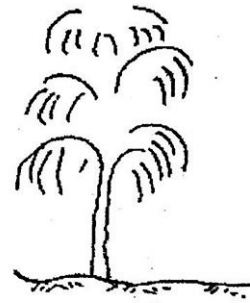
Shape 4

Regularly Columnar.
Ex. *Alstonia scholaris*.
(Tropical Plant).



Shape 5

Irregularly Columnar.
Ex. *Araucaria Coccoloba*.
Araucaria Cookii.



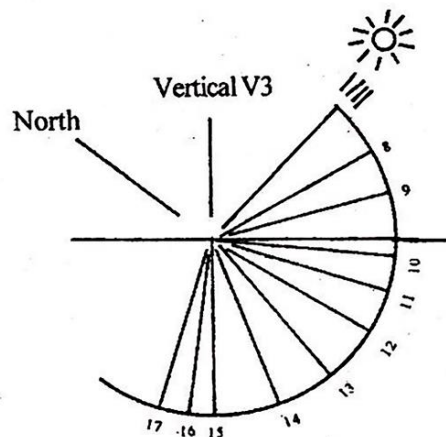
Shape 6

Weeping (pendulina).
Ex. *Callistemon Canadense*.
Callistemon lanceolatus
(Bottle-Brush).

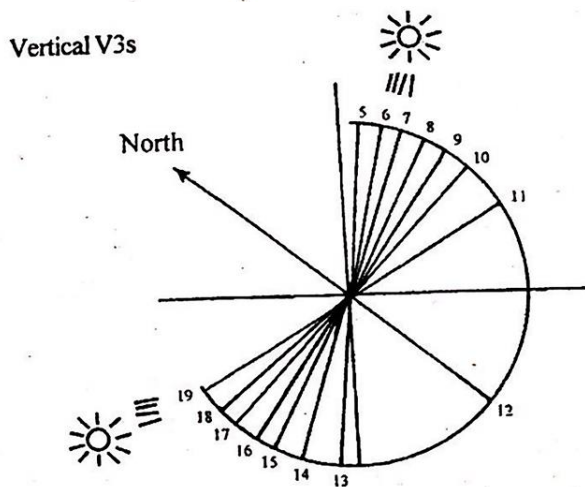
Figure 52: Different shapes of trees considered for road planting

Source: *Trees of Chandigarh*

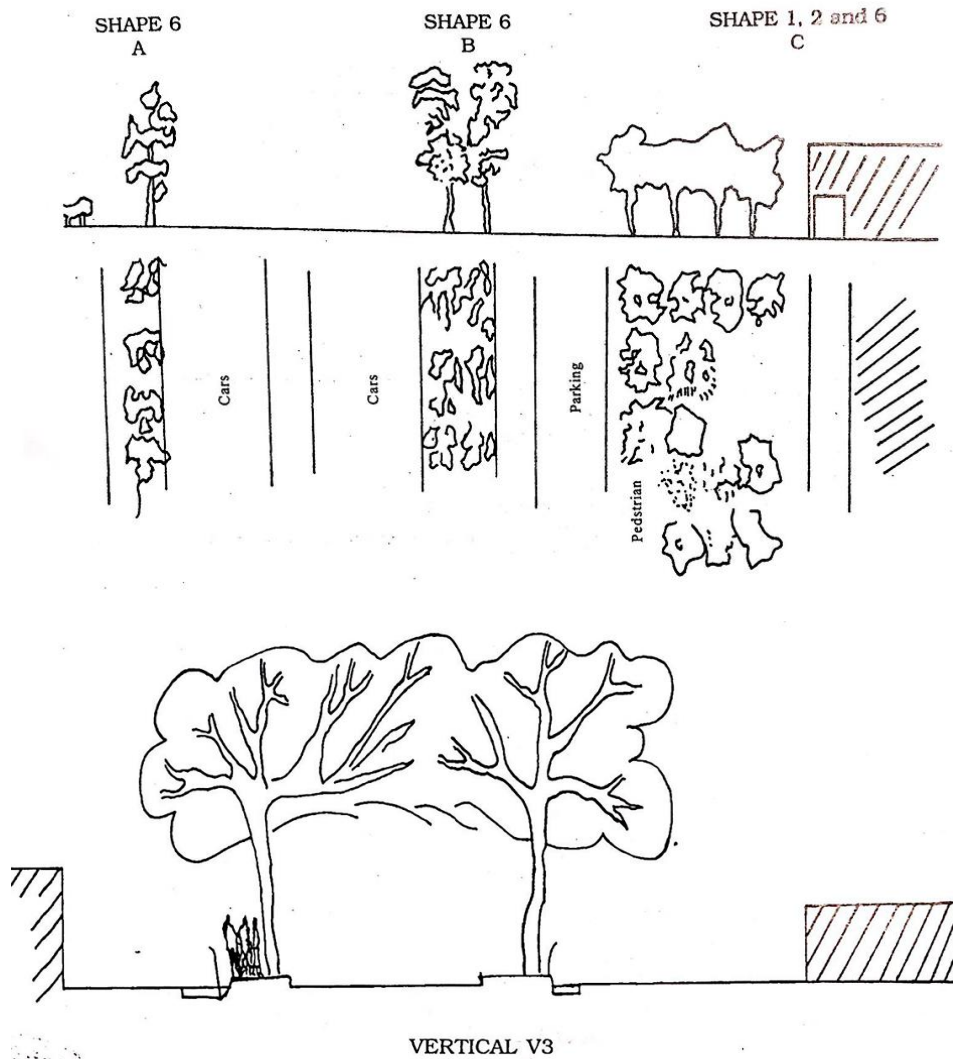
PLANTATION STRATEGY ALONG THE ROAD



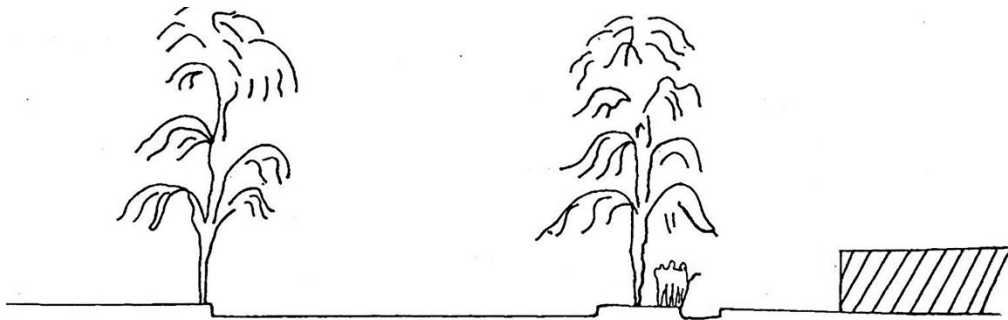
Horizontal V3
Winter solstice
The sun is high for the position at 9.30.
In position B or A, the setting sun at 4.30 p.m.
is very unfavourable.



Summer Solstice
The Sun is already high in
positions A and B at 11-30
and 12-45.



Evergreen foliage to avoid unkeep from sweeping
Form shape2. Development of horizontal branches in order to enable trimming to form a tunnel
Arrangements- row each side regular spacing



HORIZONTAL V3

Evergreen trees

Form shape 6

Arrangement- regular spacing one row each side



V4

- (a) An effective mixture of deciduous foliage to allow shade in summer and sun shine in winter
- (b) Some permanent evergreen foliage to provide scenery for winter

Shapes- Variety of shapes in order to obtain a landscape composed with variety for the whole length of its course from one end of the town to the other and characterizing effectively and diverse functions laid out along its sides as it traverse a sector by V4.

Arrangements- simple rows double or multiple or in any other way.

6.4.6 MAPPING THE EXISTING TREES ON SITE

The existing trees are mapped on the site through site observation and with the help of book *Trees of Chandigarh* written by Chattar Singh. The pallet of existing trees is studied in terms of native trees, exotic species, invasive species and the species which are growing well on the site. Refer appendix for the list of trees mapped on site.

6.4.7 CONCLUSION

Out of all the trees in palette 14 species are exotic and some of them are planted along the road side which results in choking of the road due to the stunted growth of the trees. Some of the trees out of the exotic species are growing well and can be considered as existing vegetation to be preserved on site.

6.5 THE CHOE

N-Choe, flowing through the city center plays an important ecological role. It originates in the Siwalik Hills and during the monsoons provides seasonal drainage from their catchments for the surface water runoff. Sandy surface recharge underground, the aquifers that contributes to the supply of 20% of the city water. Some of the tubewells are below the beds of the choe. Refer figure 56.

6.6 GEOMORPHOLOGY OF CHANDIGARH

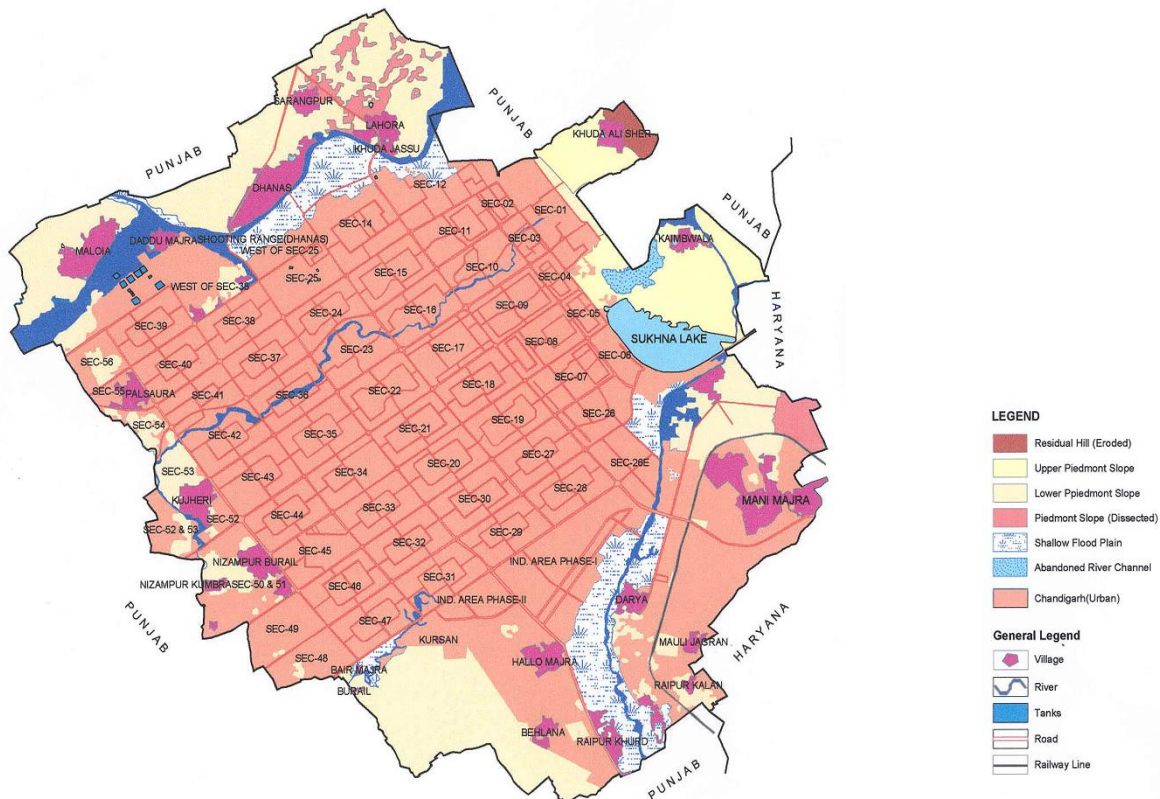


Figure 53: Geomorphology of Chandigarh

Source: IRS-1D LISS-III+MERGED DATA

Four major types are:

The foothills of shiwalik ranges has allvial fans forming hill torrents. Below this is running parallel the formation of Kandi. The deposits consist of pebbles, cobble and boulder, connected with silt, sand and clay. The Kandi formations combine with Sirowal. The Sirowal merges with the main Alluvial plain. The study area is mainly comprises of alluvial plain.

RAINFALL

Normal Annual Rainfall: 1061mm

Normal Monsoon Rainfall: 849mm

Normal Rainy days: 49

The rate of infiltration is the rate of percolation of water into the soil. The sandy loam soil infiltration rate ranges from 20-30 mm / hour. Sandy loam soils can drain excess rapidly. By facilitating good oxygen flow, these soils provide good aeration.

6.6.2 DRAINAGE OF THE CITY

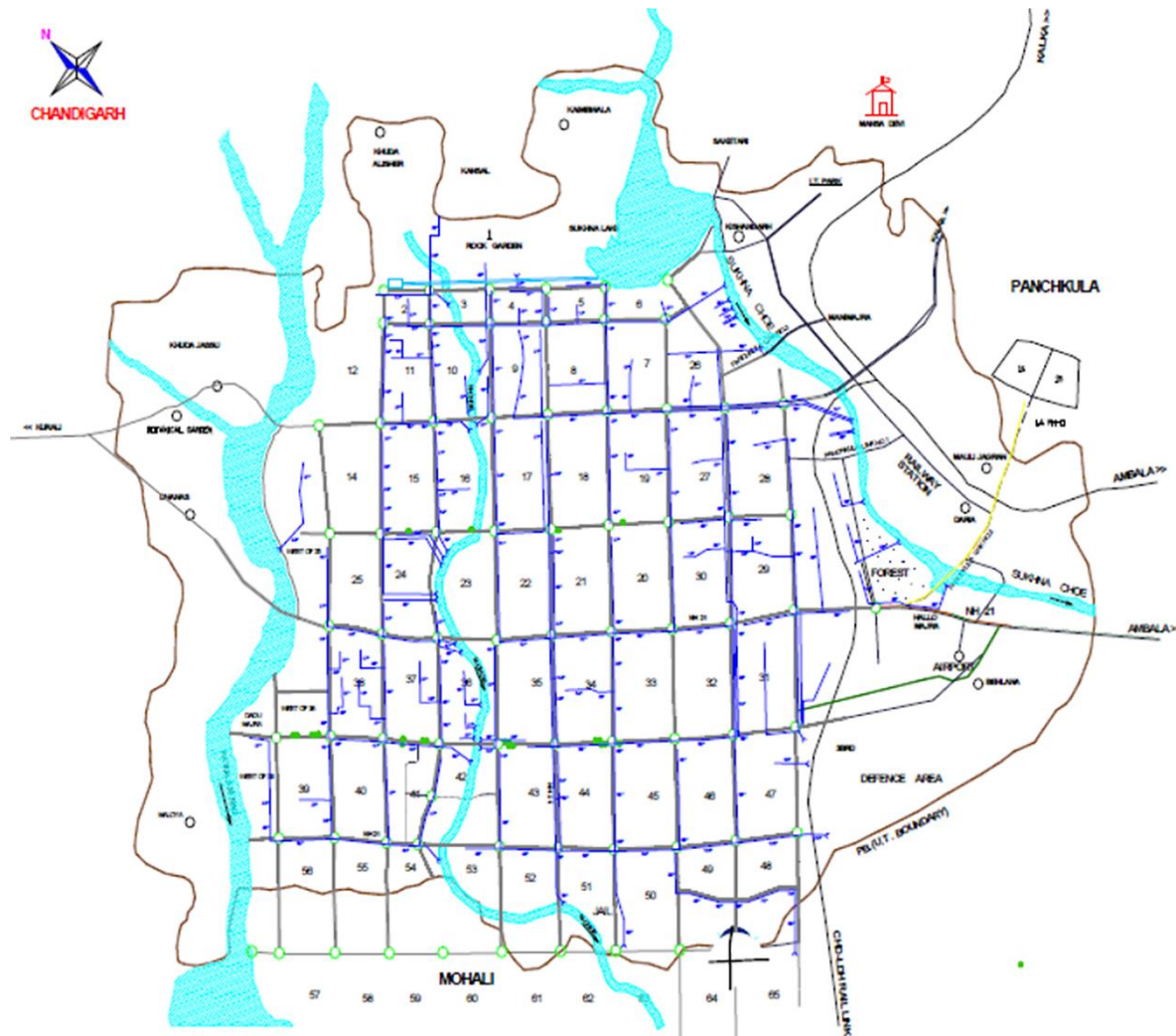


Figure 55: Storm drainage map of Chandigarh showing outlets on site.

Source: Central ground water board

Chandigarh's natural slope facilitates easy storm water disposal through Sukhna Choe, N-choe, and Patiala ki Rao. The wastewater volume is also mounting at the same rate that currently stands at 265 MLD and sewerage treatment plant has the capacity of 157MLD rest of the untreated sewage is discharged into N-Choe. Natural and man made drains of the city eventually drains into N-Choe.

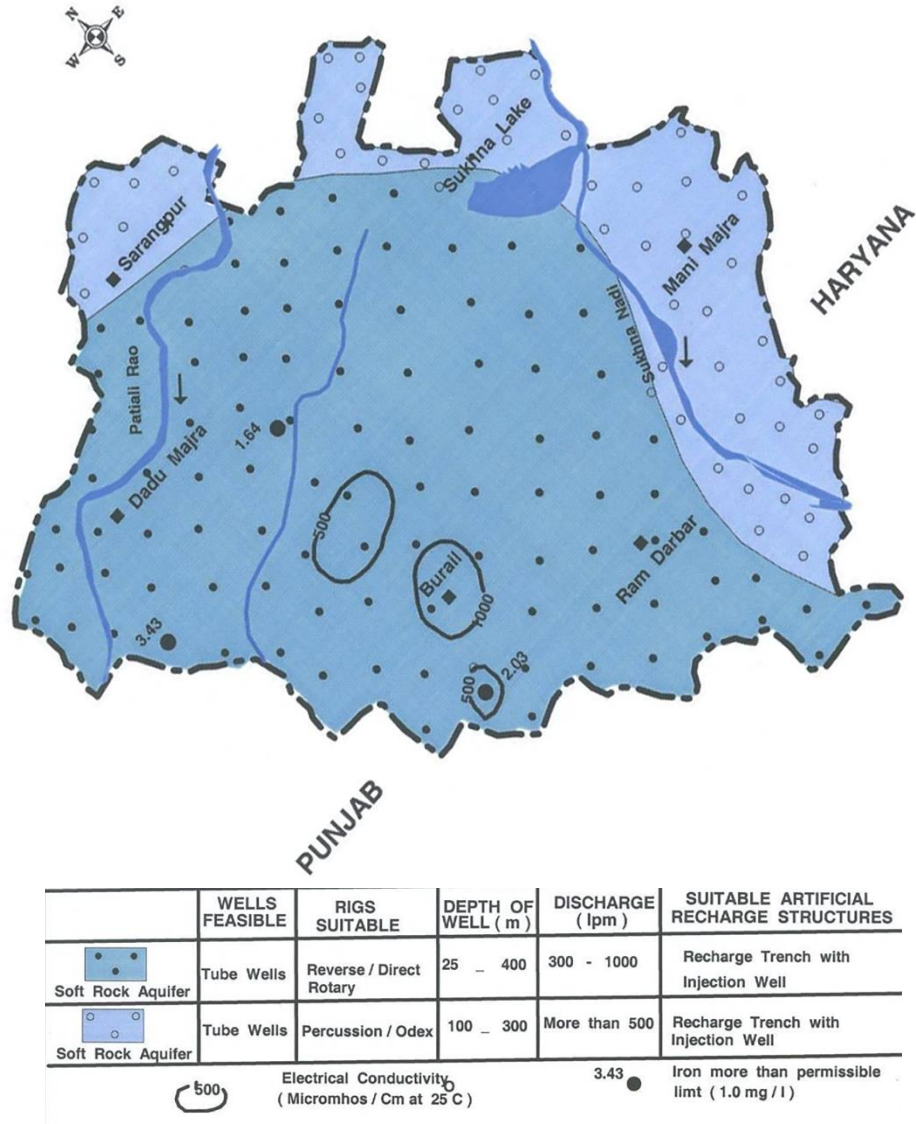


Figure 56: Location of tubewells below N- Choe

Source: Central ground water board

This storm water drain is suffering from:

- (a) man's high level of intrusion.
- (b) High level of pollution of water / environment.
- (c) Untreated sludge discharge in the choe bed.

6.6.3 WATER QUALITY OF N-CHOE

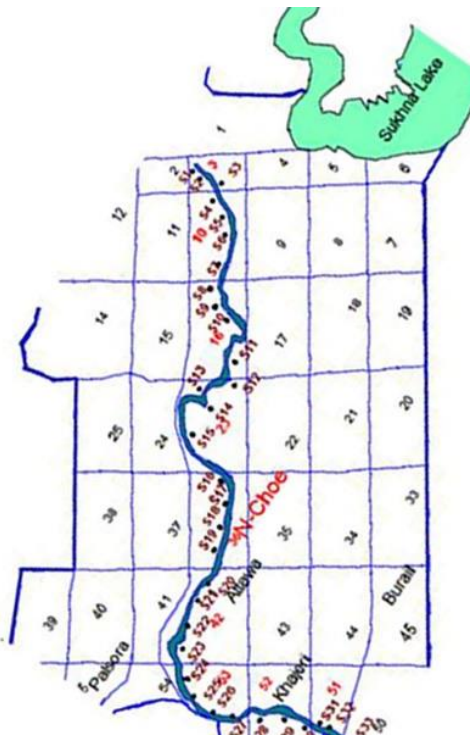


Figure 57: Location of water samples collected

Source: International journal engineering science and research (490)

S. No.	Parameters	No. of samples	Usual range in irrigation water Food and Agriculture Organization (F.A.O.), 1990	Pre-Monsoon			Post-Monsoon		
				Range	Mean	Standard Deviation	Range	Mean	Standard Deviation
1.	pH	33	6.0-8.5	5.6-7.2	6.64	0.36	6.4-8.4	7.68	0.44
2.	EC(ds/m)	33	0-3	0.23-0.69	0.46	0.11	0.27-0.75	0.57	0.16
3.	TDS(mg/l)	33	0-2000	167-446	303.3	62.44	181-487	366	105.10
4.	Ca ²⁺ (meq/l)	33	0-20	0.54 – 3.32	1.80	0.65	0.54-3.78	2.70	0.84
5.	Mg ²⁺ (meq/l)	33	0-5	0.28 -4.26	2.12	0.90	0.22-3.41	1.23	0.77
6.	Na ⁺ (meq/l)	33	0-40	0.32-1.82	1.06	0.46	0.21-2.46	1.34	0.76
7.	K ⁺ (meq/l)	33	-	0.005-0.17	0.05	0.03	0.02-0.18	0.09	0.05
8.	Cl ⁻ (meq/l)	33	0-30	0.2 – 6.0	2.04	1.12	0.16-0.84	0.49	0.16
9.	HCO ₃ ⁻ (meq/l)	33	0-1	0.49-2.13	1.33	0.44	0.27-0.90	0.65	0.17
10.	SO ₄ ²⁻ (meq/l)	33	0-20	0.46-1.29	0.78	0.21	0.21-0.26	0.24	0.01
11.	NO ₃ ⁻ (mg/l)	33	0-10	BDL-4.0	0.88	1.14	BDL-3.7	0.86	1.09
12.	DO(mg/l)	33	-	3.6-124	47.5	3.02	2-111.2	36.99	3.53
13.	COD(mg/l)	33	-	23-333	127.7	111.60	21.2-318	98.17	90.3
14.	BOD(mg/l)	33	-	BDL-10.2	5.1	46.85	BDL-11.4	5.7	38.65

Figure 58: Temporal variation under different parameters

Source: International journal engineering science and research (490)

Runoff from the study area's densely developed lands typically contains high amounts of lawn fertilizer nutrients, animal waste, and other non-point sources. Due to dilution during monsoon season the BOD and COD values are high in pre monsoon than post monsoon. The volume of water in choe is drastically reduced and there is a substantial addition of organic materials from residential areas along the choe. High intensities of BOD and depleted DO affect the aquatic flora and fauna.

6.6.5 *INFERENCES*

Alkalinity, BOD, COD and DO were the most affected parameters, so these parameters need to be considered. High level of BOD indicate the bacteriological capacity that is not suitable for marine life, so all sewage flow discharge has to be diverted or the water should be treated at drainage outlets. The harvesting of rainwater can go a long way in contributing to water supply sustainability. In the park where there are multiple drainage outlets, the DEWAT system can be supplied with a reservoir. For improvement of water quality-Biotope water treatment system with bioswales can be developed to channel water into the rivulet.

7 **ISSUE IDENTIFICATION**

Critically analyzing all the layers of the context there are certain issues that come into picture, that need to be looked over. The issues found comparing the ideal situation according to the theoretical study and realistic condition on site, are:

7.1.1 *EDGES*

The edge is an intermediate space between private and public realms that can attract us into or out of our parks and natural areas. The practices of bounded realm, restricted access and privatization of spaces has visually and physically created disconnect to the ideally provided continuous city level green open space. These edges are the boundary walls, fencing and hedges.

7.1.2 *NON HUMANIZED SCALE OF BUILDINGS*

Massive scale of the buildings and roads shun the pedestrians and cyclists psychologically. Monotonous architecture language of the buildings with non-relatable enclosure quality makes the skyline building dominant. Human scale has a variety of meanings, but generally it refers to the size of an immediate environment that generate positive feelings by being close to the human body. These feelings may include comfort, security, reassurance, orientation, friendliness and a feeling of being able to 'relate to one's surroundings'.

7.1.3 *PARKING*

The city was designed with the intend of futuristic approach, which included car as the new found interest. But, this anticipation has been pessimist to the city evolution. Cars are taking over public green spaces creating visual and physical barrier to the parkland.

7.1.4 *FORMAL LANDSCAPE*

Due to varied ownership of the parks, the development authorities has designed the entrances and boundaries with formal principles of design by providing hedges and flower beds as expression of stewardship. This set up of landscape compromises with the cultural spaces in terms of informal vending, gathering spaces and sense of belonging.

7.1.5 *TRAFFIC MOVEMENT*

Due to heavy traffic volume on the disconnects the connections are not safe for the pedestrians to move from one park to the other which makes the disconnects vehicle dominant and less of pedestrians.



- LEGEND**
-  PHYSICAL DISCONNECT TO THE LEISURE VALLEY PARKS
 -  VISUAL DISCONNECTS BETWEEN TWO PARKS
 - EDGES
 -  BOUNDARY WALLS
 -  FENCING
 -  THICKETS
 -  UNDESIGNED POCKETS
 -  INTROVERT AND FORMAL LANDSCAPE PLANING
 -  PARKING
 -  INFORMAL VENDORS
 -  STORM WATER DRAINAGE OUTLETS

Figure 60: Issue identified on site
Source: Self (author)

8 COMPREHENSIVE LANDSCAPE DEVELOPMENT PLAN



- NATURE TRAIL
- WATER RESERVOIR
- PLAZAS CONNECTING TWO PARKS VISUALLY AND PHYSICALLY
- - - PEDESTRIAN FRIENDLY STREETS

Figure 61: Program development plan
Source: Self (author)

8.1 CITY LEVEL VISION FOR THE PARKLAND

Chandigarh lacks in the components of social forest and agro forestry, the site can be seen as City urban forest. As per the guidelines on urban forestry ⁷the site comes under city parks and urban forest types as total area of the site is more than 0.5 hectare. It has variety of land cover and is partially furnished with facilities of leisure and recreation. The overall strategy for the site will also look into pedestrian movement, edge permeability, visual quality of the connections, built form and activities around the edges.

8.1.1 DIMENSIONS OF URBAN FOREST DESIGN

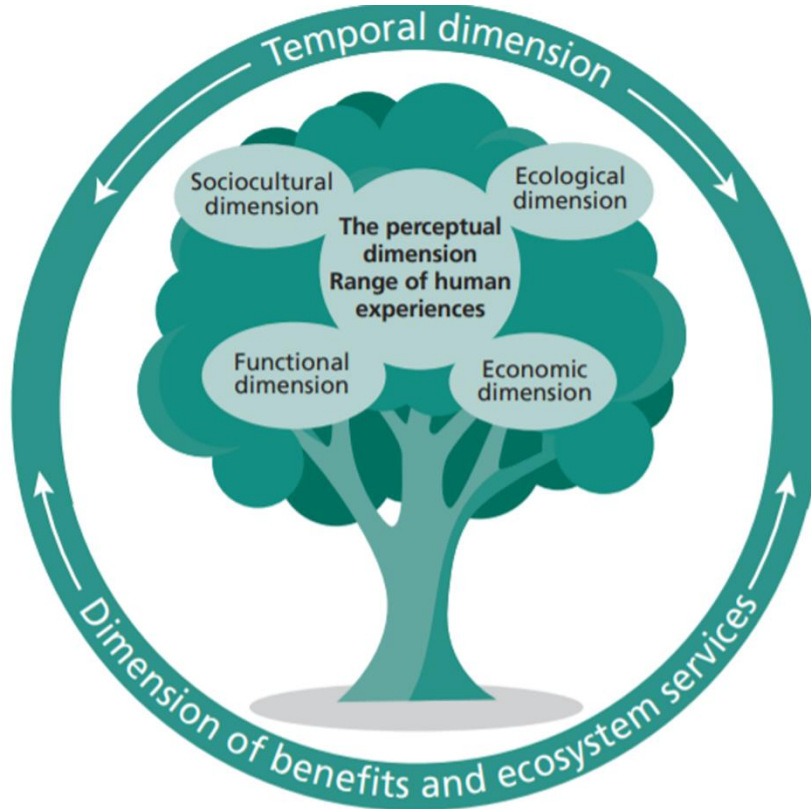


Figure 62: Dimensions of Urban forestry Source: Guidelines on urban forestry, Food and agricultural organization of United Nations

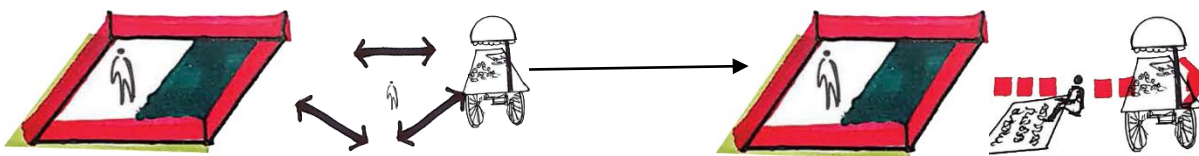
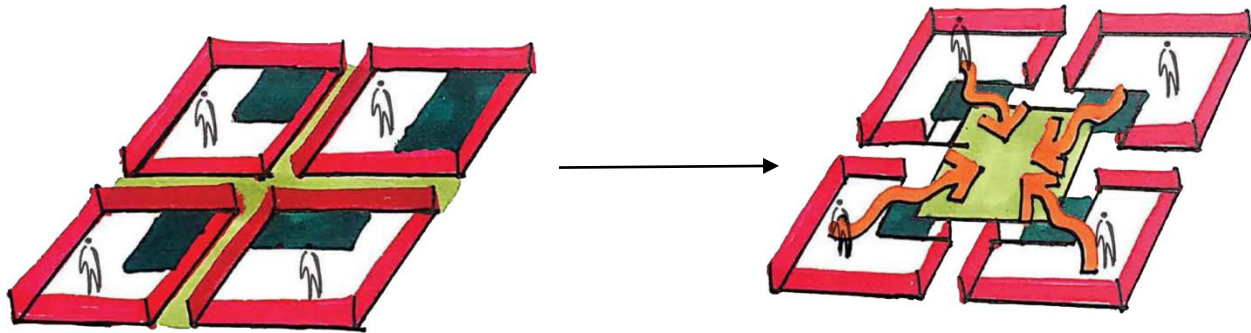
8.2 SITE LEVEL STRATEGIES

The overall strategy for the site will also look into pedestrian movement, edge permeability, visual quality of the connections, built form and activities around the edges.

8.2.1 CONTINUITY IN MOVEMENT

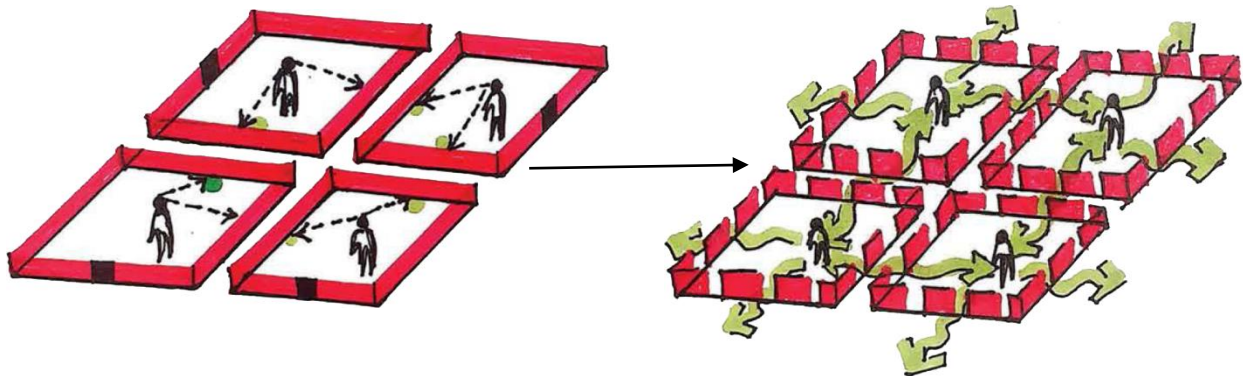
Linking disconnects between the parks through connected plazas which will help people in perceiving the parks visually. Seamless public realm will encourage people move inside the park and walk towards the next. This will also integrate the formal and informal spaces of the park.

⁷ Art, science and technology of managing trees and forest resources in and around the urban community.



8.2.2 OPENESS

Encourage rightful use of the boundaries by making edges responsive to the immediate context related activities.



8.2.3 SOCIALIBILITY

Stimulate the N- Choe by enhancing the natural ecology along water body and introducing water related activities like viewing decks and nature trails throughout water body where people can come for bird watching and educational purpose and also children play areas where children can have direct contact with water.

9 DESIGN INTERVENTION LEISURE VALLEY FITNESS TRAIL SECTOR 10

9.1 EXPERIENTIAL MAPPING OF EXISTING LANDSCAPE OF LEISURE VALLEY

This assessment tries to map the experiential quality of the existing park. Following is the vocabulary of experiential landscape.

CENTER

Subjectively significant location engendering a sense of here-ness and proximity

Being mainly convex in shape and contained
Being made up of smaller centres
Having views beyond
Having transitional features
Being on a route that encourages passers-by

Types of Center

Social Imageability

Social Interaction

Restorative Benefit

DIRECTION

Subjectively significant continuity engendering a sense of three-ness and future possibility

Stimulated by the perception of:
Linear containment
(Awareness of the possibility of continuity and how to realize it)
Route
(The actual act of going from here to there)
Anticipation
(The incentive or motivation for going)

Constituent of Direction

Kinetic

- Enclosure.
- Rhythm.
- Non engaging facades.
- Ease of movement.
- Clear primary route.

Sensory

- Exploration and mystery.
- View, smell and sound.
- Detective facades.
- Linearity of floorscape.

TRANSITION

Subjectively significant point or area of change engendering a sense of transformation in mood, atmosphere or function

Spatially concentrated or spatially extended
Change in material, colour, form and direction
Framing and gateway features
Choice of onward movement

Types of transition

Threshold (sudden change)

Corridor (gradual change)

Segment (soft linking spaces)

Ephemeral (Transient effects)

AREA

Subjectively significant realm engendering a sense of coherence and containment

Thematic continuity
Rhythm, pattern, co-ordination in texture- space and form-
detail and symbol- building type- use and activity- degree
of maintenance- topography
Degree of privacy
Private, semi private, semi public, public

After understanding the vocaboloury for experiential mapping, site is observed on the asis of above mentioned heads and a map is prepared to understand the existing spaces of the park and to clarify how landscape design affects the users behaviour.

Afetr analysing the map spaces are identified which need to be intervened. Edges which are in front of the admnistration buildings at the Jan Marg side lacks in activities hence no transition zone is there. Entrances from both the sides lacks in direction and the choe being the most interesting part of the site is being neglected hence lacks interaction. The only place which is mostly used by people is the centre of the park due to its topography.

For clear understanding of experiential mapping refer sheet no- 11 attached at the back.



Figure 63: Experiential map of Leisure valley fitness trail

Source: Self (author)

9.2 MASTER PLAN FOR LEISURE VALLEY FITNESS TRAIN SECTOR 10

The design has been detailed for the leisure valley fitness trail park 10B along with the connections to the bougainvillea park in sector 3 and leisure Valley Park in sector 10C and edges which are in context to the office building on one side and residence on other.

The reason for choosing this site is the diversity in context of the park which will allow me to prepare a module for major type of edges.

For clear understanding of master plan refer sheet no- 12 attached at the back.

9.2.1 STRATEGIES FOR DISCONNECTS BETWEEN PARKS

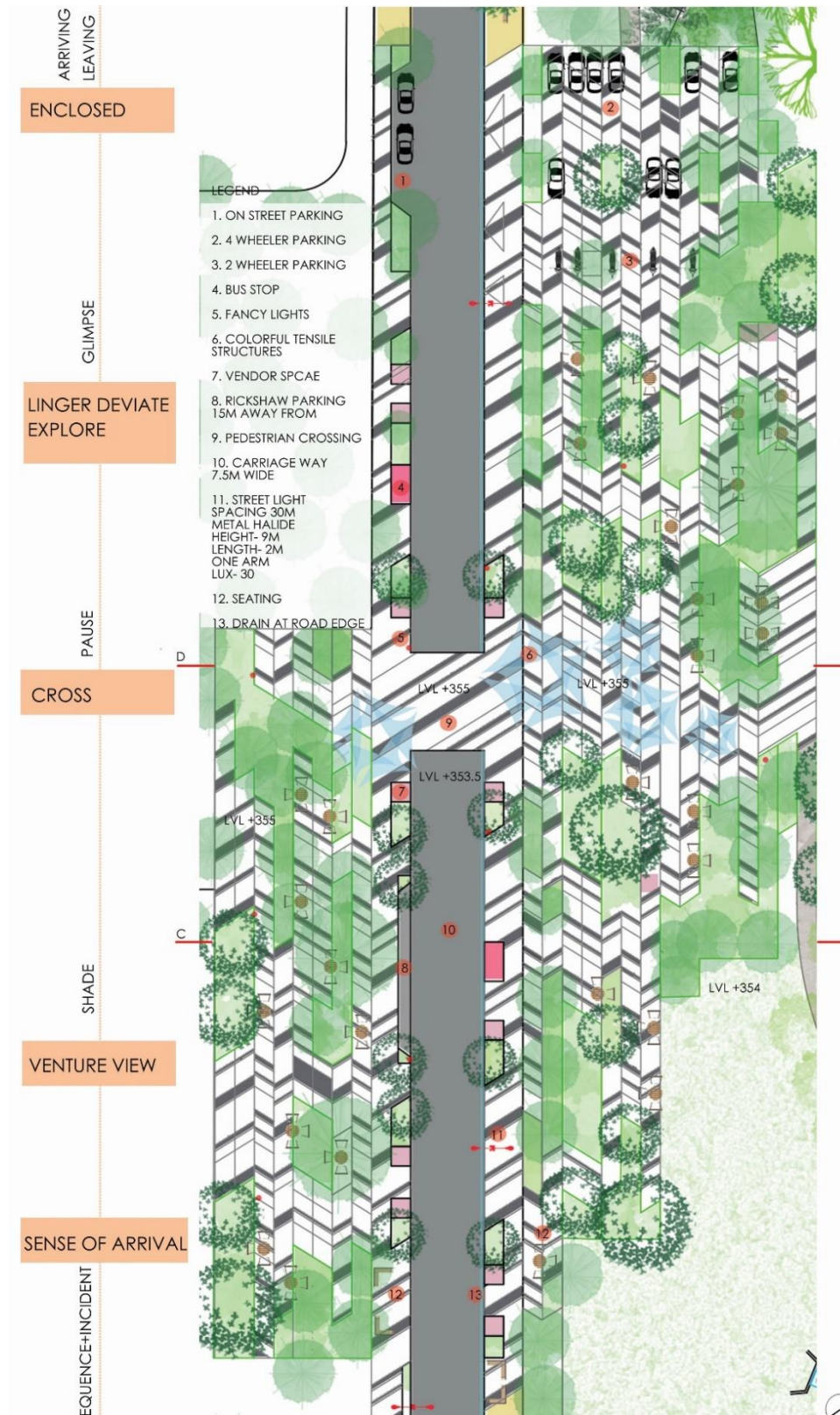


Figure 64: Detailed design proposal for Connection between bougainvillea park and leisure valley fitness trail
Source: Self (author)

RE- CONFIGURING THE LANDSCAPE OF LEISURE VALLEY PARKLANDS, CHANDIGARH



Figure 65: Proposed sections through the connection

Source: Self (author)

Linking disconnects between the parks through connected plazas which will help people in perceiving the parks visually. Seamless public realm will encourage people move inside the park and walk towards the next. This will also integrate the formal and informal spaces of the park. Traffic calming measures like table top and curb extension is used to calm the traffic movement on the road so as people can move on street safely.

9.2.2 STRATERGIES FOR PUBLIC PRIVATE GRADIENT

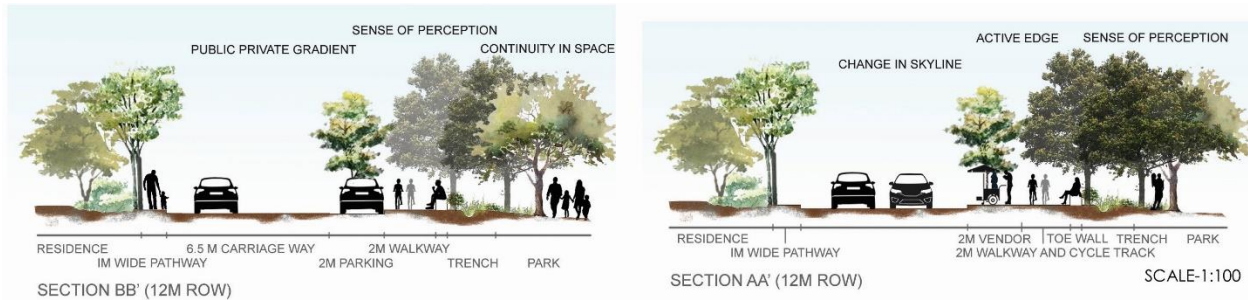


Figure 66: Proposed sections through road connecting residence to park

Source: Self (author)

Boundary walls of the park are being replaced vegetated trenches which will act as physical barrier at some edges where security is required and multiple entries from all the sides will bring people in.

9.2.3 STRATERGIES FOR WATER EDGE

N-Choe is the only tangible element which is connecting the site throughout the city. The choe is treated at drainage outlet through constructed wetland and vegetation on the edges to stabilize the edge. Water is retained in the retention pond and different activities are proposed to bring people close to water.

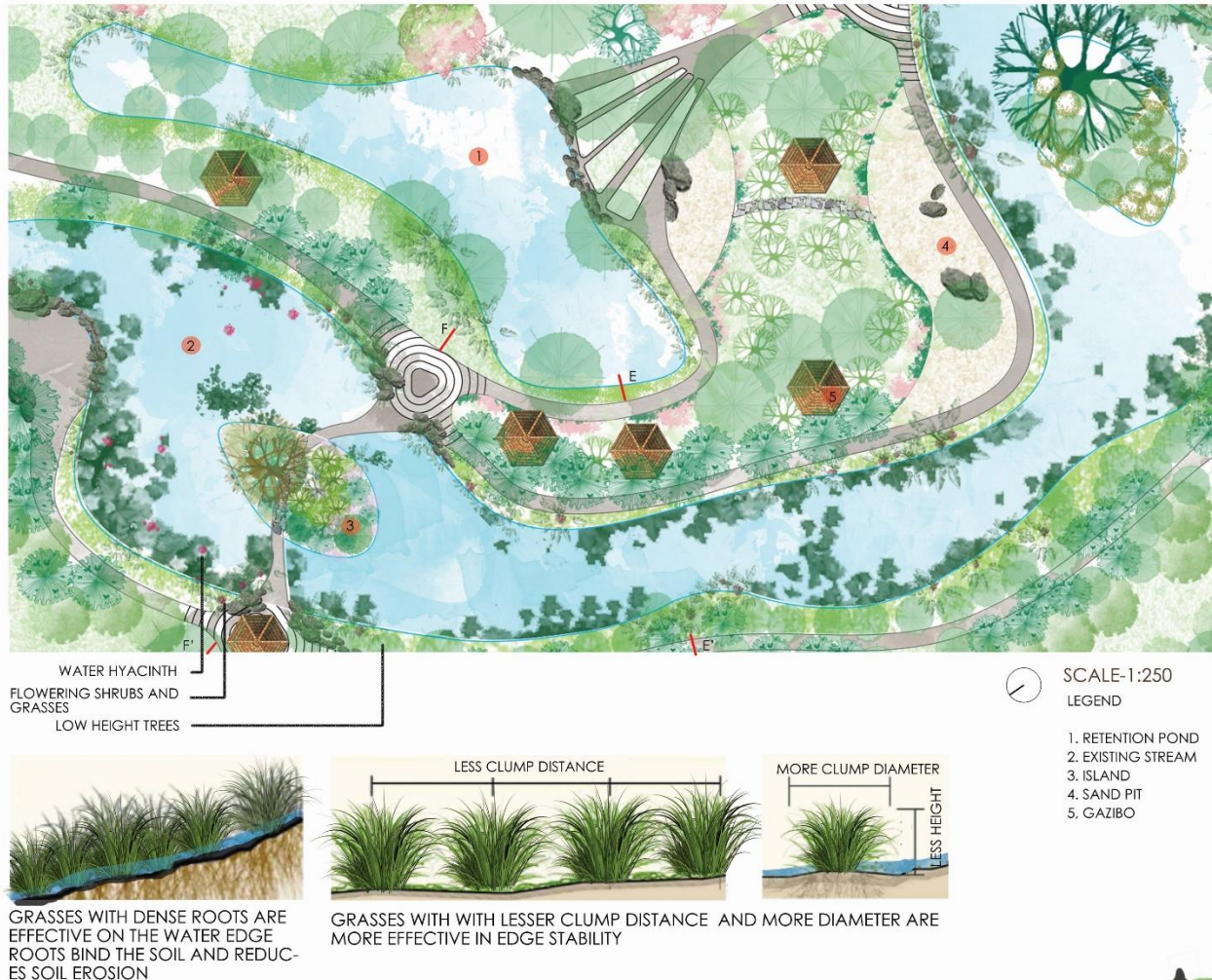


Figure 67: Proposed design strategies for N-Choe

Source: Self (author)



Figure 68: Proposed section through N-Choe










Source: Self (author)

10 APPENDIX










10.1 LIST OF TREES MAPPED ON SITE

Botanical and common name	Growth pattern and physical properties	Flowering, Fruiting and Leaves				Habitat /Native region	Soil type and other requirement	Usage and characteristics	Pollinator and dependent fauna	Image	Internet links
		Month	Fl	Fr	L						
1 Aegle marmelos (Bael)	Deciduous tree size- upto 15 m	Jan				Native: India Exotic: Bangladesh, Egypt, Malaysia, Myanmar, Pakistan, Sri Lanka, Thailand	dry,rocky conditions as well as on stiff clayey soil	Food Fodder Timber Gum/Resins Tannin or dyestuff Essential Oil Poison Medicine			http://www.efloraofgandhinagar.in/tree/aegle-marmelos http://www.worldagroforestry.org/treedb/ATPDFS/Aegle_marmelos.PDF
2 Terminalia bellirica (Bahera)	large, fast-growing deciduous tree with a large, globose crown; it can grow up to 50 metres tall, though it is usually smaller in cultivation	Jan				Scattered forests, sunny mountain slopes, one of the upper layer trees of stream valleys and lower seasonal rain forests at elevations of 500 - 1,400 metres	Succeeds in any moderately fertile, well-drained soil in a sunny position. Prefers periodically dry soils, and is moderately drought tolerant. Plants can tolerate short periods of inundation. Prefers a pH in the range 5.5 - 6.5, but tolerates 5 - 7.5	seeds are edible, Medicinal use, The dark red fruits are edible, dried fruits contain 20 - 25% tannin, insoluble gum, used for hair-oil and in the manufacture of soap, fruits yield a dye that is occasionally used together with iron sulphate for dyeing black cloth and matting	Pollination may be done by insects, as the flowers have unpleasant odour, which attracts flies		http://wildedibles.terin.org/mdex.php?album=Wild-edibles/Fruits/Terminalia-bellirica http://tropical.theferns.info/vi/ewtropical.php?id=Terminalia+bellirica
3 Terminalia chebula (Harad)	an evergreen tree growing to a height of 25 metres with a rounded crown of spreading branches	Jan				E. Asia - China, India, Sri Lanka, Bhutan, Nepal, Bangladesh, Myanmar, Cambodia, Laos, Vietnam	Succeeds in any moderately fertile, well-drained soil from sandy to clayey. Established plants are fairly drought tolerant. Prefers a pH in the range 5.5 - 6.5, but tolerates 5 - 7.5	Seed - eaten as a snack, sour fruits are eaten in salads, manufacture of black salt, Medicinal			http://tropical.theferns.info/vi/ewtropical.php?id=Terminalia+chebula
4 Erythrina Indica (Dada/Indian coral tree)	This fast-growing, 15 m tall and wide deciduous tree with green and yellow-variegated	Jan				Native: India Exotic: Malaysia, Myanmar, Thailand	Succeeds in a moderately fertile, well-drained soil. Plants are tolerant of salt laden winds and moderate levels of salt in the soil. Prefers a pH in the range 5 - 7, tolerating 4.5 - 7.5	Food Fodder Fibre Timber Tannin or dyestuff Medicine Soil improver Ornamental	Their flowers are adapted to pollination by birds, though various insects can also cause fertilization. The various species of Erythrina can all, as far as is known, be intercrossed to produce fertile hybrids		http://www.worldagroforestry.org/treedb/ATPDFS/Erythrina_indica.PDF http://tropical.theferns.info/vi/ewtropical.php?id=Erythrina+v-ariegata
5 Araucaria columnaris (Cook's pine)	a large evergreen tree with a narrowly conical crown; growing up to 65 metres tall	Jan				New Caledonia Preferred Climate Zone : Sub-Tropical / Monsoonal, Temperate	Dry Soils / Drought, Well-Drained Soils, Saline Soils / Salt Spray, Fertile Loamy Soils, Disease / Pest Resistant	Food (Herb & Spice) Medicinal, Timber & Products	The trees produce cones.		https://wildlifeofhawaii.com/fldownloaders/1442/araucaria-columnaris-cook-pine/
6 Cupressus sempervirens (Saru/Italian Cypress)	an evergreen Tree growing to 30 m by 5 m at a medium rate	Jan				Native Range: Crete, Rhodes, Turkey to Iran	light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: acid, neutral and basic (alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought.	Medicinal, Cosmetic, Essential, Wood.	The trees produce cones.		https://pfaf.org/user/Plant.asp?LatinName=Cupressus+sempervirens http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=a162
7 Salix babylonica (weeping willow)	Salix babylonica is a deciduous, short-lived tree to 20 m tall and d.b.h. of 60-80 cm.	Jan				China	Light requirement: tree grows in part shade/part sun; tree grows in full sun Soil tolerances: clay; loam; sand; acidic; alkaline; extended flooding; well-drained Drought tolerance: high Aerosol salt tolerance: high Soil salt tolerance: good	Erosion control, Shade or shelter, Ornamental, Pollution control			http://www.worldagroforestry.org/treedb/ATPDFS/Salix_babylonica.PDF http://hort.ufl.edu/database/documents/pdf/tree_fact_sheet/salsppa.pdf
8 Taxodium mucronatum	nearly evergreen, huge tree in its native habitat and is pyramidal when young with a dense crown , Capable of reaching 100 to 150 feet in height, Growth rate: medium	Jan				native to North America	Light requirement: tree grows in full sun Soil tolerances: clay; loam; sand; slightly alkaline; acidic; extended flooding; well-drained Drought tolerance: moderate	hedge; screen; specimen; no proven urban tolerance			http://hort.ufl.edu/database/documents/pdf/tree_fact_sheet/saxmca.pdf https://www.wildflower.org/gallery/result.php?id_image=17786
9 Acer oblongum	Acer oblongum is an evergreen tree that can grow up to 20 metres tall. The tree is harvested from the wild for its wood.	Jan				E. Asia - central and southern China, southern Japan, Pakistan, northern India, Nepal, Bhutan, Myanmar	found in the warm temperate zone to the subtropics, good moist well-drained soil in a sunny position but tolerates some shade Grows well in heavy clay soils. Chlorosis can sometimes develop as a result of iron deficiency when the plants are grown in alkaline soils. This species is found on acid soils in the wild	It is used for agricultural implements, minor construction, cups.			http://temperata.theferns.info/Plant/Acer+oblongum





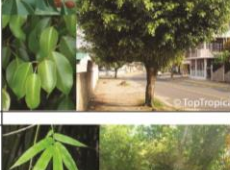




RE- CONFIGURING THE LANDSCAPE OF LEISURE VALLEY PARKLANDS, CHANDIGARH

Botanical and common name	Growth pattern and physical properties	Flowering, Fruiting and Leaves				Habitat /Native region	Soil type and other requirement	Usage and characteristics	Pollinator and dependent fauna	Image	Internet links
		Month	Fl	Fr	L						
10 <i>Artocarpus heterophyllus</i> (Jack fruit)	a fast-growing evergreen tree with a spreading and irregular crown, that can grow up to 25 metres tall, but is usually smaller	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				E. Asia - Indian subcontinent.	Prefers a deep, well-drained alluvial soil. Prefers a pH in the range 5.5 - 7.5, tolerating 4.3 - 8. Jackfruits produce one of the largest fruits in the world. The trees have a deep taproot. Plants can produce their first crop within 3 years of the seed germinating, but 8 years is a more common time	control floods and soil erosion in farms, medicinal, edible uses.	The flowers are reportedly pollinated by insects and wind, with a high percentage of cross-pollination		http://tropical.theferns.info/viewtropical.php?id=Artocarpus+heterophyllus
11 <i>Barringtonia acutangula</i> (Indian oak)	Indian oak is a small tree or shrub with a dense spreading crown. Briefly deciduous, it grows up to 13 metres tall.	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				Asia - Afghanistan, Indian subcontinent, Myanmar, Thailand, Cambodia, Laos, Vietnam, Malaysia, Indonesia, Philippines, New Guinea, Australia.	Prefers a permanently moist but well-drained soil and a position in full sun. Particularly suited to humid, shady situations	The bark is a source of tannins, medicinal, edible uses.	The flowers produce copious nectar and attract bees, who produce a good honey from it		http://tropical.theferns.info/viewtropical.php?id=Barringtonia+acutangula
12 <i>Grevillea robusta</i> (silver oak)	<i>Grevillea robusta</i> is a deciduous tree with a dense, conical crown; it can grow 12 - 25 metres tall with exceptional specimens up to 40 metres	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				Australia - New South Wales, Queensland.	Succeeds in warm temperate to tropical. An easy and fast-growing tree requiring a well-drained slightly acid soil and a sunny position. It prefers a rich moist soil, but it also succeeds in dry soils. Dislikes limey soils and heavy clays.	The bark is a source of tannins, medicinal, edible uses.	The flowers are very attractive to bees		http://tropical.theferns.info/viewtropical.php?id=Grevillea+robusta
13 <i>Mangifera indica</i> (Mango)	Mango is a large, evergreen tree with a dark green, umbrella-shaped, spreading crown; it can grow from 10 - 45 metres tall	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				E. Asia - Indian subcontinent, Myanmar	Prefers a sunny position. Plants are not too fussy over soil, not needing very fertile conditions. However, they crop better in a rich, well-drained soil whilst very poor soil, or shallow land, is unsuitable. A pH in the range 6 - 7 is ideal.	The flowers are used to repel mosquitoes. The slender branches are used as toothbrushes to treat toothache. The bark and the leaves are the source of a yellowish-brown dye used for silk. Medicinal, edible uses.	Pollinators are nectarivorous bats and insects such as flies, bees, ants, wasps, butterflies, moths, beetles and possibly thrips, but a certain amount of self-pollination also occurs.		
14 <i>Cassia siamea</i> (Kassod)	Medium-size, evergreen tree with a crown that is usually dense. It grows up to 18 metres tall, with a short, straight bole that is up to 30cm in diameter	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				Southeast Asia - Myanmar, Thailand, Malaysia, Cambodia, Laos, Vietnam	Requires a sunny position. It grows best on deep, well-drained, fertile soils, but will succeed on degraded, lateritic soils provided drainage is not impeded. It grows poorly on infertile, poorly drained podzolic soils. It is not tolerant of salinity, but is reasonably tolerant of acid soil conditions. It prefers a pH in the range 5.5 - 7.5	Young fruits and leaves are eaten as a vegetable Medicinal uses Agroforestry (used in alley cropping systems, coppicing ability and high biomass production)	pollinated by a wide variety of insects		
16 <i>Terminalia Arjuna</i> (Arjuna)	A medium sized deciduous tree, branches pubescent. Leaves alternate to opposite, oblong-lanceolate, thick coriaceous, margin crenate-serrate, apex obtuse; two glands on the petiole close to the leaf-blade. Flowers small, in axillary spikes.	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				Native: India, Sri Lanka Exotic: Bangladesh, China, Cuba, Ghana, Indonesia, Kenya, Malaysia, Mauritius, Nepal, Pakistan, Thailand	It grows well on fertile, neutral (pH 6.5 - 7.0) soils, especially loose, moist, alluvial loam with good water supply and drainage	Fuel: It makes excellent charcoal and firewood, with calorific values of 5030 Kcal/kg and 5128 Kcal/kg for the sawwood and heartwood, respectively. Medicinal Use Used as tanning and dyeing material	The facultative breeding system is considered to be adaptive for <i>T. arjuna</i> for colonization as it facilitates fruit-set through self-pollination.		
17 <i>Entolasium timbouva</i> (Timbouva)	A deciduous tree with a very wide, dense, low crown; it can grow 10 - 20 metres tall. The short, cylindrical bole can be 80 - 140cm in diameter	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				S. America - Paraguay, central, eastern and northern Brazil. Habitat: Semideciduous forest and its transition to savannah, found mainly in the more open, secondary formations and also as an isolated plant in pastures, favouring well-drained, clayey soils.	Succeeds in full sun to fairly dense shade. Grows in the wild in well-drained, clayey soils. Established plants are drought tolerant.	A fast-growing plant that fixes atmospheric nitrogen and provides food for the native fauna, it can be used as a pioneer species for restoring native woodland.	This species has a symbiotic relationship with certain soil bacteria; these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is utilized by the growing plant but some can also be used by other plants growing nearby.		http://tropical.theferns.info/viewtropical.php?id=Entolasium+timbouva
18 <i>Shorea robusta</i> (Sal, Surrei)	Deciduous tree Size upto 20m in central india, goes upto 45m in foothills of himalayas	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				Base of himalayas and central India		important source of structural wood, railway network was laid on sal sleepers, seed oil and butter is used for cooking and burning oil, leaves are used for making leaf- plates and bowls.			
20 <i>Jacaranda mimosifolia</i> (Nil gulmohar)	Deciduous tree (in extensive climatic conditions), grows upto 20m height	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				South- central South America (Brazil)		The tree is used to treat hepatitis and in folk tradition the flowers, leaves and bark are used to ease neuralgia and varicose veins. Hot Jacaranda leaf baths treat wounds and skin infections and the tree also helps in the treatment of acne			







RE- CONFIGURING THE LANDSCAPE OF LEISURE VALLEY PARKLANDS, CHANDIGARH

	Botanical and common name	Growth pattern and physical properties	Flowering, Fruiting and Leaves					Habitat /Native region	Soil type and other requirement	Usage and characteristics	Pollinator and dependent fauna	Image	Internet links	
			Month	Fl	Fr	L								
21	<i>Mimusops elengi</i> (Spanish cherry)	Deciduous tree (in extensive climatic conditions), grows upto 20m height. Evergreen in certain cases (grows 16m high)	Jan						India, Myanmar, Sri Lanka		Various parts of the tree have medicinal properties. It is used in the treatment and maintenance of oral hygiene. Rinsing mouth with water solution made with bakul helps in strengthening the teeth. It also prevents bad breath and helps keep the gums healthy.			
22	<i>Acer obtusum</i> (Acer)	evergreen tree that can grow up to 20 metres tall.	Jan						E. Asia - central and southern China, southern Japan, Pakistan, northern India, Nepal, Bhutan, Myanmar	good moist well-drained soil in a sunny position but tolerates some shade. Grows well in heavy clay soils.	The tree is harvested from the wild for its wood. when laid in layers between crops such as apples, carrots and potatoes, have a preservative effect.			
23	<i>Casia fistula</i> (Amaltas)	middle sized tree (around 10mts), deciduous	Jan						both dry and moist deciduous forest in India, avoiding only most arid tracts.	The species is reported to tolerate mild drought, slopes, and soil types ranging from acidic to alkaline (pH 5.5 to 8.7) as well as shallow and nutrient-depleted soils and dry, shallow mountain slopes (Duke, 1983; FAO, 2014). The species thrives on volcanic, granite, sandstone and lateritic soils, and can grow in calcareous, sandy, and loamy soils.	The wood is hard and heavy; it is used for cabinet, inlay work. The sweet blackish pulp of the seedpod is used as a mild laxative. The bark yields a tan and is used as red dye.	Its own pods are indehiscent and the seeds are not easily spread by water or wind, instead often falling to the ground still encased within the pods. Also, the species is very susceptible to attack by various insects and fungi.		http://www.floragandhinagar.in/tree/casia-fistula https://www.cabi.org/isc/datasheet/11434
24	<i>Citharexylum spinosum</i> (Fiddlewood)	Fast growing, evergreen, often multi-stemmed tree with a rounded crown that grows to about 40 ft (12 m)	Jan						Native to tropic America		The wood of this tree is said to be useful for making musical instruments - that could be the reason for its common name, fiddlewood.	The tiny flowers are a favourite to the bees.		http://www.flowersofindia.net/catalog/slides/Fiddlewood.html
25	<i>Albizia procera</i> (Safed siris)	Deciduous trees; to 30 m high; bark 10-15 mm, thick, surface greenish-yellow, smooth, exfoliation small, irregular; blaze red; branchlets brownish to blackish or yellowish, terete, 3-13 mm thick, silky pubescent.	Jan						native to moist deciduous and semievergreen hill forests, swamp forests, and lowland savanna woodlands in Asia from northern India through southeast Asia		The cooked leaves are eaten as a vegetable. In times of scarcity the bark can be ground into a powder, mixed with flour and eaten			http://tropical.theferns.info/vi/ewtropical.php?id=Albizia+procera
26	<i>Scheuchera oleosa</i> (Kusum)	Kusum is a large beautiful tree with a broad, shady crown. Grows upto 16mts	Jan						found widespread in Tropical Himalayas (Punjab to Nepal), India, Ceylon, Burma, Thailand, Indo-China, Malaysia		Young leaves and shoots - raw, cooked in soups or steamed and served with rice. The ripe fruit is eaten raw. A pleasantly acid flavour. Unripe fruits are pickled. The fruit is a broadly ovoid, ellipsoid to subglobular berry 15 - 25mm x 10 - 20mm	one of the primary host trees of lac insect and is said to yield the finest quality of shellac		
27	<i>Emblica officinalis</i> (Amla)	A graceful deciduous ornamental tree, normally reaching a height of 18 m and, in rare instances, 30 m	Jan						Native: Bangladesh, China, India, Malaysia, Pakistan, Sri Lanka	The emblic seems to grow equally well under both dry and humid conditions. It is noted for being able to thrive in regions too dry and soil too poor for most other fruit crops. For maximum productivity, the tree requires deep soil ranging from sandy loam to clay, light or heavy, slightly acidic to slightly alkaline. At high pH (as much as 8.0), nutritional deficiencies are evident.	Food: Rural folk in India claim that eating the highly acid, fresh, raw fruit followed by water, produces a sweet and refreshing aftertaste. Fodder: the foliage furnishes fodder for cattle. Essential oil The dried fruit yields ink and hair-dye and, having detergent properties. Timber: The hard but flexible red wood, though highly subject to warping and splitting	Cross-pollination is desirable. Honeybees work the flowers in the morning and late evening. It is now known that lack of pollination is the cause of up to 70% shedding of flowers in the first 3 weeks after onset of blooming.		https://indiabiodiversity.org/species/show/31625 http://www.worldagroforestry.org/trees/ATFPDS/Emblica_officialis.PDF
28	<i>Plumeria alba</i> (Champa)	Succulent, evergreen shrub or a tree that does not have a true crown of foliage, but forms a somewhat vase-shape with a few stout, soft and brittle erect branches ending in clusters of crowded, spreading leaves; it can grow 3 - 8 metres tall.	Jan						Range: Caribbean - Windward Islands to Puerto Rico. Habitat: Coastal thickets and limestone forests at low elevations and ascending to lower montane areas.	Succeeds in full sun to partial shade. Succeeds in a range of soils so long as they are well-drained. Established plants are very drought tolerant.	Medicinal use A white latex exudes abundantly from areas of damage on the plant			http://tropical.theferns.info/vi/ewtropical.php?id=Plumeria+alba https://www.thepruce.com/w/hte-frangipani-growing-profile-3269296
29	<i>Plumeria obtusa</i> (Great White Frangipani)	Large shrub or small tree with an irregular or rounded crown that grows up to 12 m. Evergreen in the tropics, but deciduous in temperate climates.	Jan						Habitat: Occurs along the coast on rocky or sandy, nutrient poor soils.	Use a fertilizer with a high phosphate content, such as one with an NPK of 10-50-10. Plant in slightly acidic or neutral soil (pH 6.6 - 7.5) with high organic matter content (eg., compost, manure, leaf mold) and good drainage. A soil with coarse texture, such as sandy soil or sandy loam, is ideal.	Medicinal, Cut / Dried Flower, In the Caribbean Islands, people use the bark as a diuretic. They also use the latex to stimulate purging.	Their fragrance is strong and especially intense at night to attract pollinating moths		https://florafaunaweb.nps.gov.sg/Special-Pages/plant-detail.aspx?id=3072 https://worldoffloweringplants.com/plumeria-obtusa-singapore-graveyard-flower-great-frangipani/

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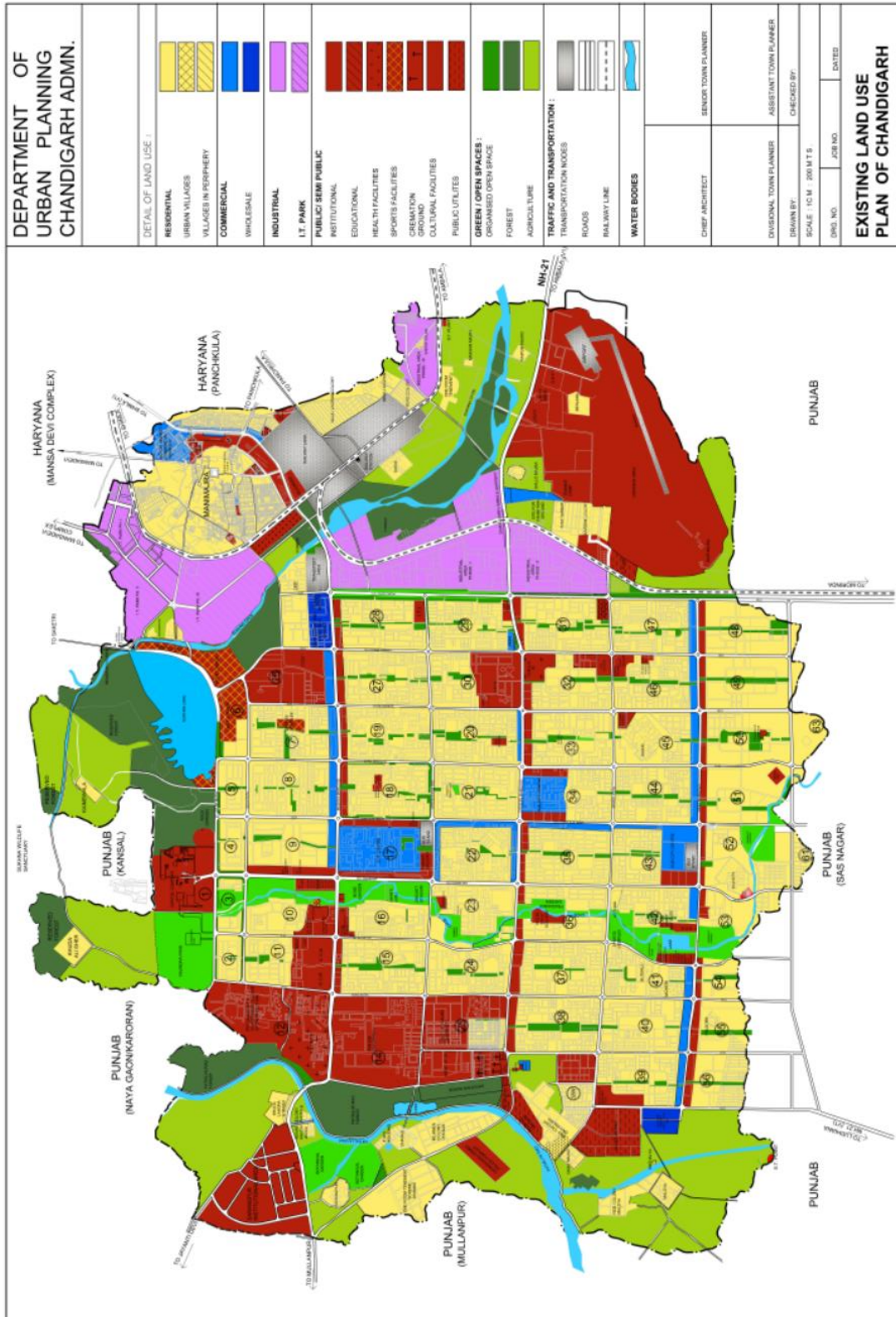
Botanical and common name	Growth pattern and physical properties	Flowering, Fruiting and Leaves				Habitat /Native region	Soil type and other requirement	Usage and characteristics	Pollinator and dependent fauna	Image	Internet links
		Month	Fl	Fr	L						
30 <i>Plumeria rubra L.</i> (Frangipani)	A deciduous, semi-succulent shrub or small tree with a broad crown that is often as wide as the tree is tall; it can grow up to 12 metres tall in the wild but is usually smaller in cultivation	Jan				Range: Western S. America, north to central Mexico. Habitat: Dry, hot areas. Dry, rocky lowland. Rather dry, often rocky forest and mountain slopes, occasionally on plains or in bushy savannahs, usually at elevations of 500 - 1,000 metres.	One of the easiest of trees to grow, it is adaptable to most soil conditions though it prefers a fertile, well-drained soil in a sunny position. Plants are very tolerant of salt-laden winds. Established plants are very salt tolerant.	The flowers are eaten in sweetmeats, Medicinal Use. An essential oil is obtained from the flowers, The tree is supposed to produce a rubber.	Biotic (Fauna) (Insects (Butterfly, Moth); Associated with: Flowers attracts and are pollinated by Spix Moths, but do not produce nectar reward.)		http://tropical.theferns.info/vi/ewtropical.php?id=Plumeria+rubra http://lorafunaweb.npark.org/ov.sg/special-pages/plant-detail.aspx?id=3074 http://www.eflorasite.gardening.com/in/tree/plumeria-rubra
31 <i>Neolamarckia cadamba</i> (Kadam)	A large tree with a broad crown and straight cylindrical bole. The tree may reach a height of 45 m with trunk diameters of 100-160 cm.	Jan				Range: E. Asia - Indian subcontinent, China, Malaysia through Indo-China to Australia. Habitat: An early-succession species, it grows best on deep, moist, alluvial sites, often in secondary forests along riverbanks and in the transitional zone between swampy, permanently flooded and periodically flooded areas.	A plant of the moister tropics, it grows well at an altitude range of 300 - 800 metres. It prefers a mean annual temperature of around 23°C and is sensitive to frost. It grows best with a mean annual rainfall of around 1,600mm or more, but can tolerate dry areas with as little as 200mm of rain. Prefers well drained entisols. It does not grow well on leached and poorly aerated soils.	The fruit and inflorescences are reportedly edible. Medicinal use. The fresh leaves are sometimes used as savelottes or plates. A yellow dye can be obtained from the root bark	The fragrant orange flowers attract insect pollinators.		http://tropical.theferns.info/vi/ewtropical.php?id=Neolamarckia+cadamba
32 <i>Cinnamomum camphora</i> (Camphor Tree)	A relatively fast-growing, evergreen tree with a dense crown. It usually grows from 10 - 15 metres tall, but can reach 40 metres. The bole, which usually branches from quite low down, can be up to 75cm in diameter.	Jan				Range: E. Asia - China, Japan. Habitat: Banks of streams in China to elevations of 750 metres. Primary forest, occasionally in open areas, at elevations up to 3,000 metres but usually below 1,000 metres.	Succeeds in most soils but prefers a fertile sandy moisture-retentive well-drained soil in full sun or light part-d shade. Plants are tolerant of saline soils and salt-laden winds. Tolerates a pH in the range 4.3 to 8, but prefers a range from 6.5 - 8.	Young shoots and leaves - cooked. Some caution is suggested because there is a report that the plant is poisonous in large quantities. The old leaves are dried and used as a spice. An essential oil obtained from the plant is used as a food flavouring in baked goods, candy etc. Medicinal use	Pollination by Diptera.		http://tropical.theferns.info/vi/ewtropical.php?id=Cinnamomum+camphora http://www.worldagroforestry.org/trees/AFTPDFS/Cinnamomum_camphora.PDF https://www.ayurtimes.com/ci/nnamomum-camphora/
33 <i>Magnolia champaca</i> (Champaca)	A large evergreen tree with a close tapering conical to cylindrical crown composed of ascending branches. It can grow 33 metres or more tall, with some specimens attaining 50 metres.	Jan				Range: E. Asia - China, India, Bangladesh, Myanmar, Thailand, Vietnam, Indonesia. Habitat: Scattered in primary lowland to montane rain forest.	It prefers a mean annual rainfall in the range 3,000 - 4,000mm, but tolerates 2,200 - 5,100mm. Requires a sunny position in a moist but well-drained, deep, fertile, loamy to sandy soil. Prefers a pH in the range 4.5 - 5.5, tolerating 4 - 6.	The aromatic, bitter bark is sometimes used for the adulteration of cinnamon. The fruit is said to be edible. Medicinal use. The tree is used to reforest badly eroded areas in Java. Soil under tree cover shows an increase in pH, soil organic carbon and available phosphorus.	The flowers are protogynous and are pollinated by beetles, which feed on the stigmas, pollen, nectar and secretion from the petals.		http://tropical.theferns.info/vi/ewtropical.php?id=Magnolia+champaca
34 <i>Ficus benjamina</i> (Java Fig)	An evergreen tree with a dense, wide crown; it can grow 15 - 30 metres tall. The bole can be 30 - 60cm in diameter	Jan				Range: E. Asia - China, India, Nepal, Myanmar, Thailand, Cambodia, Laos, Vietnam, Malaysia, Indonesia, Philippines, New Guinea, Australia, Pacific Islands. Habitat: Mixed forests near villages at elevations from 400 - 800 metres in southern China. Primary forests at low and medium elevations in the Philippines.	Succeeds in full sun to partial shade. Grows best in a moist, fertile soil. Tolerant of strong winds. The leaves are very sensitive to small changes in light.	Medicinal use. The inner bark is a source of fibre. The strips of bast of this species are salmon-buff; some are soft and pliable, others hard and stiff. Rope made from the bast possesses a fair degree of tenacity. With a tensile strength of 480 kilos per square centimeter. Wetting reduced the strength only 2%	Wasps play an important role in pollination and reproduction of this species.		https://indiabiodiversity.org/species/show/266605 http://tropical.theferns.info/vi/ewtropical.php?id=Ficus+benjamina
35 <i>Bambusa balcooa</i> (Bamboo)	A densely tufted, sympodial bamboo. The erect culm can be up to 30 metres tall, but is more commonly less than 18 metres tall, and has a pendulous tip.	Jan				Believed to originate from E. Asia in northern India and Bangladesh.	Succeeds in full sun and in dappled shade. Succeeds in any type of soil but prefers heavy textured soils with good drainage and pH of about 5.5. Prefers a pH in the range 5 - 6, tolerating 4.5 - 7.5	Young shoots are used as a vegetable. The young shoots are harvested as they emerge from the soil. The culms are used as building material for houses, bridges, temporary fishing floats, frames of rickshaw hoods, to prepare agricultural and fishing implements and to weave mats and baskets. This is one of the best and strongest bamboos for building purposes.			http://tropical.theferns.info/vi/ewtropical.php?id=Bambusa+balcooa
36 <i>Acrocarpus fraxinifolius</i> (Pink cedar)	Deciduous tree, Shape- Tall tree with pyramidal shape. height- 30-40 m, Spread- 7.8m Growth rate- Fast Leaves bipinnate, about 30 cm with 3-4 compound leaflets and consisting of 5-6 elliptical, lanceolate leaflets 7-10 cm long and arranged in pairs, bright red when young, giving the tree its characteristic appearance.	Jan				Bangladesh, Bhutan, China, India, Indonesia, Laos, Myanmar, Nepal, Thailand	Grows best in deep, well-drained, clayey loam soils and in submontane areas in the humid and subhumid tropics with a short, dry spell. It is a pioneer and demands light, but it can tolerate slight shade when young.	As nectar and a good bee forage, for reinforcing riverbanks and stabilizing terraces. Leaves are suitable for mulching.	Pollinator- bee, can be used as fodder.		
37 <i>Alistonia scholaris</i> (Devil's tree)	Evergreen tree, Shape- Tall tree with columnar shape height- 10m, Spread- 7m, Growth rate- Fast Leaves palmately compound but are not; 4-8 leaves arise around a stem at the same height. Flower- small, fragrant, white, in tight clusters Fruit- long and slender, bean-like, in pairs	Jan				Submontane forests, Tropical, Subtropical / Monsoonal, Indian subcontinent, Southern China, Indochina, Philippines, Malaysia, Indonesia	Hardy tree, prefers well-drained soils.	The latex provides a good quality chewing gum, Bark yields a fibre, and the wood is regarded as suitable for pulp and paper production. Flowers of <i>A. scholaris</i> yield an essential oil.	Host plant for <i>Pauropsylla tuberculata</i> , a kind of psyllid (Jumping plant louse) which produces unsightly pouch galls over leaf surfaces. Butterfly Food Plant.		
38 <i>Bauhinia variegata</i> (Kachnar)	<i>Bauhinia variegata</i> is a small to medium-sized deciduous tree with a short bole and spreading crown, attaining a height of up to 15 m and spread of 50 cm. Growth rate: Fast. The leaves are shaped a little like a cow's hoof. The flowers are reminiscent of showy orchids, with five irregular, usually slightly overlapping	Jan				<i>B. variegata</i> is a plant of tropical and subtropical climates with hot, dry summers and mild winters. China, Colombia, India, Myanmar, Nepal, Pakistan, Thailand, Vietnam	A scattered tree of deciduous forests. Capable of growing on a wide range of soils from gravelly, shallow, rocky soil on hill slopes to sandy loam and loamy soil in the valley	The leaves, flowers and flower buds are eaten as vegetables. The wood is brown and moderately hard and used for agricultural implements	Leaves make good fodder and are greedily eaten by sheep, goats and cattle.		

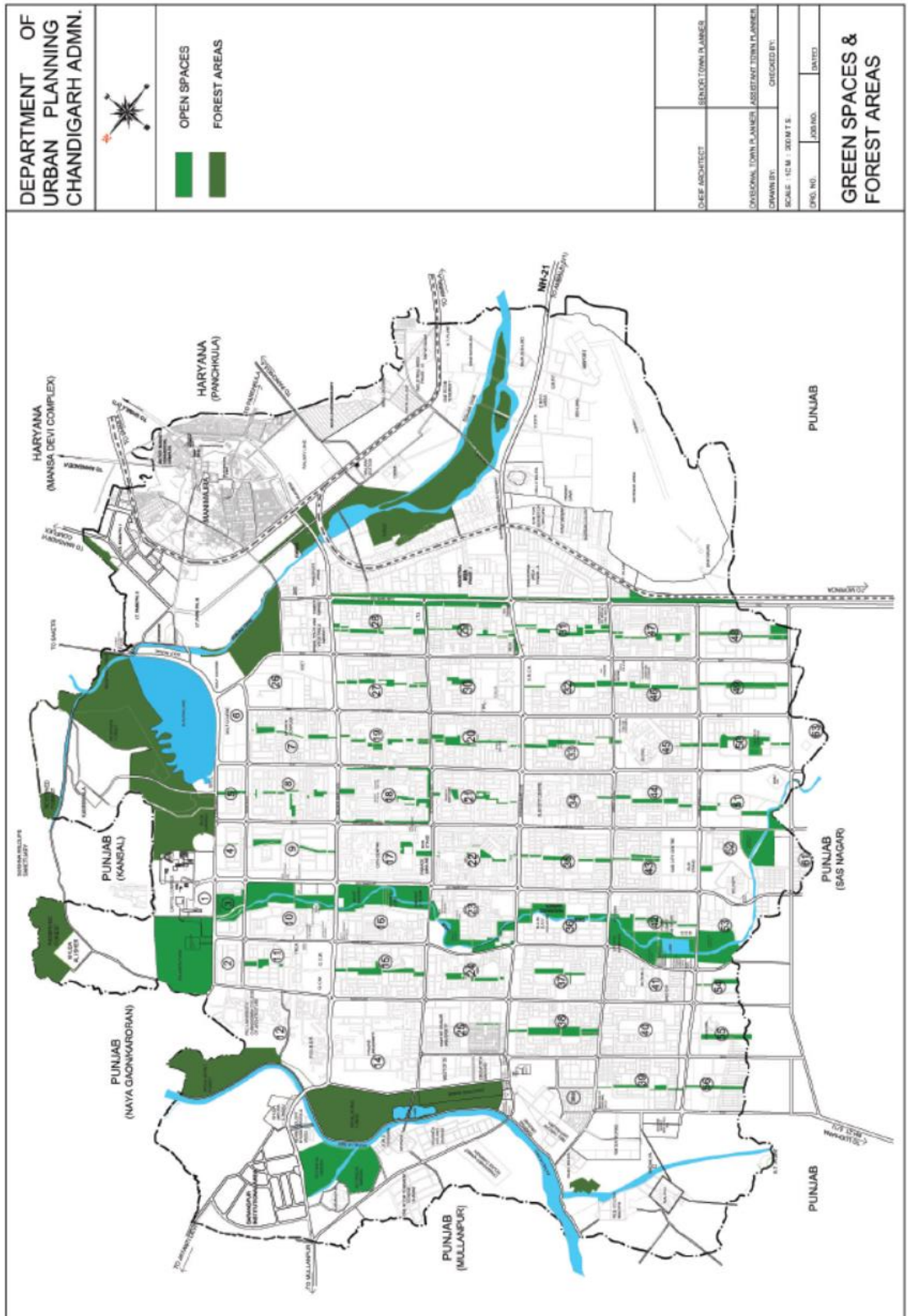
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Botanical and common name	Growth pattern and physical properties	Flowering, Fruiting and Leaves				Habitat /Native region	Soil type and other requirement	Usage and characteristics	Pollinator and dependent fauna	Image	Internet links
		Month	Fl	Fr	L						
39 Magnolia grandiflora (Bara champa)	Evergreen tree. Shape- Pyramidal shape, height- 10m, spread- 6m Leaves- 10-20 cm long thick, firm, glossy green above, often rusty hairy below, apex bluntly pointed. Flowers- white, cup shaped. Fruits- pink to brown with bright red exposed seeds	Jan				native to the southeastern United States, from southeastern North Carolina to central Florida, and west to East Texas		The timber is hard and heavy, and has been used commercially to make furniture, pallets, and veneer.	Squirrels, opossums, quail, and turkey are known to eat the seeds.		
40 Lagerstroemia flos-reginae (Queen's flower)	Deciduous tree, shape- columnar, height- 15m, spread- 6m, Greater tree heights attained under more forested conditions, where blooming is delayed as a result of more abundant moisture. Young leaves emerge glossy red, turning to pinkish, light orange, light green and then finally green. Old leaves wither to orange-	Jan				Relatively open sites like secondary or disturbed forests, grassland, and especially along rivers.	Prefers moderately fertile, well-drained soils. Drought-tolerant when established, but exhibits lush growth with regular watering.		Host plant for bees and insects.		
41 Lagerstroemia parviflora (Bakli)	Deciduous tree, Shape- height- 25m, Growth rate- slow, Leaves are oblong to ovate-pointed, pale on the underside. Small white flowers are borne in 2-6 flowers clusters in leaf axils and at the end of branches. Fruit is a leathery capsule surrounded below by a persistent sepal-cup, oblong, 2.0 to 3 cms long, 3 to 4	Jan				Deciduous forests, especially in dry, mixed forests, in most parts of India except the dryer areas. Asia - India, Bhutan, Nepal, Myanmar.	Mature trees are fairly frost-hardy, it prefers a climate with a distinct dry season, Prefers a medium soil, but also succeeds in sands and in clays if they are well-drained	The timber, which is known locally as 'Sida' is used for general carpentry	eaten by cattle		
42 Delonix regia (Gulmohar)	Deciduous tree, Shape- irregular columnar, Leaves twice feathered with 10-20 pairs of side- stalks; each one with upto 30 pairs of small, blunt leaflets. Flowers in loose clusters, 5 petals. Fruit pods flat, woody, dark, upto 60cm long.	Jan				Original home is Madagasgar but is one of the most extensively cultivated trees in tropical climates worldwide.	It prefers a warm climate with a pronounced dry season, especially near sea. It is not fussy about soils but will not withstand frost.	Primarily as a decorative tree.			
43 Polyalthia longifolia (Ashok)	Evergreen Tree, Shape- Tall pyramidal and symmetrical. Leaves slim, long, with wavy edges and extended pointy tips, glossy on both sides. Flowers in cluster with 6 long, narrow pale green petals. Fruits- grape sized, in cluster growing from a common stalk; dark purple when ripe.	Jan				Native to onsoon forests of srilanka. It is found scattered as an understory or main canopy tree in both evergreen and monsoon forests.	It is fairly drought hardy and quick growing.	Medicinal use and religious use.	Fruit is eaten by flying fox, birds and monkeys		
44 Ficus religiosa (Pipal)	It is a deciduous tree that is native to India. The peepal tree is tall tree and has heart shaped leaves. The figs of the tree house the flowers and grow in pairs. The berries are purple and also grow in pairs.	Jan				Native to India. Cuttings from this tree exist in Sri Lanka that date back to 288 B.C.	Peepal trees are native to India and thrive in hot, humid weather. They prefer full sunlight and can grow in most soil types, though loam is the best.	Peepal trees have many medicinal uses.	The leaves make an excellent fodder especially for buffaloes and elephants. Host of the lac insect. Ripe figs are a favourite food of migrating rosy starlings.		

10.2 MASTER PLAN 2031

For all the analysis layers maps has been prepared and referred from Master Plan 2031





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