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DESINING THE GREEN SPACE ON THE EDGE OF THE GORGAN CANAL

TYPE A

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1.INTRODUCTION

According to the UN, 55.3% of the world's population lives in cities, and that number is anticipated to rise to 64% by 2050. Around 75% of Europeans reside in cities (World Bank, 2013). Global “urbanization” is causing serious environmental issues that harm human health. Urban planners and architects must also ensure city well-being (Clark, 2014). Urban green spaces are crucial to this issue. Even while urban green spaces help humans and cities, their effects on human well-being are ambiguous (Mears et al., 2020; Zhang et al., 2020).

Moderation of air pollution, extreme temperatures, and noise provides further benefits. Green spaces are scarce in most metropolitan areas, especially inner-city regions (Kabisch and Haase, 2011). Parks, golf courses, sports fields, and other open spaces in urban built-up areas, whether public or private, are considered urban green space. In urban and semi-urban green spaces, natural and manufactured networks of multifunctional ecological systems are common.

Green places can be public or private. Private places are for specific users while public spaces are for everyone. Thus, developer regulations and conditions may restrict public access to green places. Green landscapes held by public agencies were often deemed public utilities. In contrast, private green spaces were typically inaccessible but sometimes open.

1.1 PROBLEM STATEMENT

The primary research on green space shows that it improves air quality, reduces stress, and increases physical activity in urban areas, improving citizens' physical and mental health. Designing green areas in cities improves social connection and beautifies cities. Creating green areas in cities is essential.

Urban infrastructure like green spaces improves residents' well-being (Pedersen et al., 2019; UN-Habitat, 2015). Gardens, parks, green walks, and other public places with grass, trees, and bushes give environmental, social, and psychological advantages (Barrantes-Sotela, 2020).

Many urban green space design articles and research studies discuss how urban green spaces improve mental health, social interactions, and the city's cognitive and visual aesthetics. Naturally, architectural design, urban planning, and landscape design will aid these components in the initial stage. Thus, this research first explores urban green space design concepts and then offers answers.

1.2 RESEARCH GOALS

The research aims to create a dynamic and picturesque urban fabric, construct urban green areas that improve urban inhabitants' quality of life, and improve Gorgan city's visual appearance and design. In keeping with this core purpose, the following secondary objectives are proposed:

1. Identification and analysis of social, economic, and individual aspects affecting Gorgan city canal green space design.
2. Identification and analysis of architectural design aspects and variables affecting Gorgan city canal green spaces.
3. Identification and analysis of urban design aspects and variables affecting Gorgan city canal green spaces.
4. Finding the best green space designs for the Gorgan city canal.

1.3 RESEARCH QUESTIONS

The key study issue is how developing green areas along the canal in Gorgan city may help the city's structure beyond development. This includes answering secondary questions like the following:

1. What social and psychological factors affect urban green space design?
2. Which architectural factors shape urban green spaces?
3. Which urban characteristics affect green space design?
4. What architectural and urban design alternatives are available for city canal green spaces?

1.4 HYPOTHESIS

The research hypothesis is that developing green areas around Gorgan city's boundaries influences people' mental and psychological health, urban attractiveness, and economic and social infrastructures. Then, secondary theories are proposed:

1. Social preferences, economic position, and individual characteristics (age, gender, education, etc.) might impact urban green space design.
2. Plant coverage type, color, diversity, design flexibility, and architectural aspects affect urban green space design.

3. Accessibility, location, services, and security affect urban green space design.
4. Urban regeneration and connectedness, aesthetic enhancement, long-term sustainability, and canal water management are good design options.

1.5 THE SCOPE OF RESEARCH

This research will be place at Gorgan. This city is in northern Iran's Golestan Province. Gorgan lies in the northern Alborz Mountains foothills southeast of the Caspian Sea at 36 degrees 50 minutes north latitude and 54 degrees 25 minutes east longitude. This city is 176 meters above sea level.

Despite summer heat and humidity, Gorgan enjoys a mild climate. The average annual maximum temperature in Gorgan is 22.9 degrees Celsius, and the lowest is 12.7. The coldest month is January and the hottest is July. The average annual precipitation in Gorgan is 583.8 mm. Average maximum humidity is 85%, lowest 53%. The average wind speed in Gorgan is 2.4 meters per second from the west and southwest. Gorgan has 14.4 frost days yearly.

2. LITERATURE REVIEW

The literature review has two subsections. We first cover research from a decade ago, including systematic reviews and scholarly papers. The second portion covers similar case studies. These subsections contain basic knowledge and further information on relevant topics, theories, and approaches.

The 2023 semi-systematic review, "Designing urban green spaces for climate adaptation: A critical review of research outputs," examined how much recent research has produced evidence-based outputs relevant to practitioners on the design of outdoor urban green spaces for climate adaptation.

We used the Boolean operator to search for English articles and reviews published between January 2010 and October 2020. We created a Population-Intervention-Comparison-Outcome (PICO) search string to identify relevant keywords related to green spaces in urban contexts (population), design (intervention), and climate adaptation (outcome), with the aim of filtering practitioner-relevant research. The title, abstract, and keywords of 381 papers were evaluated to see if they met the complete review selection criteria. In **Table 1**, five primary questions represent study variables.

Table 1: list of variables for analyzing case study papers and possible categories

	Variable (question)	**Possible categories**
1	Where is the case study located?	Identify city and economy
2	Which climate impact is being considerable?	Flooding, heat waves, thermal comfort, cold waves, wind distress
3	What is the research scale?	City region, city neighborhood, sites
4	What kind of research methodology is applied?	Observational (field data), experimental, remote sensing, modeling and simulation.
5	What types of outputs potentially used for practitioners are provided?	Design guidelines, software and model

The methodology has three subsections. The first paragraph contextualizes the literature under review and scrutinizes the evolution of research over the past decade, taking into account the case study location, journal, and year of publication. The second subsection addresses our purpose by categorizing case studies by climate adaptation implications, research scale, methodology, and

output. Finally, the final paragraph examines output relevance and transferability for practitioners to achieve aim ii. The main category 'Thermal Comfort' covered 64% of articles. Most publications in this primary class (94%), addressed 'thermal comfort', although others addressed 'bioclimatic comfort' and 'microclimate'. Most studies in the later subcategory examined heat periods, but Afshar et al. (2018) examined how planting design affects winter thermal comfort in an urban park in Iran, and Johansson and Yahia (2020) examined wind comfort and solar access in a Swedish coastal development. The category 'UHI Mitigation' represented 29% of all publications **Figure 1** and includes research not directly related to human comfort in four subcategories: 'heat mitigation', 'land surface temperature', 'UHI mitigation', and 'urban cooling. 7% of publications covered 'urban rain harvesting', 'surface water flooding', and 'storm water management' **Figure 2**.

Figure 1: Share of case studies per research scale

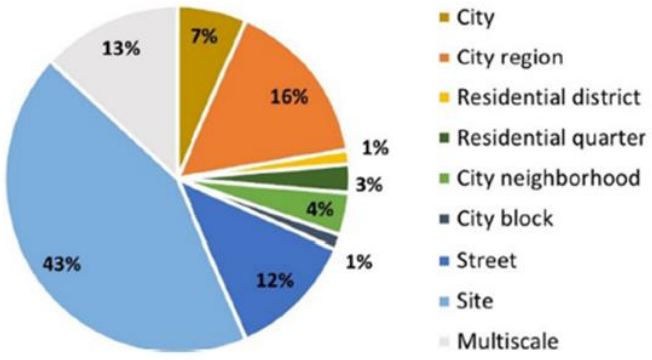
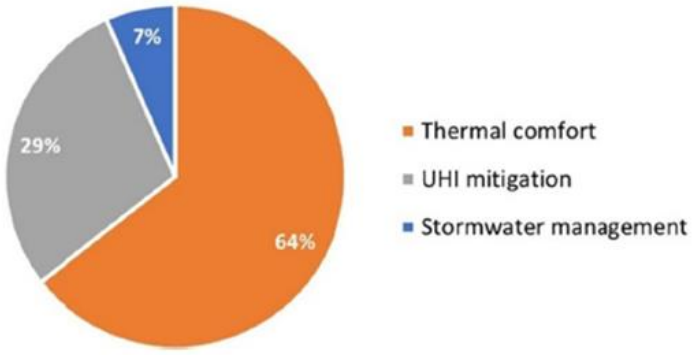


Figure 2: Share of case studies per climatic impact addressed



We found that evidence-based guidelines for green space design are scarce despite the huge number of studies on outdoor urban green spaces and climate adaptation since Bowler et al. (2010).

Our findings reveal significant barriers to the transferability and operationalization of evidence-based research into practice, and we propose a roadmap for future research to address five important challenges: Lack of clarity in design practice definitions and orientations Finding mechanisms that relate design components to climate adaption results, Identifying trade-offs and synergies between urban green space form and composition and climate adaption, Creating indicators and frameworks to track design kinds and aspects throughout time and space, Scientist-practice interaction-based co-designing research.

The 2017 study by Owen Douglas, Mick Lennon, and Mark Scott evaluates life-course evidence relating to health, well-being, and green space. In literature A life-course approach provides a more nuanced account of green space and health relationships, helping planning and urban design professionals understand the evidence beyond quantity. Many studies have found substantial links between surrounding greenness and enhanced developmental and birth outcomes in parental development; however, some have found socio-economic and cultural differences. For instance, only the least educated who resided near a significant green area had greater birth weights. Other research has examined the association between green space and health in modern children's lifestyles and habits. Greenery was associated with an 11–19% reduced relative frequency of overweight/obesity and excessive screen usage. In addition, 8–14-year-olds in greener regions were more likely to exercise. “Growing Up in an Urbanizing World” found that teens regarded neighborhood qualities in the 1990s and 1970s similarly. Young teenagers explored, creatively played, and hid in overgrown, unoccupied areas and utilized parks for hanging out, active play, and admiring trees and gardens. The most common factor promoting physical activity was access to green space, assessed as distance from residence to parks and green spaces, percentage green covering, or number of recreational facilities in the community. Higher amounts and closer distances increase park use, which boosts physical activity. The second most common reason was that informal sports and movement facilities were publicly accessible. Such components typically yielded positive results. These competitive sports facilities often attract boy-dominated groups (Limstrand & Rehrer, 2008).

Numerous studies have linked greenness to adult health. After adjusting for ambient air pollution, higher greenness is associated with decreased CVD, ischemic heart disease, and stroke mortality. Astell-Burt, Feng, and Kolt (2014) found that type-2 diabetes risk was significantly lower in

greener neighborhoods, controlling for demographic and cultural factors, especially in neighborhoods with 41–60% green space land use. Finally, city green spaces are increasingly seen as places for 'restorative' interaction with nature, physical activity, and social engagement, which appears to improve well-being and encourage healthier lives. The 2015 publication "The Role of Urban Green Space for Human Well-Being" combined spatially explicit survey data with spatially highly disaggregated GIS data on urban green space. This report seeks to answer the following research questions: (1) How does urban green space affect human well-being? (2) Does additional urban green space always improve well-being, or does it have a threshold? What is the monetary equivalent of a shift in urban green space availability? District residents' life satisfaction is the dependent variable. The net monthly income response is an explanatory variable. The regression equation includes income in its natural logarithm to account for falling marginal utility. Other demographic and socio-economic factors of the respondent and household shed light. Respondent neighborhood traits. Dummy variables for each district control for district-specific effects.

Most of their study uses online survey data. Demographic and socioeconomic questions about respondents and their homes included gender, age, marital status, education, employment, and household income. Question regarding subjective well-being: "All things considered, how satisfied are you with your life these days?" Participants answered on an 11-point Likert scale from "0" (extremely unsatisfied) to "10" (highly satisfied). Many large surveys in different countries and economic literature on life satisfaction use this question method. Life satisfaction was highest in a 1-kilometer buffer around residential addresses with 35 hectares of urban green space, or 11% of the buffer area. In the Berlin case study region, green space is scarce since three-quarters of respondents had less than this quantity in their homes. We found a substantial, inverted U-shaped influence of urban green space amount and distance on life satisfaction. Our data show that 35 ha (11% of a 1 km buffer) of green space improves life satisfaction the most. We found 75% of respondents had less green space. This suggests positive MRS predictions based on green space area and income. Based on mean income and green space availability, the implied MRS is EUR 27 per person per hectare per month. Their findings suggested that municipal administrations should prioritize green space expansion in limited locations. Target a more uniform supply of urban green space. Income endogeneity may be a problem. If personality traits are not control variables, unobserved variability may explain the observed association between economic situations and well-being. Happier people may lose their jobs less often, re-employ more readily,

or find better-paying positions. This may raise the income coefficient and lower the MRS. Character trait controls may help to reduce unobserved heterogeneity-induced upward bias.

Fourth, in 2010, Jasper Schipperijn and colleagues utilized a socio-ecological model to explore impacts on respondents nearest urban green space in Odense, Denmark. This study aims to describe urban green space utilization and identify its correlates. Based on the socio-ecological paradigm and literature, we predict that individual and environmental variables will be associated. We asked the following research questions to achieve this goal: Do size and distance affect urban green space use? Are age and education related to urban green space use? How do they interact? This research uses data from Odense, Denmark's third-biggest city with 187,929 residents (Statistics Denmark, 2009). Odense was chosen as a 'critical case' for our survey because it is a 'green city' with extensive information on all UGS. Selecting a significant case allows logical inferences such as ‘if this is not valid for this situation, then it applies to all (no) cases. We chose the city center due to its wide range of housing and UGS types. Many types of apartment complexes, semi-detached residences, and huge villas are available. Apartment dwellers have access to a communal private garden, while most house inhabitants have their own. Odense Municipal Statistics Department randomly chose 2500 people aged 18–80 to receive an 18-page mail questionnaire in October 2005. After two reminders, 1305 (52.2%) returned the questionnaire. We used three distance measurements to predict the frequency of usage of the nearest UGS in three logistic regression analyses to determine which was best. The self-evaluated distance is the greatest predictor, with an OR of 1.85 for respondents who felt the nearest UGS was less than 100 m vs. more than 300 m. Euclidian and network distance ORs were 1.39 and 1.47, respectively. All three metrics have substantial odds ratios, although the Euclidian and network distance models are poorly fitting, according to Hosmer and Lemeshow (2000). The results indicated that the nearby UGS's size affects its popularity. The farther away, the more likely it is to be the most utilized UGS. Having small children, being elderly, or having bad health might limit movement. If there is no personal mobility issue, individuals will utilize the larger UGS more often than their local UGS if there is a larger UGS nearby. Understanding this is crucial, as UGS must be accessible to everybody, even the poor. The study's strength is that every piece of data includes a geographic reference, offering a unique look into how different factors affect UGS consumption in a given place. Additionally, the vast number of responses is a strength. This paper's strength is its ability to blend questionnaire data with GIS data; however, there is a danger of misunderstanding because

we don't know if respondents name the objectively nearest UGS. Nor do we know if respondents recognize every municipal GIS-mentioned UGS. It's unclear if the numerous minor UGS were always recognized as useful, even though we only listed UGS with at least one entry that could be visited.

The Journal of Urban Forestry and Urban Greening published its next paper in 2012. Article titled "Use of Small Public Urban Green Spaces (SPUGS)". Based on data from 686 visitors who completed on-site surveys, we explain how Copenhageners utilize nine SPUGS. This study describes SPUGS usage and its variables; hence, the authors ask the following questions: Who utilizes SPUGS in Copenhagen and how? What drives SPU use? Distance to SPUGS and frequency of use? What demographic characteristics affect SPUGS use? A 'population' of all probable SPUGS in Copenhagen's densest housing districts (N = 79) was identified. The City of Copenhagen's pocket park list and aerial pictures were used in ArcGIS 9.3. Existing SPUGS and vacant lots were listed. The study area was divided between multistory structures and single-family homes. All identified SPUGS were visited and photographed before research site selection. Our landscape architecture knowledge led us to categorize all places into thirteen groups based on major physical features and design. The remaining 27 SPUGS fall into five categories: 'Geometric design' (n = 7), a geometrical design; 'South European Square' (n = 3), a hardscape surface and a few trees; 'multi-characteristic' (n = 10), an area with seating, a playground, and space for impulsive but limited activity; 'Café/history' (n = 3), a café and historical context; and 'Traffic' (n = 4), close to a main road. Not all 27 SPUGS were included due to time and budget restrictions. We endeavored to maximize size, vegetation, and architectural design variance in the final selection phase while ensuring that all categories were proportionally represented. Two places were picked from the 'Geometric appearance' (n = 7), one from the 'South European Square' (n = 3), one from 'Café/history' (n = 3), one from 'Traffic' (n = 4), and four from 'multi-characteristic' (n = 10).

All data were obtained in the summer 2010. We visited each SPUGS four times per month, from May 1 to October 1. Each visit lasted 1½–2 hours. To reach as many users as possible, the four visits occurred in the morning, lunch, evening, and weekend each month. We chose July because we believed the weather would be ideal and increase SPUGS attendance. We found a link between context, purpose, and distance. On their journey home, 28.9% of SPUGS users 'socialized,' while

25.4% did so from home. As expected, dog walkers and playground users were either home or on their way. Forrest and restitution', SPUGS were mostly used 'end route' or on the way home. Not unexpectedly, the context of usage by distance traveled showed that shorter distances were connected to 'coming from home and going home' or 'coming from A and going home' and larger distances to 'end route'. Several respondents had traveled '1000–2000 m' (24.70%) or 'more' (26.00%) when 'coming from A and heading home'. Those living near 500 m were twice as likely to attend the SPUGS on a weekly basis as those living farther away. The older persons were more likely to visit the SPUGS at least once a week, but as shown by the broad confidence interval, there was great variance within the age range of 66–100, which did not vary significantly from 15–29-year-olds. People with fewer than 10 years of schooling were 3.4 times more likely to visit the SPUGS weekly than those with more than 15 years. The authors sought to identify the demographic parameters related to the two primary motives for attending SPUGS:'socializing' and 'rest and restitution'. They ran logistic regression analyses using 'rest and restitution' and 'socializing' as dependent variables and age, education, nationality, civil status, and gender as predictors. 'Age' and 'gender' predict SPUGS' rest and restitution' use. Compared to 15–29-year-olds, 50–65-year-olds were more likely to attend the SPUGS for 'rest and restitution'. Women were less likely to visit SPUGS for 'rest and restitution'. SPUGS for 'rest and restitution' did not seem to depend on nationality or civil status. Age and gender again determine SPUGS use for 'socializing'. In SPUGS, all age groups diverged from the youngest age group (reference group) in 'socializing'. Older people were less likely to socialize at SPUGS. Women were more likely than men to 'socialize' at SPUGS. The fundamental rationale for employing SPUGS is that Maat and de Vries (2006) found that individuals don't appear to adjust for the absence of green space in their surroundings. However, since play and dog walking were primarily associated with contextual usage, particularly 'home', this could suggest that the respondents used the SPUGS due to the restriction of their local green space. This may also explain why the age groups 30–49 and 50–65 visited the SPUGS most often, since they were most likely to use the playgrounds.

We found that males and older persons 50–65 utilized the SPUGS forest and restitution'. We don't know why, but we think younger individuals visit the SPUGS with others and use them more for social reasons. These results reveal the key user groups for the two main forms of usage, which is crucial when assessing and analyzing SPUGS's purpose. The data also provide the distance to SPUGS, which helps us understand their function in the city's green morphology. The sixth paper,

"Linking public urban green spaces and human well-being: A systematic review," was authored by Rosa Reyes-Riveros and colleagues. This systematic literature review examined how green space qualities affect human well-being. However, most research views human well-being as multifaceted and quantifies it using composite measures that incorporate various characteristics. This study used **Table 2** to analyze the data the data in five dimensions.

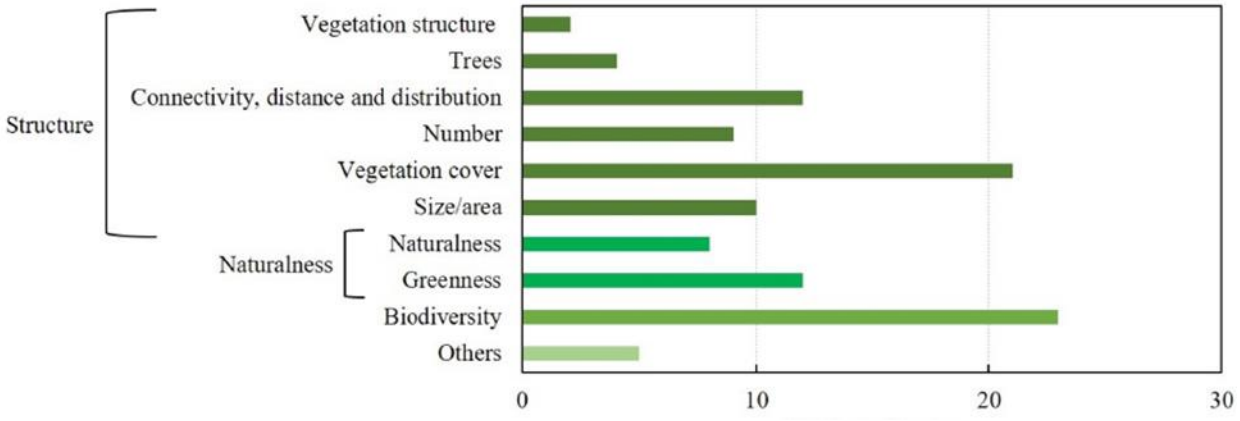
Table 2: Table2. Well- being dimensions

Dimension	Definition
Good social relations	This dimension considers the well-being that humans feel when they develop good social relations, showing mutual respect and helping others. Besides, it also includes the capability to carry out recreational and spiritual/cultural activities.
Freedom of choice and action	Freedom of choice and action is defined as the range of options available to take free decisions or perform actions. Education is a clear aspect of well-being that enhances life prospects. When a person accesses to education increases his/her possibilities to access information and make a free choice of what quality's life he/she wants to live.
Security	A state of security is related to a condition of life when humans do not suffer abrupt threats to their well-being. Different types of security are considered in this dimension. However, some of the most salient threats are organised violence and natural disasters (e.g., climate change and flood). Additional component included in this dimension is secure resources access.
Health	This dimension includes the capacity to receive adequate food (good quality) to be free of avoidable diseases, to have drinking water of an adequate level of purity, the capacity to have clean air, the capacity to have the energy for temperature control (heat and cold). Components included in this dimension are: Feeling well, strength and access to a pollution-free environment.
Basic materials for living well	In this dimension, the basic materials for a good life include the access to adequate income, household assets, food, water, and shelter.

For the review, they used the Scopus and Web of Science databases from November 16 to November 19, 2020. Our search was done using the most common synonyms discovered for the study topic. We started with a generic bibliometric analysis, which compares keyword occurrences and the most cited papers and superimposes a view with keyword colors by publication year. They then examined the most researched public urban green areas, their influence on human well-being, and the methodologies used to assess them. The authors examined many public urban green space

characteristics in the publications analyzed. We divided green space features into four categories: biodiversity, structure, naturalness, and others. Reid et al. (2005) classified human well-being components as health, security, excellent social ties, and freedom of choice and action. Half of the publications assessed the impact of visiting public urban green areas on human well-being that was not related to their features. Access to places, transit, and distance to public urban green areas were used to assess this possibility. Structural factors also positively affected freedom of choice and action in 9% of publications on structure. Higher tree covers improved school achievement in certain assessments (e.g., reading), whereas bigger green space improved teen cognitive performance (concentration values). Security (5%) was positively influenced by the size and connection of public urban green areas, particularly catastrophe security and resource availability. **Figure 3** shows that plant cover and biodiversity are the most researched urban green space features.

Figure 3: The most studies characteristics of public urban green spaces



The 2012 paper "Urban Green Space Design Affects Urban Residents' Social Interaction" examined Malaysian green space designs that are thought to improve community social interactions. Urban green areas' design promotes urban society's activities, influencing human behavior and cultural norms. Strong social relationships in metropolitan society may generate connectivity, meaning, and purpose, whereas a lack of integration can lead to despondency and depressive symptoms. Interaction among urban dwellers lets them get to know their communities and acquaintances. Green spaces were divided into parks and gardens, natural and semi-natural spaces, green corridors, outdoor sports facilities, amenity green spaces, provision for children and young people, allotments, community gardens, and urban farms, cemeteries, disused churchyards,

and other burial grounds, and public space (Bell et al., 2007). However, this study solely covers urban park types. However, social engagement may connect and harmonize areas. This research defines 'social interaction' as the links or relationships between two or more people in a community, especially in multi-cultural contexts. It is also one's communal connection and solidarity (Mahasin & Roux, 2010). This article examines whether green space design's physical or natural features affect social interaction. The centrality of places, user-centric design, and availability of services and amenities like stores and service locations significantly affect people's presence in such areas (Golinik & Ward Thompson, 2010). This research examines urban people's social preferences and experiences in green areas, particularly with design elements. The layout might facilitate social interaction. **Table 3** lists variables.

Table 3: The determined variables

Green Space Properties						
Green Quality	Natural	Manmade	-	-	-	-
Green Setting	Maturity	Density	Physical Boundaries	Design (Physical and Natural Character)	Facilities	Location
Accessibility	Mode of Transportation	Distance	-	-	-	-
Dynamic Feature	Climatic Factor	Peak Hour	Visit Frequency	-	-	-

Social Attributes						
Personal Information	Gender	Age Group	Race/Ethnic	-	-	-
Social Division	Individual	Group	-	-	-	-
Social Preference	Activity	Program	-	-	-	-

Green Space Design Character						
Natural	Fields & Open Space	Trees	Animals	Water Element	-	-
Physical	Playground	Pathway	Shelter & Seat	Courts	Fitness Station	Plaza

Methodology: 330 survey questions (SQ) were delivered in chosen green locations. Users of all ages, races, and ethnicities received it randomly. Only 172 trustworthy responses were analyzed since 158 left the surveys blank, approximately half of the 27 items. Each behavioral observation

was hand-mapped and then digitized. In conclusion, this study found that physical and natural green space design elements impact social interaction among new Malaysian township inhabitants. Green spaces, including fields, open space, playgrounds, play courts, pathways, shelters, and benches, may draw people together. A well-equipped green space doesn't guarantee visitors. Design elements and green space settings work together to create successful green spaces. Considering green space conditions like maturity, shadiness, a complete facility, appeal, safety, cleanliness, and accessibility to a house can boost user visit frequency. Green space usage also depended on spatial element function and layout rather than aesthetics.

Zheng Tan and his colleagues published the eighth study, "Designing Urban Green Spaces for Older Adults in Asian Cities," in 2019, using a questionnaire to interview 326 people in Hong Kong and Tainan, Taiwan. The design of UGSs (e.g., spatial distribution and accessibility, characteristics of plants and UGSs), older adults' perceptions of UGS safety and aesthetic quality, and their self-reported health conditions (assessed by the SF-12v2 Health Survey) were examined using bivariate Spearman rank correlation tests. In addition, the present study sought to understand older individuals' subjective evaluation of UGSs and guide UGS design for older adults by focusing on the following research questions:

1. How may UGSs affect Asian older individuals' self-reported health and well-being? Which age group improves the most after visiting UGSs?
2. Do older people with different self-reported health problems see UGSs differently?
3. What UGS design elements influence older folks' perceptions? How can we plan UGSs for active aging in high-density Asian cities?

Methodology: On-site face-to-face interviews utilizing a traditional paper-and-pencil questionnaire, which provides high accuracy and quality data in questionnaire **Table 4**, memory bias, amount of information, etc. Designers and site selection specialists audited UGSs. The first questionnaire was pilot research, and the second was in-depth interviews on planning and design. At 31 small-scale UGS locations in the two cities, 326 older people were questioned from December 2016 to March 2018.

Table 4: Questionnaire design

	Investigating aspects	Detailed items
1	Subjective assessment on quality and characteristics	Spaciousness, number of trees, facilities, seating, safety and aesthetic of qualities of UGSs
2	Usage pattern	Time of the day for the visit, visit frequency and duration
3	Self-reported health status	Short form 12v2 health survey
4	Socio-demographic	Age, gender, Martial status, living arrangement, level of education, income level, perceived social status
5	accessibility	Subjective assessment of the accessibility of UGSs, walking time required from home, obstacles (such as traffic and stairs), and frequently visited places near the UGS.
6	Activities in two types of UGSs	Visit duration, the type of activities and companies
7	Preferences for different designs and settings	Sitting under a tree VS sitting in the sun, view of greenery, visual access to the streetscape. View of other site users and their activities, acoustic environment and atmosphere
8	Design and aesthetic qualities	Color, shape and seasonal variation in the vegetation, diversity in species, maintenance and proportion of soft surface.
9	Perceived safety	Reduced visibility associated with dense vegetation. Prospect of crime, presence of security guard, fear of falling, and feeling unwell.

UGSs may improve health and wellbeing since the duration of the visit was positively connected with older persons' social functioning and mental health, especially those with lower incomes or single homes, older age groups, and female respondents. Greater physical health ratings were associated with greater UGS safety perceptions. Higher health ratings favored bright, vibrant UGSs with more people, whereas poorer health scores favored shady, quiet ones. People perceived better-looking UGSs as safer due to their aesthetic appeal. The UGS's upkeep and plant color influenced safety perceptions, and older people preferred more flowers. To encourage active aging, UGSs might be near wet markets, stores, and public housing. Additionally, we should design parks for varied use cases based on geography and incorporate more social aspects. The ninth article, "Planning of Urban Green Spaces: An Ecological Perspective on Human Benefits," discussed the pros and cons of using the ecosystem services method to build green spaces in 2021. The focus is on the main urban ecosystem services provided by green roofs and community gardens like GI,

which can provide ecological and social multi-functionality to waterproofed surfaces connected to buildings and low-exploited gardens, which affect dense urban settlements and increase ecosystem services like reducing urban heat island and flooding events. The paper discusses (i) feedback between ecological processes and functions that support ecosystem services, (ii) urban environmental stresses and their disservices to human well-being, and (iii) key issues in urban ecosystem service planning and design. A new perspective on urban ecosystem services emphasizes the necessity of including GI in built environment urban space planning. "Publicly owned and accessible open spaces within urban areas, wholly or partly covered by considerable amounts of vegetation" are known as urban green spaces, and they are known to reduce the land use effect of urbanization. They comprise forest, road, park, garden, and environment conservation trees. Urban plans specify the link between green and developed places; thus, parks, public gardens, road trees, etc. are essential (Salbitano et al. 2016).

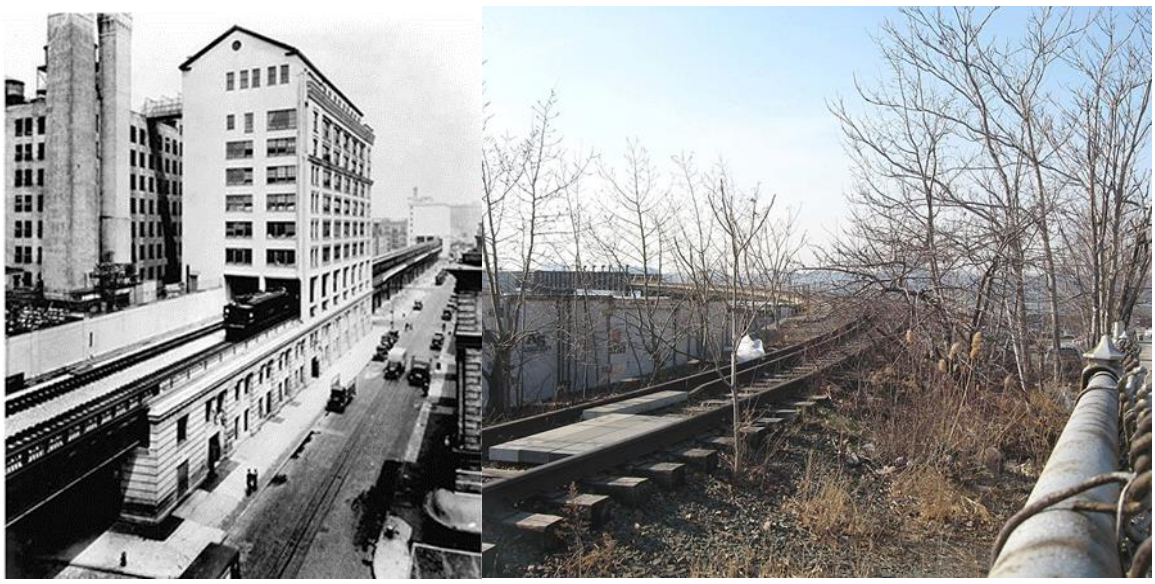
We first synthesize urban green space ecosystem services using green roofs and community gardens. We examine ecosystem disservices from improper vegetation usage, using pollution and plant responses to environmental stresses as examples. The Economics of Ecosystems and Biodiversity (TEEB) taxonomy classifies services into provisioning, biological, habitat, cultural, and amenity categories.

Last but not least, such solutions are examined from a fresh perspective that views vegetation as an active aspect of urban space planning to maximize advantages and avoid drawbacks. We acknowledge that the review is not exhaustive and that a further analysis of co-creation processes involving scientific and non-scientific stakeholders in relation to the challenge(s) at stake is foreseen. Some papers used stakeholder involvement to analyze GI's ecosystem services and benefits. Time is also crucial because human demands, scientific research, technology, and environmental and urban regulations change; therefore, ecological functions that provide ecosystem benefits and disservices might too. This review should lead to a new vision calling for a trans-disciplinary approach to different scales, from single physiological processes of vegetation to neighborhood and city scales, involving scientists, decision-makers, and business companies to choose the right GI system.

In the next paragraph, researchers will examine many case studies to learn more about ideas, information, and the structure of real-world human initiatives. Project managers face various

challenges, and these case studies shed light on the completion and management of projects under various conditions. These real-world examples can help us understand project success and failure and identify best practices for our own initiatives. The 1.45-mile High Line Park in New York City is the first example. It was converted from a west-side Manhattan elevated railway track **Figure 4**.

Figure 4: Abandoned High Line tracks in 2009



This Manhattan retreat has trees, walking routes, benches, and art pieces. James Corner Field Operations, Diller Scofidio + Renfro, and Piet Oudolf designed the High Line. It extends from Gansevoort Street in the Meatpacking District to 34th Street, between Avenues 10 and 11. Section 1 from Gansevoort Street to 20th Street opened on June 9, 2009; Section 2 from 20th West Street to 30th St opened in 2011, and the third phase from West 30th to West 34th St opened in 2014. We anticipate the opening of a minor elevator-equipped section of 30th Street in 2015. The abandoned spur is now a "living system" combining landscape architecture, urban planning, and ecology. A 1993 Parisian tree-lined promenade, the 4.7 km (2.9 mi) Coulée verte, inspired the High Line. The designers of New York City's High Line Park aimed to address numerous urban needs:

1. The transformation of unused space
2. Community revitalization
3. Preserving History and Culture
4. Urban renewal and innovation

5. Public access and recreation
6. Biodiversity and Sustainability
7. Economic advantages

An abandoned southern viaduct of the New York Central Railroad's West Side Line houses the park. Starting in the Meatpacking District, the park spans from Gansevoort Street three blocks below 14th Street through Chelsea to the northern boundary of the West Side Yard on 34th Street at the Javits Center. The West Side Line used to go south to a train terminus at Spring Street, north of Canal Street, and north to 35th Street at the Javits Center. In 1980, the construction of the Javits Center led to the demolition of the northernmost segment of the viaduct, thereby reducing rail travel along the remaining portion. **Figure 5** shows portions of the southern viaduct dismantled in the late 20th century.

Figure 5: Current use of high Line Park

The High Line has been an American modern landscape architectural landmark since launching in June 2009. The High Line's success has prompted US communities to repurpose outmoded infrastructure as public space. Along the way, real estate values rose as tourists visited the park and developed nearby neighborhoods, real estate values rose. By September 2014, the park had approximately five million visits, and by 2019, eight million. Inspired by the High Line's melancholy beauty and rebelliousness, where nature has recaptured a critical piece of urban infrastructure, the computer turns this commercial vehicle into a post-industrial tool for leisure, life, and progress. The "agri-tecture" method changes the laws of engagement between plant life and pedestrians by combining organic and construction elements in proportions that respond to

nature, culture, intimacy, and hyper-sociality. This parallel linear experience is sluggish, distracting, and otherworldly, preserving the High Line's peculiar nature, unlike Hudson River Park. The proposal is constantly incomplete, evolving and sustaining change as it adapts to the changing demands, possibilities, and wants of the dynamic setting.

The land is divided into planting zones. High Line gardeners planted plants from nurseries selected by landscape architects James Corner and Piet Oudolf. The vegetation includes grass, bushes, bulbs, perennial trees, and tropical species like banana trees **Figure 6**.

Figure 6: Plants and vegetation in High Park

The High Line Park's multifunctional design transformed a desolate site into a thriving urban park that provided vegetation, leisure, community development, and urban revitalization. The Miami Underline is the second case study. **Figure 7** depicts the construction of a 10-mile linear park featuring fitness pathways, art exhibits, and green areas beneath Miami's Metrorail.

Figure 7: The Underline, Miami, USA

The first section of a park under Miami's Metrorail is open. The 2017 design boom highlight 'The Underline' is being finished in sections to become an urban trail and public art attraction. Meg

Daly and James Corner Field Operations created the site plan. The project's first phase, "brickell backyard," debuted on February 26, 2021. This first half mile of the underline, designed by field operations, includes the river room, with separate biking and walking paths, a dog walk, and native grasses, trees, and flowers; an urban gym with exercise equipment, basketball, and soccer facilities; the promenade, an urban stage with a plaza for cultural and wellness programming and community events; and the 'oolite room', with four butterfly gardens nestled in a natural stone ca. Phase two will add 2 miles (3 km) to the network, while the final phase will add 7 miles (11 km). After completion in 2025, the project will create more than 120 acres of open space with restored natural habitats, improved pedestrian and bicycle pathways that connect directly to public transportation, and active, passive, and cultural programs and installations **Figure 8**.

Figure 8: Different activities in the Underline in Miami

In response to urban and neighborhood demands, designers created the Miami Underline to transform an underutilized site into a dynamic and useful corridor. Here are its main design reasons:

1. Utilizing Underutilized Space
2. Connectivity and Community Engagement
3. Active Transportation and Recreation
4. Environmental benefits
5. Economic and Social Impact
6. Safety and Accessibility
7. Beauty and Identity
8. Forward-Thinking Urban Planning

The Underline's multi-functional design blends active transportation, landscaping, community participation, and economic growth into Miami's urban fabric. Seoul's Cheonggyecheon Stream is another example. An excavation and revitalization of a historic stream created a pedestrian-friendly green corridor throughout the city **Figure 9**.

Figure 9: General perspective of Cheonggyecheon Stream

This project is located in Seoul's Central Business District, the source of the Cheonggye River, which has two urban superblocks. Individual stone sculptures symbolize the eventual unification of North and South Korea's nine provinces and celebrate the city's cleaned surface and subgrade runoff source. The stones from provincial quarries frame the urban plaza and provide direct access to the river. As stones sink and reemerge, the canal design adapts to seasonal flooding. Seoul’s enormous canal reconstruction work includes demolishing almost four miles of at-grade and elevated highway infrastructure that split the city to rehabilitate this heavily filthy and covered river. **Figure 10** shows how this old automobile access road became a pedestrian walkway that connects to the ancient Cheonggye River.

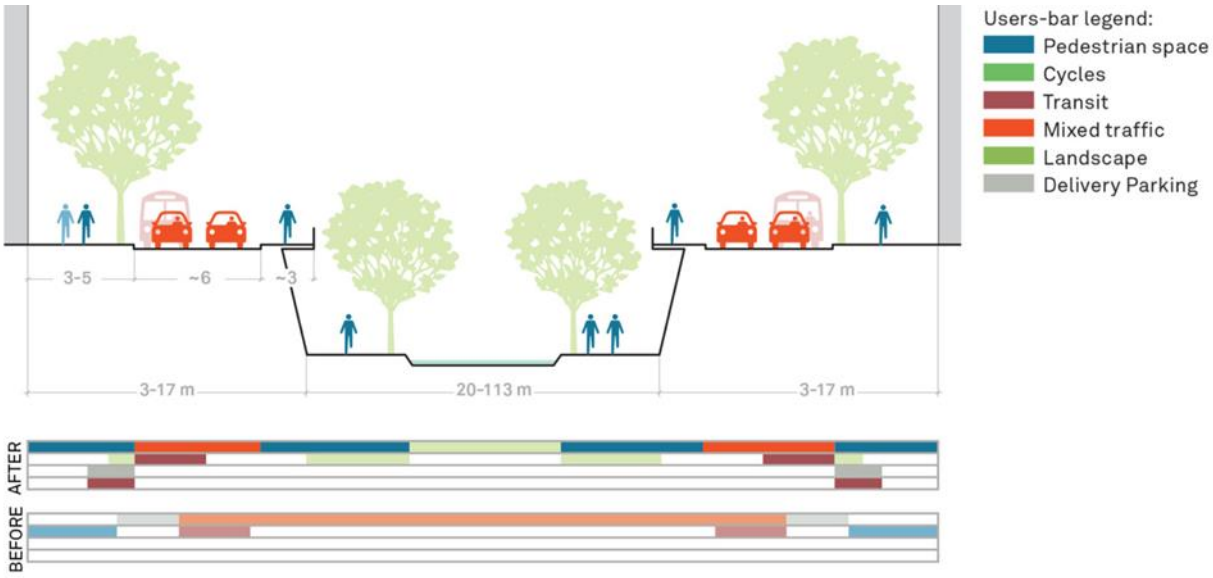
Figure 10: Before and after of Cheonggye River way

It improved air, water, and living quality; decreased urban heat island effects; connected two city neighborhoods separated by road infrastructure; and became a popular recreational area. Here are its main design reasons:

1. Environmental revitalization
2. Urban Issue Mitigation
3. Cultural and Historical Preservation
4. Urban Renewal and Connectivity
5. Economic development
6. Government Initiatives
7. Long-term sustainability
8. Aesthetic Enhancement

The Cheonggyecheon Stream in Seoul was designed and restored to address environmental issues, preserve cultural heritage, foster community engagement, and improve the urban landscape. Removing an elevated highway concrete structure, daylighting a previously covered urban stream, creating an extensive new open space along the stream, creating pedestrian amenities and recreational spaces (two plazas, eight thematic places), and building 21 new bridges to reconnect the urban fabric are also key elements **Figure 11**.

Figure 11: Section of Cheonggye River way



The last example is about Chicago's Lurie Garden. A five-acre Millennium Park Garden featuring prairie-style flora, city vistas, and art. Landscape architect TGDA coordinated Millennium Park's urban garden. Gustafson Guthrie Nichol created this 3-acre green roof garden. Piet Oudolf, known for his innovative gardens, developed the 35,000-square-foot perennial landscape. Piet Oudolf and TGDA sought a sustainable planting design that shows plants' seasonal interests year-round to bring nature back into human homes. **Figure 12** shows that 65% of the chosen plant species are Chicago natives and thrive in harsh urban environments.

Figure 12: The Lurie Garden

The light and dark "plates" of Lurie Garden are bulging and contrasting. The Dark Plate immerses visitors in a volume of densely textured plants, echoing the site's wet, enigmatic history. The Light Plate reflects Chicago's contemporary and creative mastery of nature, offering an exciting view of a clean, controlled landscape. TGDA helped Piet Oudolf select and install woody plants. Chicago designed the Lurie Garden to align with the city's objectives for green spaces, sustainability, and community engagement.

1. Millennium Park Improvement
2. Ecological Restoration
3. Educational and Cultural Importance
4. Stewardship of the Environment
5. Aesthetic Enhancement
6. Urban Renewal and Public Access

The Lurie Garden's architecture symbolizes Chicago's dedication to ecological, educational, and culturally significant green areas. It is a peaceful retreat, educational hub, and urban icon of ecological care **Figure 13**.

Figure 13: Different perspectives of Lurie Garden

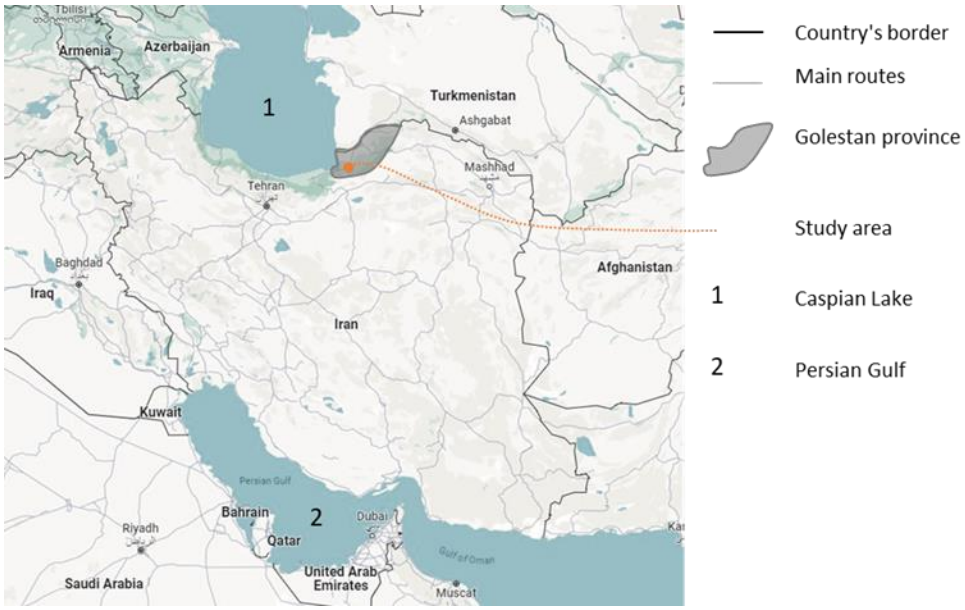
3.STUDY AREA ANALYSIS

Our landscape architecture thesis begins with a thorough study area investigation to uncover context and possibilities.

3.1. LOCATION IN IRAN

The location under investigation is located in the city of Gorgan, inside the province of Golestan. Golestan, located in the northeastern region of Iran, stands out due to its diverse array of physical features, cultural attractions, and economic activity. This province is characterized by the presence of the Alborz Mountain range and Hyrcanian woods in its southern region. It is also located in close proximity to the Caspian Sea in the northwest and Turkmenistan in the north. The climate of Golestan province is modulated by its close proximity to the Caspian Sea, resulting in a temperate environment characterized by gentle summers and mild winters. The primary economic activity in this region revolves around agriculture. Gorgan, known for its fertile plains, is a major hub for the production of rice, citrus fruits, and other commodities. The woods of Hyrkani and the Gorgan River are crucial contributors to the lush vegetation in Golestan, enhancing the region's natural splendor **Figure 14**.

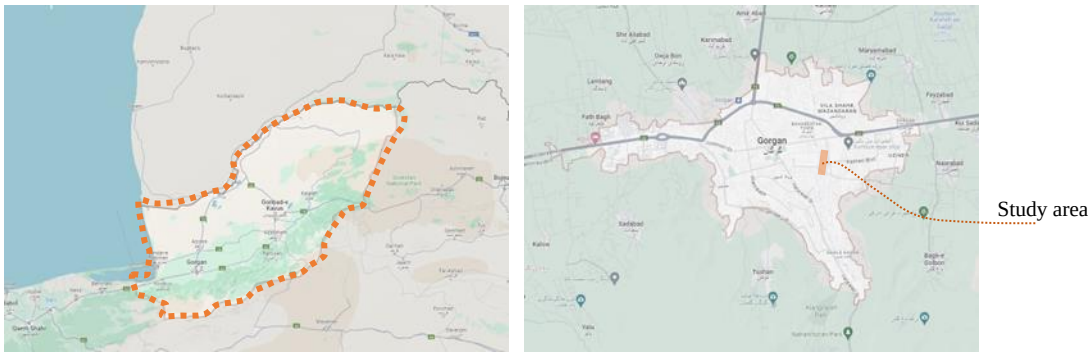
Figure 14: Location of the project



3.2. LOCATION IN GORGAN

Gorgan is a city located in the Golestan region of Iran. It is known for its unique geographical position, several districts, and diversified natural scenery. Gurgaon is situated at around 36.8394 degrees north latitude and 54.4375 degrees east longitude, making it a strategically significant location in the province. The city of Gorgan is comprised of several neighborhoods, each with distinct traits and social dynamics that contribute to its cultural richness. The climatic conditions of Gorgan are influenced by its close proximity to the Caspian Sea, resulting in a temperate climate characterized by pleasant summers and moderate winters. The city's natural allure is apparent via its lush vegetation, expansive woodlands, and the presence of the Gorgan River. Residents are afforded several options for outdoor activities and enjoyment. The seasonal fluctuations in temperature provide inhabitants with a consistently pleasant living environment for the majority of the year. The Gorgan River and underground water wells are significant sources of water that play a crucial role in maintaining agricultural sustainability and supporting the local economy. Gorgan serves as a prominent economic, cultural, and administrative hub in Golestan province, playing a vital role in the region's progress and growth **Figure 15**.

Figure 15: Location in Gorgan



3.3. HISTORY BACKGROUND

The history of Gorgan, that is the city in Iran and also the broader historic region in Central Asia, goes back to millennia and is a result of the contact of different civilizations and cultures.

Ancient Settlements: Based on archaeological evidence, it is estimated that people have inhabited the Gorgan region since the 4th millennium BCE. Over the course of history, it has served as a hub

for commerce and cultural interaction, particularly due to its proximity to the Silk Road and Caspian Sea.

The Persian Empire: Gorgan was a location where many Persian dynasties exerted significant influence, establishing a substantial presence of the Persian Empire. It served as the primary center for agriculture, commerce, and administration within the empire.

Sassanian Era: During the Sassanian period, which lasted from the 3rd to the 7th century CE, Gorgan saw increased significance. The construction of the Gorgan Wall during that period demonstrates the empire's aspirations to fortify its northern boundaries against incursions by nomadic tribes. The Islamic conquest in the 7th century CE transformed Gorgan into a significant center of Islamic culture and governance. The Abbasid Caliphate flourished due to the concurrent growth of trade and the advancement of Islamic civilization. During the Medieval Period, Gorgan maintained its prosperity and served as a significant hub for trade, connecting Central Asia, the Middle East, and Europe. The wealth of the region attracted the interest of other empires and dynasties, including the Seljuk Turks, the Mongols, and others. In the subsequent years, Gorgan's fate has been closely tied to the fluctuating influence of neighboring nations. The region saw phases of prosperity and poverty under several rulers, including the Safavids, the Qajars, and the Pahlavi. Iran saw significant political and social upheavals. In the present day, Gorgan has transformed into a vibrant city that thrives on education, commerce, and cultural activities in Iran. It continues to play a significant role in the country's economy, particularly in the areas of agriculture and tourism, as well as in the conservation of its abundant historical and cultural legacy. The history of Gorgan is characterized by its geopolitical importance, multicultural legacy, and long duration, which serves as evidence of the influence of the civilizations that have flourished in the region.

3.4. CLIMATE CONDITIONS

The climate of Golestan province, namely its city, Gorgan, is determined by its physical location and its close proximity to the Caspian Sea. Golestan, located in the northeastern region of Iran, experiences a temperate climate characterized by pleasant summers and moderate winters. Gorgan benefits from the moderating influence of the Caspian Sea in this region, which helps to manage both temperature and humidity. The summers in Gurgaon are typically mild to hot, while

the winters are quite chilly and occasionally have rain. The city has abundant precipitation throughout the year, with a special emphasis on the spring and autumn months. This results in the plains being lush green and highly fruitful. Fog and dust are common occurrences in coastal locations, contributing to the distinctive appearance of the terrain. However, the region is also susceptible to sporadic extreme weather events, such as thunderstorms and heavy rainfall, which can result in flooding and landslides in certain areas. The climate of Golestan and Gorgan has a significant influence on agriculture, natural landscapes, and the overall welfare of the local inhabitants.

3.5. LAND USE

The city is encompassed by the Hyrcanian woodlands and the Alborz Mountain range to the south. In the southern regions, the residential areas are interspersed with sections of woodland, whereas in other areas, there is a high concentration of urban development. A river originating from the southern mountainous region flows into the city and traverses through the densely populated residential area. The northern half of the city has agricultural fields, and there are other villages around the city of Gorgan. The research location has been chosen in a densely populated area of the city, next to the Gorgan River **Figure 16**.

Figure 16: Land use

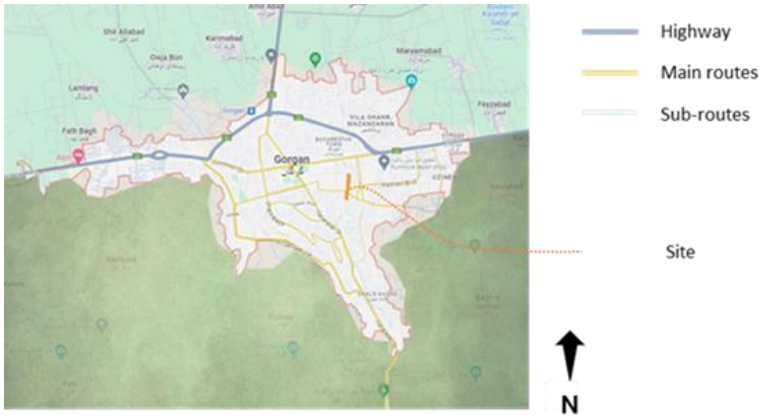
3.6. TRAFFIC CONDITIONS

The traffic conditions of Golestan Province, particularly in its largest city, Gorgan, exemplify the intricate and ever-changing nature of urban transportation in the northeastern region of Iran. The level of traffic congestion in Golestan Province is influenced by several factors, such as the density of the population, economic activity, and the quality of the transport infrastructure. The primary issue in Gorgan, the central urban hub of the province, is the significant traffic congestion, particularly during rush hours and in crucial zones. The city's road network, consisting of primary thoroughfares and smaller streets, has persistent congestion at the principal junctions and entry points. Attempts to alleviate road congestion through road extensions, traffic management initiatives, and enhancements to public transportation have been undertaken; however, the obstacles persist. These challenges include inadequate infrastructure, limited public transportation options, and the growing number of automobiles on the highways. In addition, elements like the volume of pedestrians, concerns over road safety, and the implementation of traffic laws contribute to the overall traffic conditions in Golestan and Gorgan. Addressing these challenges requires a comprehensive approach that includes investing in transportation infrastructure, promoting various sustainable transportation choices, and implementing public campaigns to foster a more civilized driving culture and alleviate traffic congestion.

3.7. ROAD SYSTEM

This urban area is comprised of main thoroughfares and secondary streets. Primary thoroughfares serve a crucial function in facilitating the connection between various sections of the urban area. A major thoroughfare is situated in the northern region of the city, serving as a crucial conduit for vehicular traffic and as a vital connection to neighboring cities **Figure 17**.

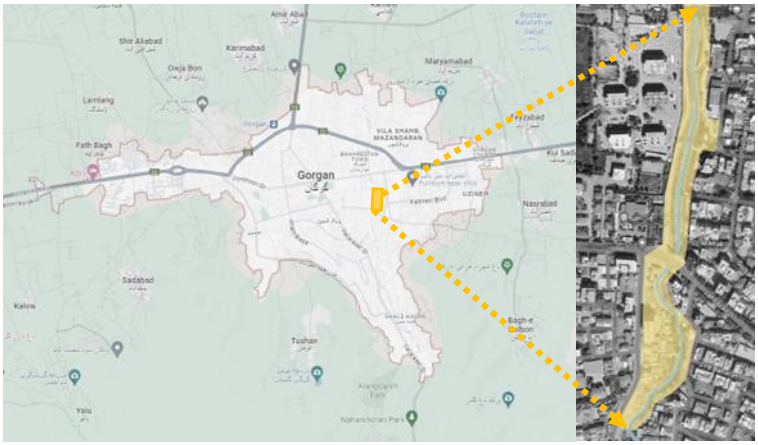
Figure 17: Road system



3.8. ANALYSIS SITE

Small-scale analysis will focus on the study area. The studied area of 3500 hectares is adjacent to the narrow river of Gorgan **Figure 18**.

Figure 18: Site Location



3.8.1. HISTORICAL RESEARCH OF THE SITE

We are observing several alterations in accordance with the city's expansion strategy. Over time, the forests around the city have been transformed into agricultural regions due to population development. Additionally, the majority of agricultural lands have been converted into residential spaces to meet the high demand for housing **Figure 19**.

Figure 19: Historical research of the site

3.8.2. FUNCTION AROUND THE SITE

The location is located in a residential area. The western part of the compound consists of government land belonging to the army, which covers a significant part of the western side. The land is close to essential facilities such as hospital, school and volleyball club. On the north side of the field, there is a compact park with a basketball court and a small grass area where people can relax in its green space **Figure 20**.

Figure 20: Function around the site

A The green space includes a place to sit and a basketball court

B Small green space without playground and sports space

C Small green space with playground

D The main park of the city along with sports field and playground

School

Government site (Army)

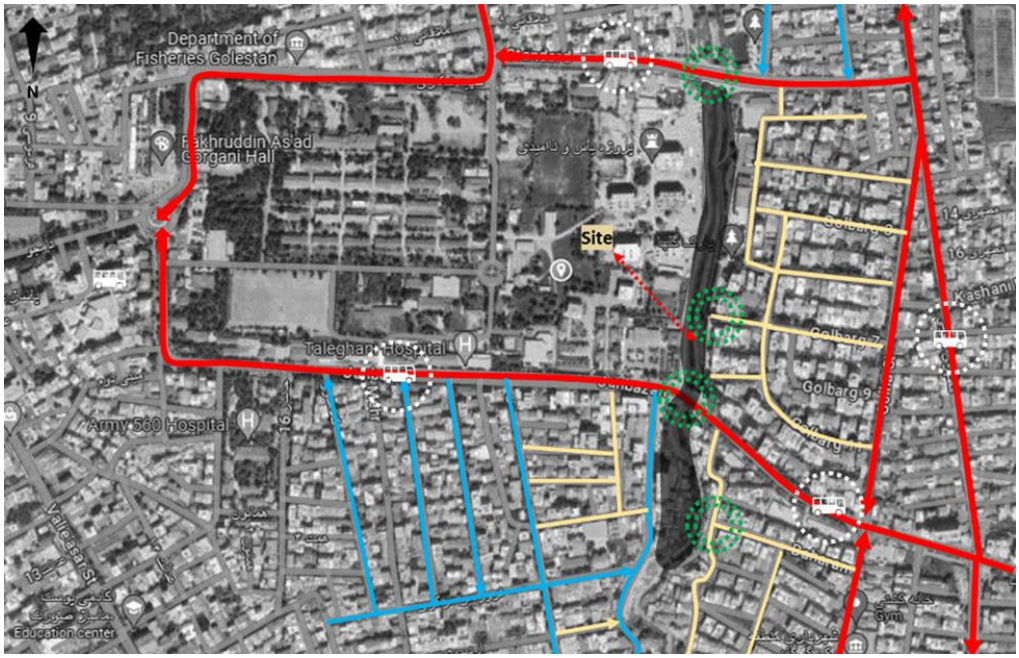
Volleyball club

Hospital

3.8.3. ROUTE SYSTEM, TRAFFIC, PUBLIC TRANSPORTATION

Given the site's proximity to the city core, the property is traversed by many prominent and crucial metropolitan roads, which see significant traffic throughout the day. Aside from the very congested routs, there are alternative routes with lower traffic that may be used to visit the site. In fact, the site is connected to the city by many main and secondary routes. There are many bus stops in close proximity to the location **Figure 21**.

Figure 21: Route system, Traffic, Public transportation



3.8.4. ACCESSIBILITIES

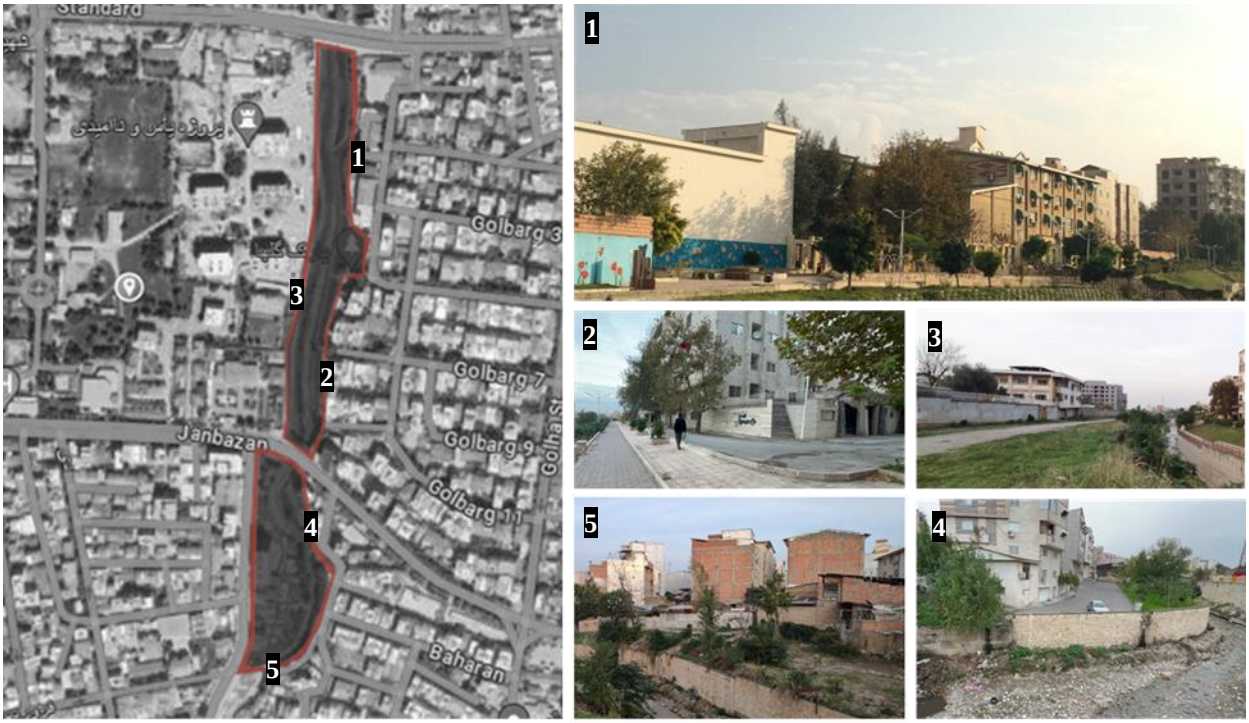
Given the presence of primary and subsidiary routes surrounding the site, it can be inferred that the site is accessible from nearly all directions. However, the primary access points are located in the northern and central areas of the site **Figure 22**.

Figure 22: Accessibilities

3.8.5. SITE BOUNDARY

There are a multitude of residential complexes in the vicinity of the site. There are a multitude of apartments located on the western side and the eastern side. On the western side, there is a wall that serves as the demarcation between the property and the site, which is owned by the military administration **Figure 23**.

Figure 23: Site boundary



3.8.6. CURRENT SITUATION

The current condition of the site includes two small parks for children and two sitting areas. Due to the neighborhood with residential complexes, we see a pedestrian path along the site, and in the southern part of the site there are dilapidated buildings that are not in a good condition. In general, the land is empty and There are many spaces for design that are not currently functional **Figure 24**.

Figure 24: Current situation

3.8.7. USERS

Considering the two small parks on the site that are suitable for children and parents, these two areas are the most used during the day, the amount of use and the hours of use vary according to seasonal conditions, for example during the summer due to the high heat of the hours Parks can be used between 6:00 and 10:00 p.m., while during winter, the park can be used between 3:00 and 7:00 p.m. Next to the two parks, the residents use the empty land on the west side of the site, which is adjacent to the government land, as a walking path, usually the hours of use of this space are in the evenings **Figure 25**.

Figure 25: Users

3.8.8. TOPOGRAPHY ANALYSIS

Along the water channel in the southern part of the site, there are parts of the land with different heights, which are there for residents to access both sides of the water channel in the southern part of the bridge, and also in the northern part of the site along the water channel, there is a height difference and there are a number of stairs in We are the extension of the northern part of the site to access the lower height of the site **Figure 26** and **Figure 27**.

Figure 26: Topography 1

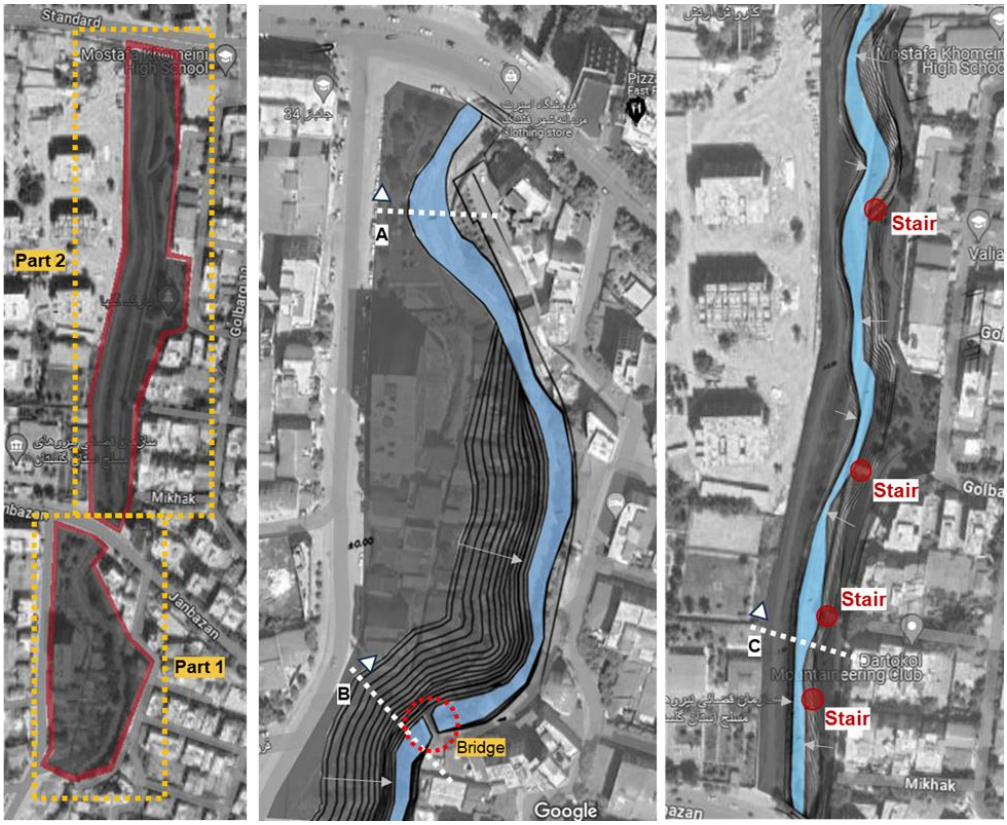
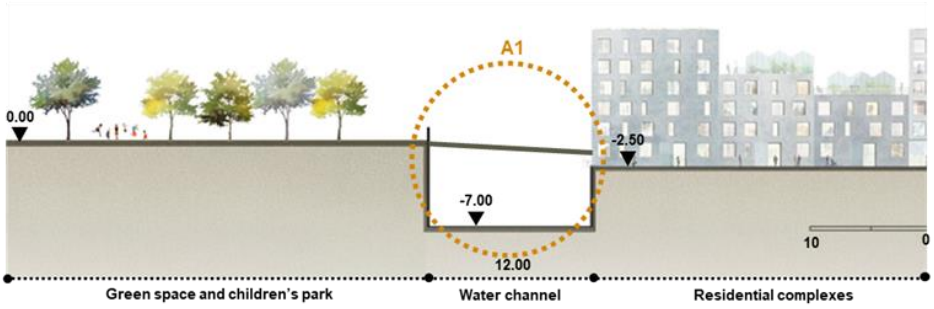
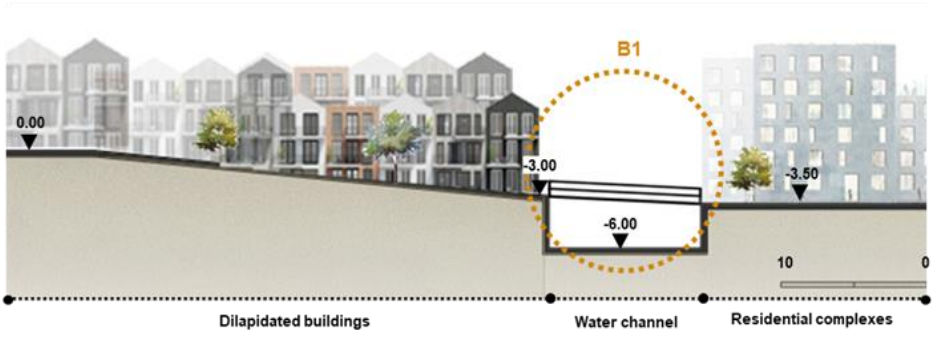


Figure 27: Topography 2



Section A

A1



Section B

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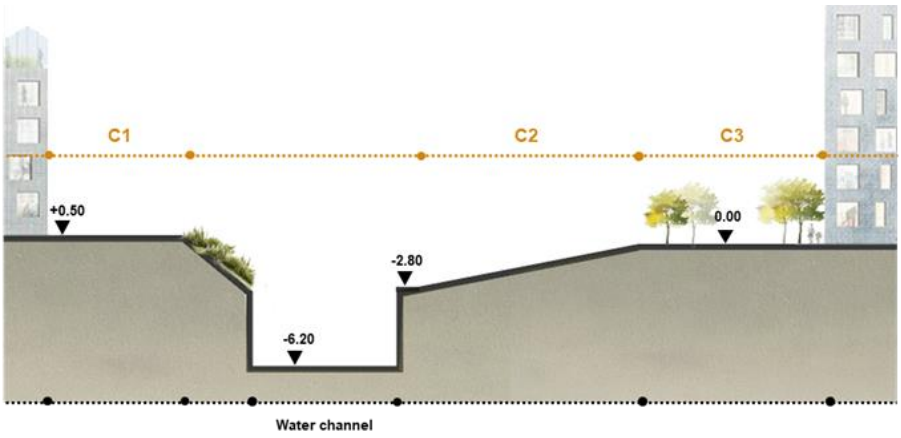


Section C

C1

C2

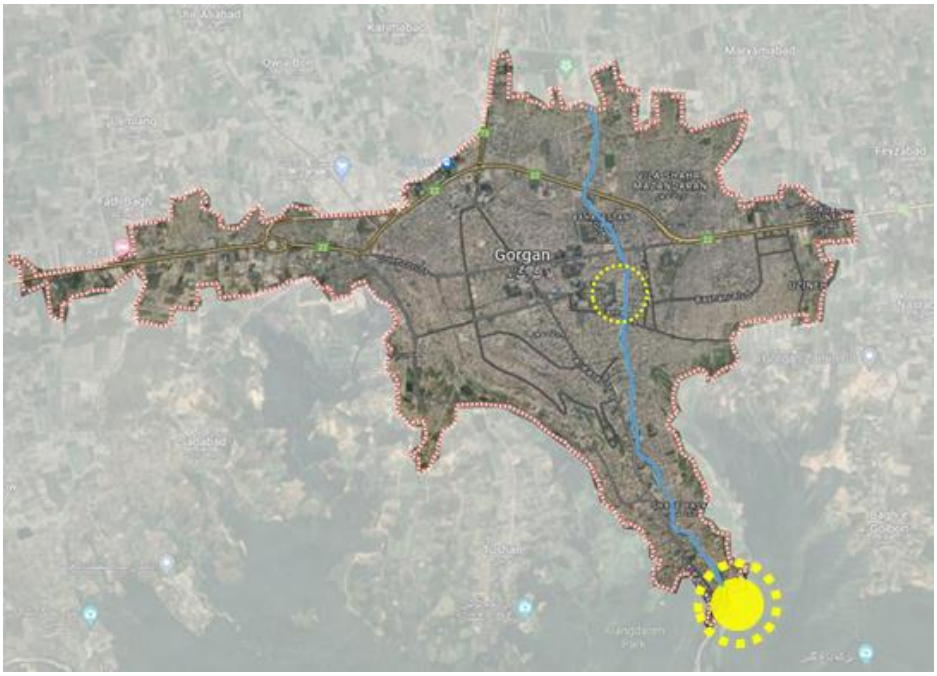
C3

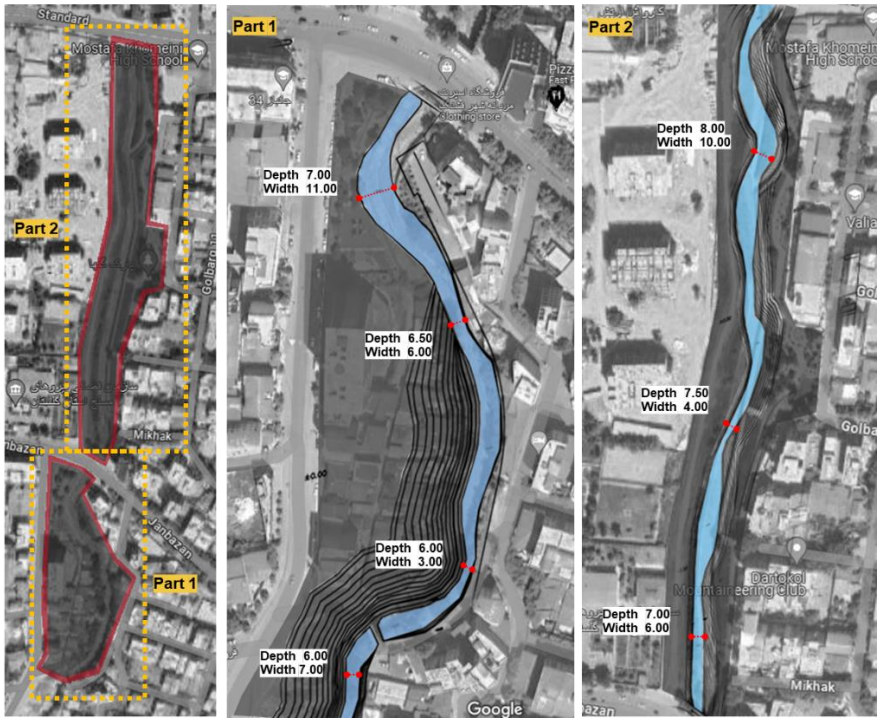
3.8.9. WATER CANAL ANALYSIS

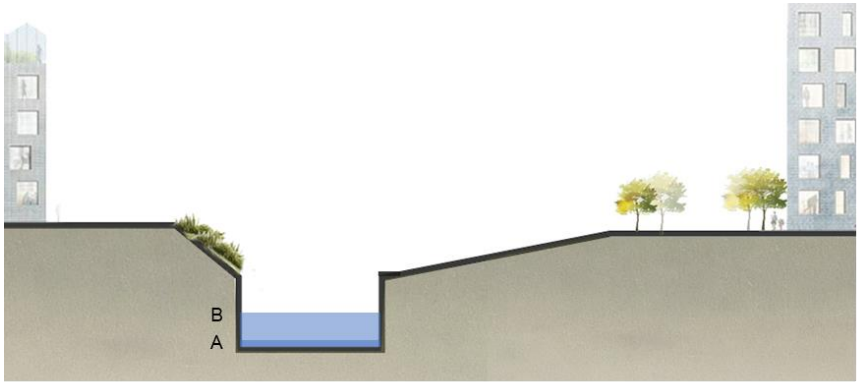
Considering that the Gorgan canal flows from the Gorgan spring, which is located in the south of Gorgan in the Hyrkani forests, and the amount of water in the canal depends on the amount of rainfall throughout the year and also on the urban management, on average, according to the

climatic conditions and climatic changes in recent years, rainfall has been reduced to a minimum. According to these conditions, the amount of water in the canal reaches the highest possible level on average in the autumn and winter seasons, which vary between 20 cm and 120 cm, and in the spring and summer seasons. On average, it varies between 20 cm and 60 cm. (The amount of water in the canal has a direct relationship with the amount of rain.) Unfortunately, due to improper management, we sometimes see that during the summer, the amount of water in the canal reaches a minimum for a short period of time, and sometimes there is no water in the canal for several days. In winter, due to heavy rains, we see that the water channel fills up to 150 to 200 cm, which is not a regular condition, and the probability of this happening is once a year. The depth and opening of the channel vary along the site, and the channel has a gentle slope towards the north. In some parts, the channel floor is concrete, while in others it is natural (gravel). The body of the channel is made of concrete in some parts and large natural stones in others **Figure 28**.

Figure 28: Water canal analysis







A The amount of water varies between 20 cm and 60 cm in spring and summer.

B The amount of water varies between 20 cm and 120 cm in Fall and winter.

3.8.10. PLANT ANALYSIS

The vegetation of the investigated area is mainly composed of native trees in the children's park. Along the walkway in the eastern half of the site, there is a cluster of trees. The vegetation of this area is more mature than other parts. In another part of the site, you can occasionally see grass growing. Plants and weeds have multiplied on the site **Figure 29**.

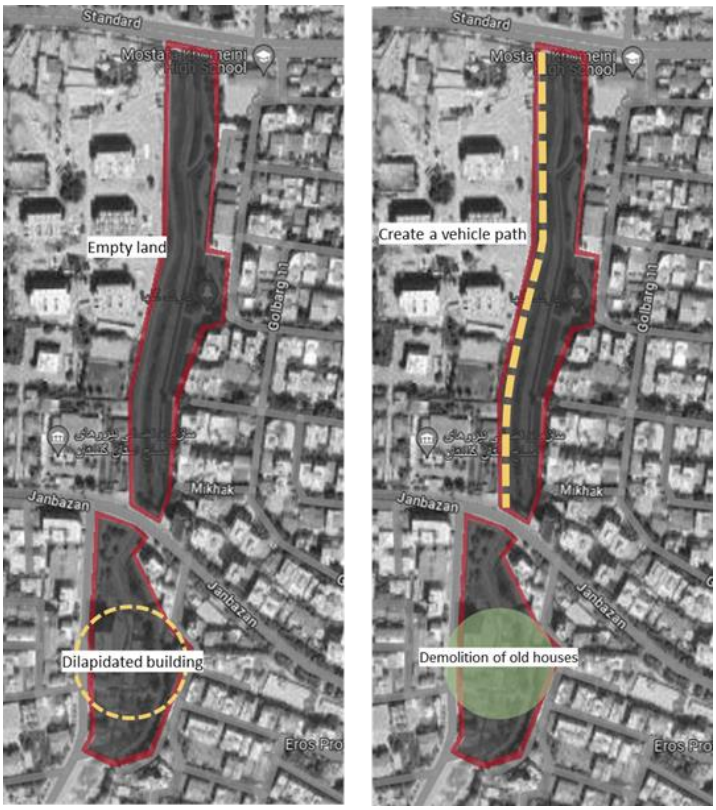
The plants available on the site are: Quercus castaneifolia, Fraxinus excelsior, Populus alba, Acer platanoides, Taxus × media Hicksii, Citrus × aurantium, Acer campestre.

Figure 29: Plant analysis

3.9. URBAN DEVELOPMENT MAP

Managers and trustees in Gorgan are actively looking for a solution to deal with the increase in population and urban traffic. As a result, one of the urban strategies is to build additional roads in very busy neighborhoods to accommodate a large amount of traffic. One of the planned routes is located on the western side of the study area and defines the boundary between the site and the adjacent government (military) territory. Furthermore, because dilapidated buildings exist in the investigated area, the goal is to remove these old buildings and replace them with green areas. This document outlines the municipality's 10-year long-term plan for a specific area of the city. Through a circular from the Gorgan Municipality **Figure 30**.

Figure 30: Urban development map



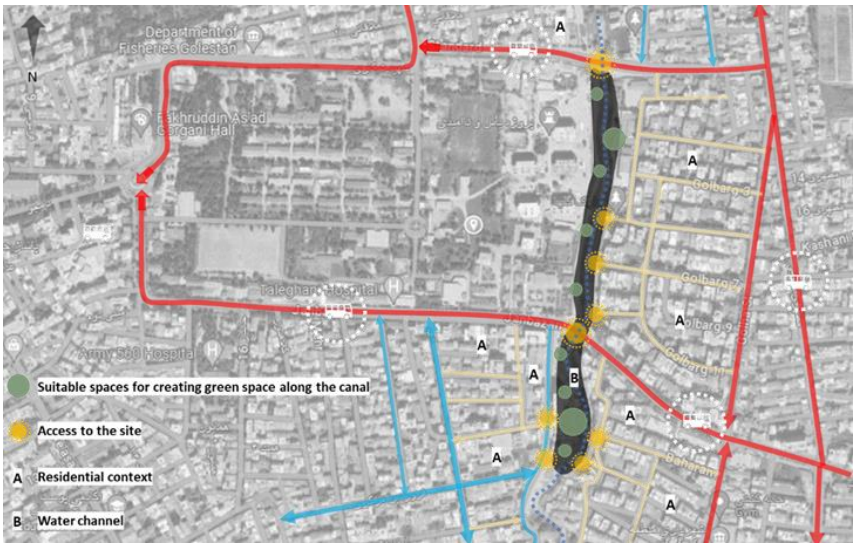
3.10. SUMMARY

The following sections offer a summary of the region that has been examined.

3.10.1. VALUES

According to the analysis of the studied area, it can be mentioned in this section that the site is easy to access. The studied site is located in a dense urban context, and considering that the neighboring sites are residential, there are many routes to reach the site around it. It can be said that it is one of the values of the site. In addition to easy access for residents, there are many undesigned spaces on the site, which can have good potential for designing and improving the site **Figure 31**.

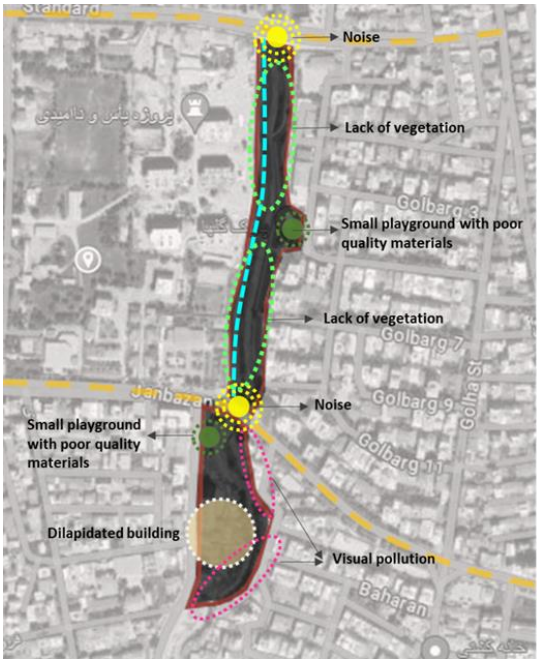
Figure 31: Value map



3.10.2. CONFLICTS

This part provides a summary of the contradictions identified through the study conducted in the site analysis section. These contradictions may include the absence of green spaces and unsuitable plants, visual pollution resulting from the deterioration of structures, and the presence of weeds. We can mention the quality of materials used in children's parks and the lack of suitable space for various activities **Figure 32**.

Figure 32: Conflicts



4. STRATEGY

Any research project needs design strategies. In other words, design methods underpin all research projects. This research's design solutions, or tactics, may be summed up in four main parts:

1. Connectivity and Urban Renewal
2. Aesthetic Improvement
3. Long-term viability
4. Canal Water Management

These strategies are terms that define the research's purpose and coordinate and integrate other parts of the investigation.

Easy access with city connectivity and appropriate green space is the primary approach. Studies reveal a strong association between green spaces and resident health and well-being. City planning, user appreciation, availability, accessibility, and urban function have all been used to evaluate urban green space. These studies have helped city planners and governments manage urban green areas to increase ecosystem services and physical exercise. Common parameters like availability and accessibility classify and evaluate urban green areas (Corine & Laan, 2021). Availability of green urban space quantifies green areas in proportion to land usage, such as size (m2), city size (%), or population size (m2/citizen). Accessibility measures green space availability to public groups by distance. Accessibility to green urban spaces indicates if their geographical distribution meets local demand. This technique has five components:

1. Suitable green space: City green spaces offer four main advantages to citizens: leisure, ecological value, aesthetic value, and beneficial health implications. Recreational options make urban open space popular.

> **1.1 Recreation:** Urban open space Recreation can be active (e.g., organized sports and exercise) or passive. People exercise more in appealing, accessible, open settings, according to research. Recreation in urban open spaces provides a break from overstimulation and the urban environment.

1.2. Ecological: Urban green spaces promote a sense of appreciation for nature. In The End of Nature, Bill McKibben writes that only by immersing oneself in nature can one fully understand it. He follows Henry David Thoreau's example by retreating to the Adirondack Mountains from civilization and its overbearing ideals. He writes about society and human effects while he watches airplanes fly overhead or hears motorboats shout.

1.3. Health Impact: Open urban areas with trees or bushes tend to moderate temperatures and reduce air pollution. Populations with more green space reported better health. Researchers have linked urban open space access to reduced incidence and severity of chronic illnesses caused by sedentary lifestyles, improved mental health, and reduced health implications of climate change (Giovagnorio et al. 2017).

2. Creating a good landscape in the urban context: open areas in cities have inherent aesthetic value. When nature is scarce in metropolitan areas, people enjoy seeing it. Thus, open space "replaces gray infrastructure. Overall, aesthetics can be vital to urban landscape design.

2.1 Promoting biodiversity: Urban open spaces promote biodiversity by providing a habitat for native species in unsuitable regions due to human growth. Biodiversity loss reduces ecosystems' ability to collect resources, create biomass, and support ecological processes like nitrogen cycling. Ecological losses reduce human wellbeing and nature's benefits (Itani et al., 2017).

2.2 Easy access for all ages and disabled people: Studies on physically active middle-aged and older persons demonstrate that green spaces boost benefits. Coupled stress reduction reduces the risk of depression and increases exercise frequency. The adolescent years are crucial for children because they grow, develop, and form habits. Children typically take advantage of active opportunities. Access to parks and recreational facilities through urban green space makes youngsters more active. [53] In all ages, green areas encourage leisure strolling, physical exercise, and less inactive time. [54] Coordination shows that residential green space lowers BMI. [6] Children who are active and have a healthy BMI as adolescents are less likely to be obese as adults (Maas et al., 2018).

2.3 Urban connection with the help of riding and walking routes: Walking and cycling improve mental and physical wellness. Many European towns now prioritize walking and

cycling in transit planning. Many bikers and pedestrians feel neglected and experience air pollution, noise, and travel injuries. Most users emphasize safety (Coombes & Jones, 2010).

3. Physical and mental health: Public urban space planning and design have not been studied for mental health. The findings demonstrate that micro-level environmental factors, particularly natural components, considerably impact pedestrian street mental health. Car-dominated streets have a greater impact on mental health due to macro-level environmental factors. Pollution affects mental health most in car-dominated streets. Social ties, safety, and social surveillance also affect mental health in pedestrian walkways. Mixed land use, public transit, attractiveness, active edge, pedestrian path quality, soundscape, and air pollution are most linked to mental health on both streets. Car dominance undermines mental health through air and noise pollution and by reducing social space experience (Hematian & Ranjbar, 2022). Urban parks, trails, and other outdoor public places are used for exercise more than gyms. How people use parks and trails depends on their location. Residents are more likely to exercise if the park is close to their homes.

3.1 Create social interaction: Neighborhood size, population, facilities, and other variables influence human contact in open areas. Therefore, each research domain affects each study area differently. Researchers are also finding socio-demographic and user profile variables that influence open space visits (Kingsley, 2019).

3.2 Activity area: Parks and green areas in neighborhoods encourage a range of physical exercise. Public plazas, nature reserves, and greenways are less studied in active living research than parks and green spaces. Urban design study defines public open space as ‘managed open space, often green and available and open to everybody, even if temporally controlled’ (Pengelly et al., 2012).

4. Sustainable design: Planning and designing urban open spaces improves the sustainability and resilience of the built environment. Green infrastructure in urban open spaces may promote sustainable development, strengthen cities, and enable new safe transportation scenarios (Shishegar, 2013).

4.1. Rainwater storage for watering plants: Harvesting and managing rainfall in urban settings to feed non-potable water users saves high-quality water for potable use and limits

freshwater waste. A model is used to simulate the rainwater collection system and modified with an algorithm to account for soil water availability for plants and its temporal degradation based on soil type and vegetation. For each scenario and tank size combination, reliability indices are calculated and compared, and detention time and annual usage volume per unit tank capacity indicate tank water quality deterioration and economic benefit from resource exploitation. The optimal rainwater collection scenario and tank capacity are determined (Ledsom, 2019).

4.2. Use of environmentally friendly materials: Sunlight raises surface warmth as albedo decreases; therefore, dark hues are warmer and vice versa. Clear and smooth materials like marble behave like shadows because their surface temperature is similar to the air temperature. A clean surface like marble can reflect sun energy onto a space. The heat balance comprises the surface temperature (MRT) and all radiation, including reflected radiation (Ward Thompson, 2011).

4.3 Native and Seasonal vegetation: Birds and other pollinators depend on native plants in the local ecology. Native plants help pollinators like hummingbirds, butterflies, and moths survive and complete their life cycles by supplying nectar. Local towns may help birds and other pollinators by planting native plants in city parks, roadside medians, public rights-of-way, and around public buildings and infrastructure. Municipalities can gain economically and ecologically from native plant landscaping (Wolch et al. 2014). Open vegetation with a lot of grass boosted visual services, while flowers and attractive trees improved people's spiritual perspective. Aesthetic and spiritual services were also higher with more tree species, especially blooming and fruiting trees.

4.4 Use of clean energy such as solar panels: Smart cities use technology and data to optimize energy use and quality of life. Solar energy is essential to this ambition since it is clean, dependable, and sustainable. Smart cities use solar energy to provide a seamless and integrated urban experience, from intelligent street lighting to electric vehicle charging stations. Advanced energy management systems optimize energy use, decreasing waste and expenses.

4.5 Education and awareness to people using signs and signs: Arts-based approaches offer similar experiences and impressions compared to sticker maps. Perceptions of

human-environment interaction, relationships, and ‘sense of place’ in urban open areas were the key findings (Suomalainen et al., 2022).

5. Canal water management: Blue and green areas enhance city quality by providing air corridors, visual comforts, and public mental health. Historic blue and green urban areas were geopolitical and agrarian. These functions persist in many cities. Suburban neighborhoods benefit from their ecological advantages.

5.1Water Quality Improvement: Urban green space improves water filtration. Green space regulates water through leaf canopy interception, soil capillary storage, and downward infiltration.

5.2 Flood management: Engineering, ecological, and social-ecological resilience are used in flood risk planning and management. Engineering resilience discourse recommends dams and drainage systems for flood risk planning and management. Critics have criticized these methods for harming riverine ecosystems and escalating long-term flood risk (Shishegar, 2013).

5.3. bio-filtration systems: Urban Bio-Filter is both useful and decorative. It has a lot of space for locals to relax and enjoy the garden's natural freshness, as well as solar-powered fans to cool them. Urban Bio-Filter Benefits: 1. cleanses the air: reduces city pollution by removing certain pollutants. 2. Lowers temperature: Plant evapotranspiration reduces the “heat island” effect. 3. Reactivate places: Its aesthetic function comforts pedestrians in public and recreational settings. 4. Add diversity: Dry urban environments can support all natural plant species.

5. DESIGN

During the design process, our creative strokes are influenced by the results of our study area investigation. This allows us to create a blueprint that aligns with the landscape's character and goals.

5.1. DESIGN CONCEPT

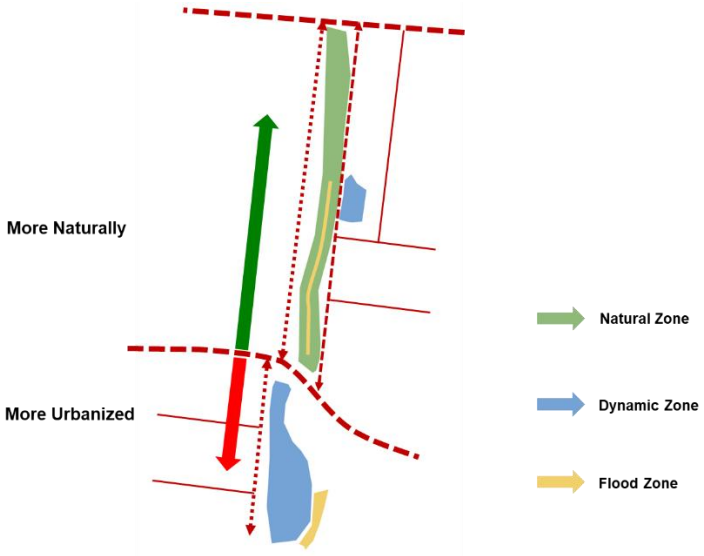
The plan's primary goal is to provide a vibrant environment and an aesthetically pleasing panorama in an urban setting. After examining the site and conducting preliminary research on how green spaces affect people's lives, it is clear that designing a green space with elements that encourage social interaction and physical activity can be very effective **Figure 33**.

Figure 33: Design concept

5.2. FUNCTION

The first stage of design, after analyzing the site and the design concept, was to specify the main functions in the desired site, and in this part, I divided the site into two parts: an urban part and a natural part, which has spaces for different activities in the urban part. They will be designed and in the natural part, most spaces are natural, and spaces with different activities are less visible, which can be suitable for walking and relaxing **Figure 34**.

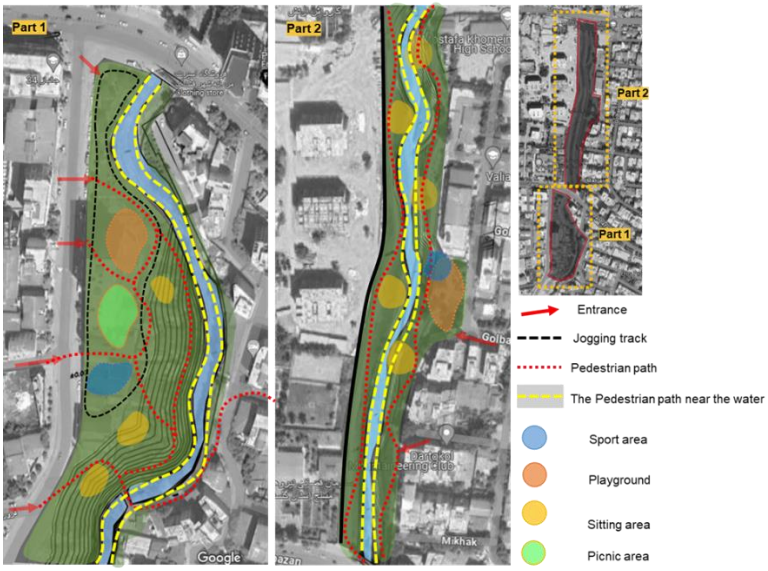
Figure 34: Function



5.3. BUBBLE DIAGRAM

In the section on bubble diagrams, I have separated the site into two segments based on an examination of the site and the identification of its key purposes. The lower section of the site includes jogging paths, recreational areas, picnic spots, tennis and skating areas, canal-side paths, and a children's play area. This section is conveniently accessible from the west side of the site, as there are multiple streets that lead directly to it **Figure 35**.

Figure 35: Bubble diagram



5.4. CONCEPTUAL PLAN

This landscape architecture thesis aims to provide a conceptual design that combines creativity and purpose, picturing dynamic landscapes as harmonious ecosystems that serve both functional and aesthetic purposes.

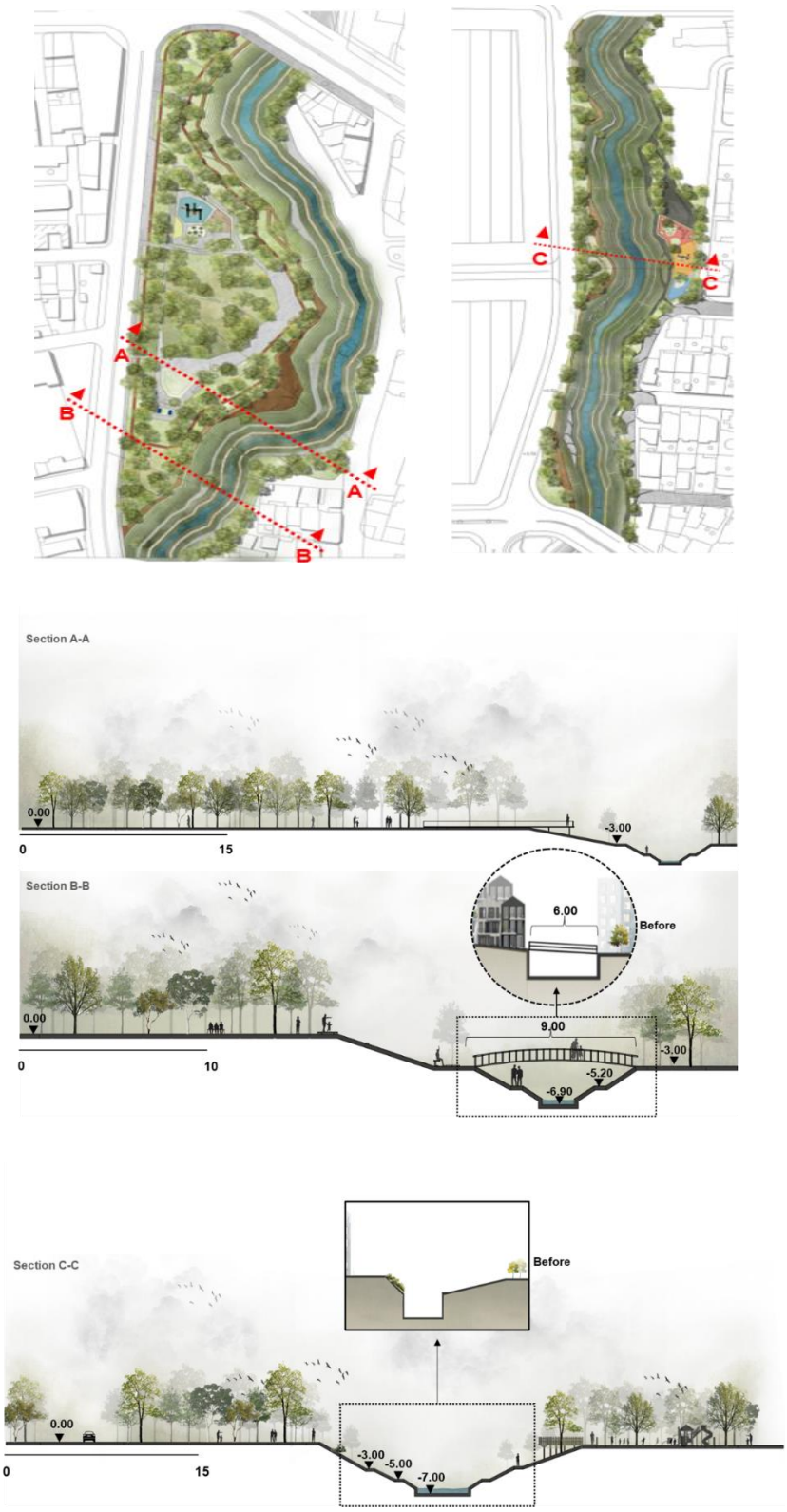
5.4.1. MASTER PLAN (1/2000)

I divided the study area into two separate sections. In the southern part of the site, which is called the first half, I have considered many entrances. This is due to the significant number of streets and alleys surrounding the property, each requiring specific access. The purpose of this action was to increase the connection of the site with the nearby streets. This section has a well-planned running track that spans the entire property and is one kilometer long. We have created a designated picnic area in the center of the property, adjacent to an ample green space that provides space for leisure and social activities. Adjacent to the picnic area, we have created a designated area for children to participate in recreational activities. To strengthen the connection between people and water, there are paths adjacent to the canal. The planners specifically planned the waterway for pedestrian use and used designated seating areas to improve overall connectivity.

The northern part of the site has two primary entrances from the main roads as well as other secondary entrances from the surrounding lanes. We strategically built these entrances to increase residents' access to the site. This part of the property provides a relatively large area for children to participate in recreational activities. A sports equipment section is strategically located near the children's play area. Along the water channel, a natural environment has been created to create space for relaxation and common spaces **Figure 36** and **Figure 37.**

Figure 36: Master plan

Figure 37: Sections



5.4.2. PLANTS CONCEPT

According to the climatic conditions, the plants have been selected, some of them are evergreen trees and broad-leaved trees to create shade in the summer season, and the other part are trees and plants that will be planted near the canal. Plants include.

Trees:

Fagus orientalis, Parrotia persica, Abies nordmanniana, Albizia julibrissin, Quercus macranthera, Juglans regia, Ulmus laevis, Platanus orientalis, Tilia begoniifolia, Acer velutinum, Alnus subcordata, Ulmus glabra, Ilex aquifolium, Picea orientalis, Pinus spp, Cupressus spp, Juniperus virginiana, Thuja occidentalis, Cryptomeria japonica.

Shrubs:

Rhododendron spp, Hamamelis spp, Pieris japonica, Camellia spp, Kalmia latifolia, Skimmia japonica, Nandina domestica.

Herbs:

Rosmarinus officinalis, Salvia officinalis, Thymus vulgaris, Origanum vulgare, Lavandula spp, Matricaria chamomilla, Equisetum hyemale, Typha latifolia, Pontederia cordata, Sagittaria latifolia, Iris pseudacorus, Caltha palustris, Alisma plantago-aquatica, Juncus effusus, Eichhornia crassipes **Figure 38**.

Figure 38: Plants

5.4.3. MATERIAL

The often-utilized materials in Gorgan include concrete, gravel, and brick tiles. After careful consideration and evaluation of the site's features, the materials used for different areas are as follows: rubber is used for the children's play area and running track, while gravel, brick tiles, concrete, and wood are used for the remaining tracks **Figure 39**.

Figure 39: Material

6. PARTIAL DESIGN

It examines the concept of partial design, which involves carefully balancing the preservation of existing places with intentional interventions to create environments that both respect the original elements and embrace transformation.

6.1. HIGHLIGHT AREA DESIGN

Thesis research explores the design of highlight areas, focusing on creating focal points that capture the senses and enhance the character of the environment. The goal is to infuse places with curiosity and seduction.

6.1.1. MASTER PLAN

The site analysis and investigation of the water volume in the canal throughout the seasons have determined that the canal has the potential to fill up to a height of 150 to 200 meters. Consequently, we have widened the canal opening and incorporated sloping surfaces to create stepped spaces. The purpose is to provide users with the opportunity to walk and sit near the water when the water level is low. Additionally, when the canal is full, the park equipment remains undamaged. Furthermore, the biofiltration system located at the canal's edge reduces water velocity during rainfall and minimizes water and air pollution. This system is environmentally

compatible. Additionally, it enhances the aesthetic appeal of the surroundings **Figure 40** and **Figure 41**.

Figure 40: Master plan (6.1.1)

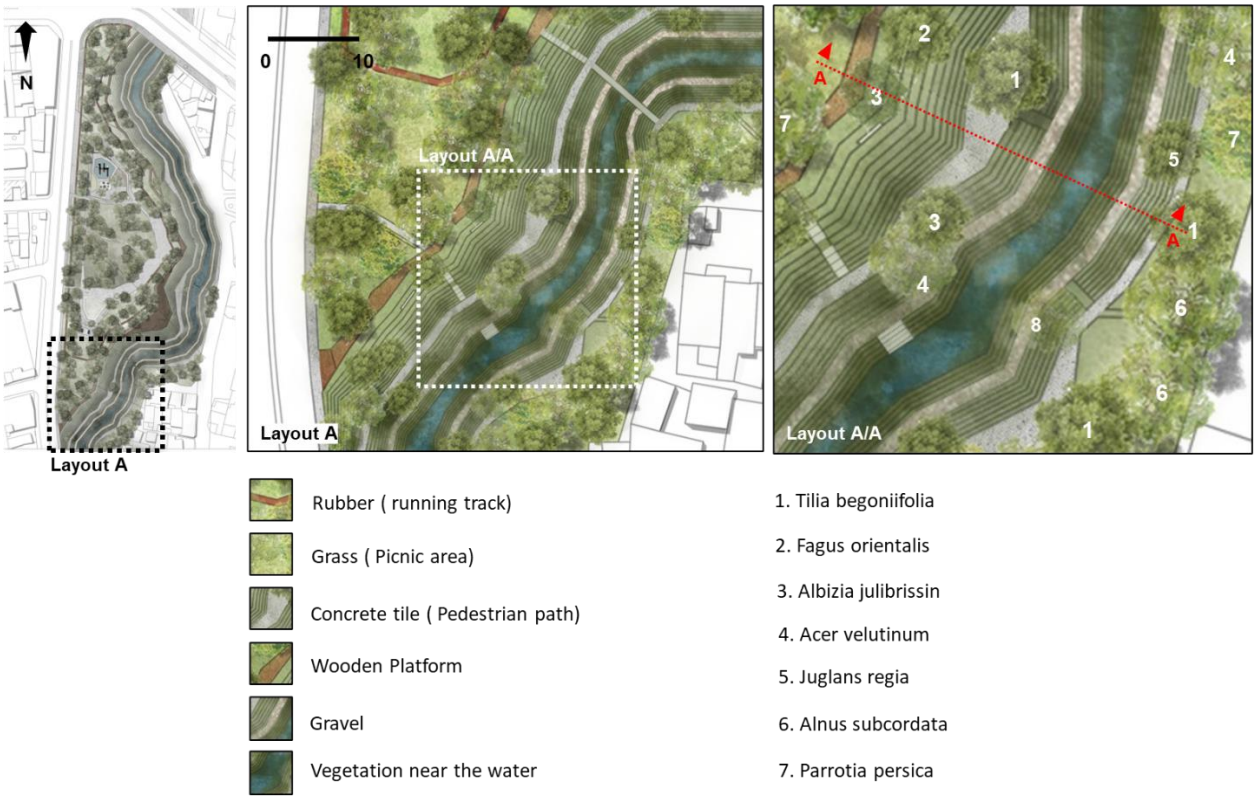
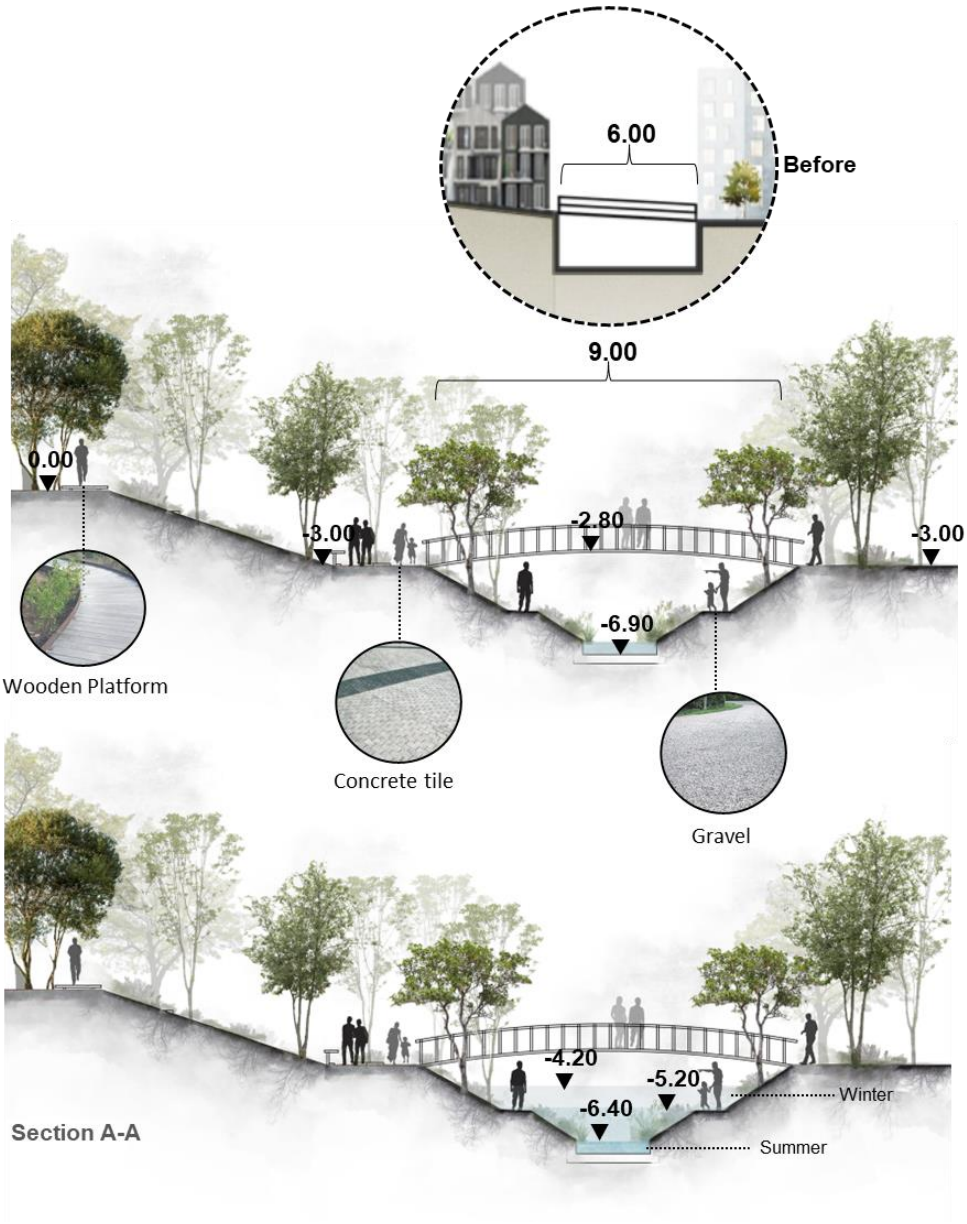


Figure 41: Section (6.1.1)



SUMMERY

Over half the world's population lives in cities, and this is expected to climb by 2050. This urbanization tendency causes health-threatening environmental challenges. Urban planners and architects must balance these issues with city health.

Urban green spaces are vital to environmental and human health, yet their impacts remain unknown. While beneficial, urban green spaces, especially in inner cities, are limited. These include parks, sports fields, and public and private green areas. Public green spaces are open to anyone, while developer regulations limit access to private ones.

Effective urban green space design demands multifunctional ecological system knowledge. Research shows that green areas boost urban physical and mental health by improving air quality, stress, and exercise. They boost community, city beauty, and social connections. Urban green space design concepts and aspects have been researched due to these benefits.

This research recommends canalside green areas in northern Iran's Gorgan city to improve its structure and well-being. Social, economic, architectural, and urban aspects affect canal green space design, according to studies. Study topics include how social and psychological factors, architectural elements, and urban aspects impact green space design.

The hypothesis claims that Gorgan city's green areas will boost mental health, urban attractiveness, and social and economic infrastructures. Social preferences, plant covering type, accessibility, and aesthetic enhancement will shape green space design. Design possibilities for canal water control, urban regeneration, aesthetic enhancement, and long-term sustainability are examined.

Gorgan city's location, climate, and urban form characterize the research emphasis. Two study area areas strengthen connectivity, provide recreational amenities, and allow leisure and social contact. The research aims to build active, attractive urban green spaces that improve Gorgan residents' lives.

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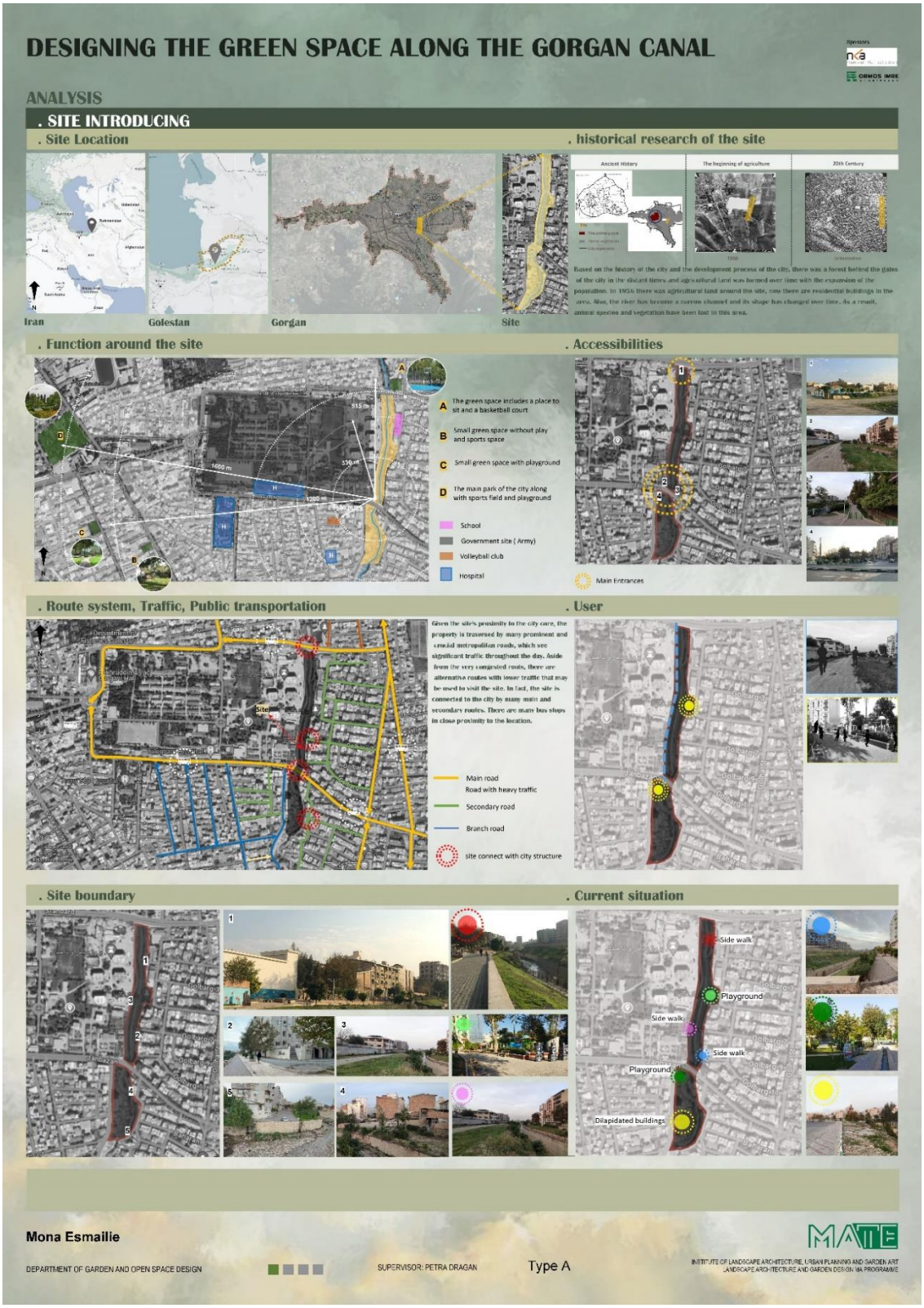
POSTERS


DESIGNING THE GREEN SPACE ALONG THE GORGAN CANAL
ANALYSIS
. SITE INTRODUCING
. Site Location
. historical research of the site
Iran
Golestan
Gorgan
Site
. Function around the site
. Accessibilities
A The green space includes a place to sit and a basketball court
B Small green space without play and sports space
C Small green space with playground
D The main park of the city along with sports field and playground
School
Government site (Army)
Volleyball club
Hospital
Main Entrances
. Route system, Traffic, Public transportation
. User
Main road
Road with heavy traffic
Secondary road
Branch road
site connect with city structure
. Site boundary
. Current situation
Side walk
Playground
Side walk
Side walk
Playground
Dilapidated buildings
Mona Esmailie
DEPARTMENT OF GARDEN AND OPEN SPACE DESIGN
SUPERVISOR: PETRA DRAGAN
Type A
INSTITUTE OF LANDSCAPE ARCHITECTURE, URBAN PLANNING AND GARDEN ART
LANDSCAPE ARCHITECTURE AND GARDEN DESIGN MA PROGRAMME

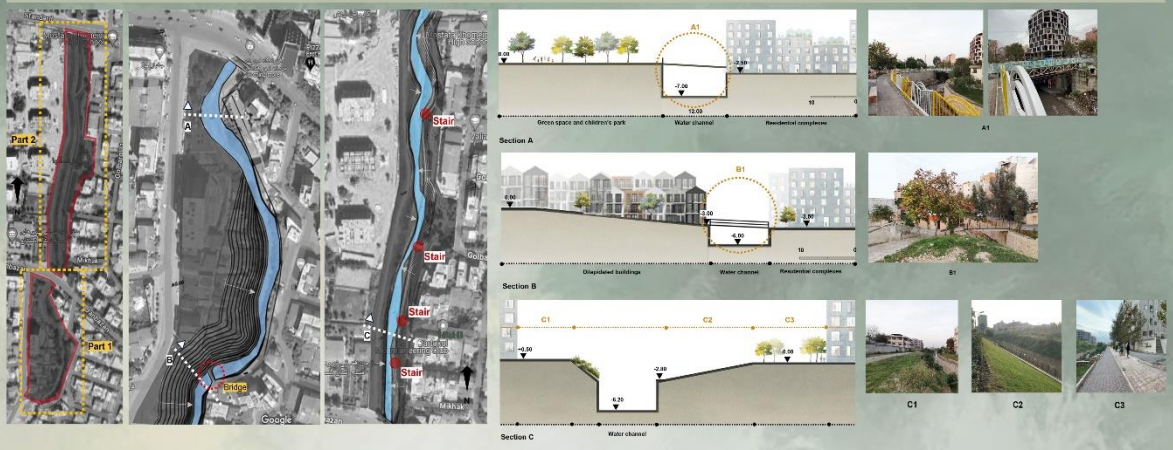
DESIGNING THE GREEN SPACE ALONG THE GORGAN CANAL

Sponsors

ANALYSIS

. SITE INTRODUCING

. Topography



. Water Canal

A The amount of water varies between 20 cm and 60 cm in spring and summer.

B The amount of water varies between 20 cm and 120 cm in Fall and winter.

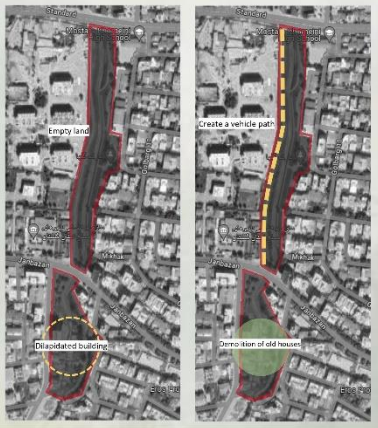
The material of the canal body is stone in some parts and concrete in some parts.

Every year, during the winter, the water canal witnesses a flood due to heavy rains. (It depends on the amount of rain.)

The water channel has little water throughout the year, especially in the summer, the amount of water reaches the lowest possible level, and during the winter, the channel gets a little full during rainy days.

. Plant analysis

. Urban development map



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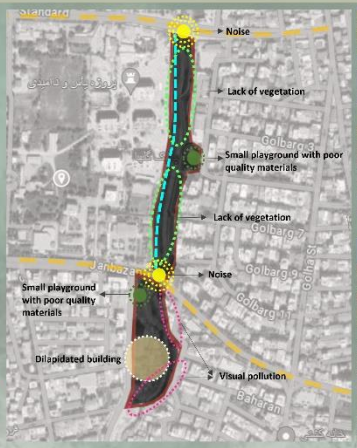
ANALYSIS

. SITE INTRODUCING

. Values map

. Conflicts



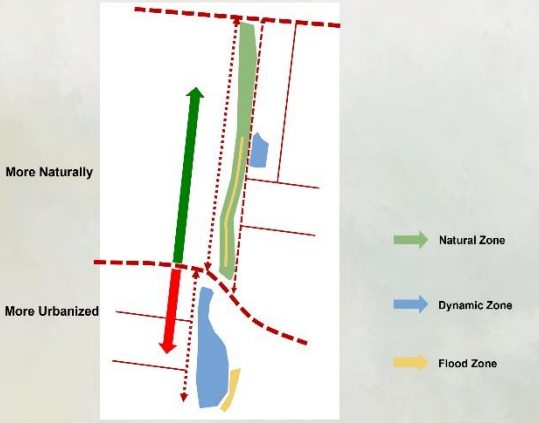
. DESIGN PROCESS

. Strategy, Design strategy

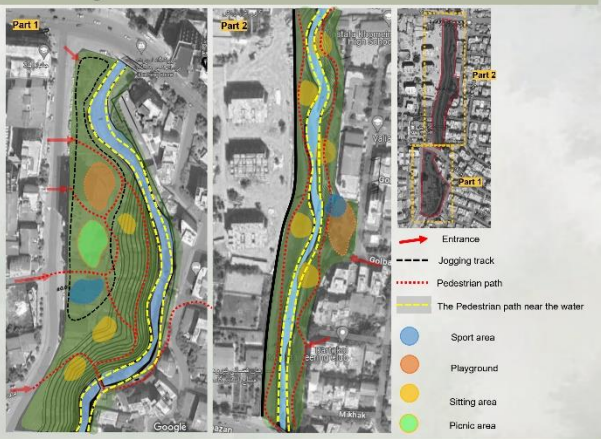
. Concept

Creating a dynamic atmosphere and a beautiful view in the context of the city

. Functions



. Bubble diagram



. Inspirational pictures

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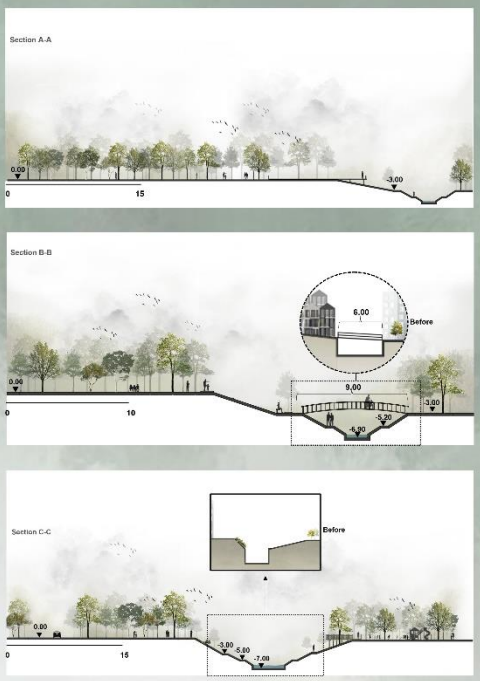
Sponsors

DESIGN

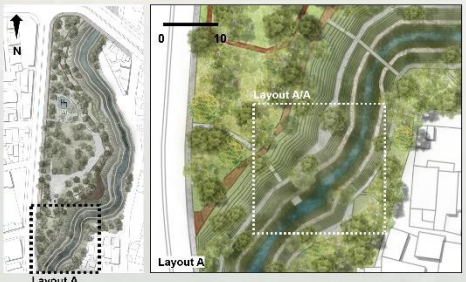
. Master plan

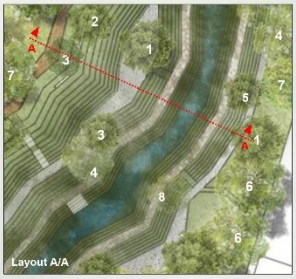
1 Entrance
2 Ramp and stair
3 Sitting area
4 Playground
5 Picnic area
6 Sport area
7 Jogging track
8 Bridge
9 Pedestrian

. Sections



. Plant concept

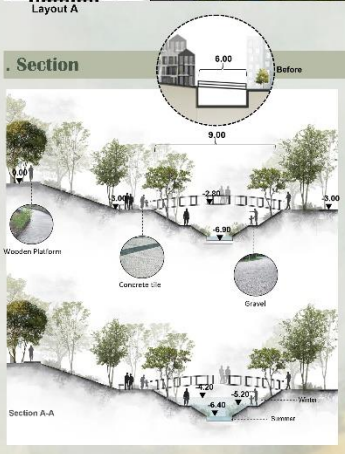




1. Tilia begoniifolia
2. Fagus orientalis
3. Albizia julibrissin
4. Acer velutinum
5. Juglans regia
6. Alnus subcordata
7. Parrotia persica

. Material

. Section



. Visuallization

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DECLARATION

on authenticity and public assess of final essay/thesis/mater's thesis/portfolio[1]

Student's name:	**Mona Esmailie**
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Title of the document:	**Designing the green space along the Gorgan canal.**
Year of publication:	**2024**
Department:	**Green and open space design**

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