



ENVIRONMENTAL GUIDELINES FOR SUSTAINABLE NEIGHBORHOOD PLANNING CASE STUDY: ALEX-WEST COMPOUND, ALEXANDRIA

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ABSTRACT

Planning new sustainable neighborhoods is essential to achieve environmentally friendly, economically vibrant, culturally meaningful cities. Building new communities that are physically and socially sustainable is a challenge when resolving the city's housing crisis and avoiding problems.

These new communities that are physically and socially sustainable to resolve the communities' housing and environmental degradation, problems of poverty, and insecurity. Moreover, there are other challenges for planning the sustainable neighborhoods. Sustainable urban planning plays an important role in achieving sustainable growth and development by integrating sustainable development principles in urban planning strategies. However, sustainable urban development of neighborhoods is important to achieve the goals of environmental improvements through the development of land use, transportation, housing, energy efficiency, economic development, and public health.

Based on the literature review, the environmental aspects of urban development strategies are deduced to help neighborhoods achieve the sustainable goals studied. Then by analyzing international and local case studies the paper concludes guidelines to be applied in planning sustainable neighborhoods.

Finally, the design guidelines for sustainable neighborhood planning are deduced and applied on Alex west an existing residential neighborhood in Alexandria, some of the guidelines are applied in the chosen neighborhood.

KEYWORDS: Sustainable planning, sustainable neighborhoods, environmental aspects.

1. INTRODUCTION

Urban planners are nowadays concerned to collaborate their work with the global concern for sustainability in the process of growth and development leading to the terminology of 'sustainable development'. Sustainable urban planning of neighborhoods is important for infrastructure improvements to support new housing and development. Also helps in improving the issues including wastewater and solid waste aims to improve the living conditions. Sustainability aims for construction that enhances the scale of buildings, streets and open spaces and improving in public transport systems and urban environmental conditions. Also reducing high energy consumptions in communities.

The expansion of urban boundaries due to urban sprawl and population growth is a major problem in the Egypt. Building neighborhoods to accommodate large number of population with inadequate Green spaces in the condensed built up areas. These communities also lack the design of appropriate infrastructure for walking and also lack green buildings which is a factor of high energy consumption. Moreover, the ecosystems are rapidly deteriorating in quality due to many sources of pollution such as Air pollution and decreasing water levels to rising energy costs, which causes pressures on land, the natural environment, energy use and waste. Moreover, energy demand is rising globally such as electricity figure 1 and heat is generated from non-renewable sources.



Figure 1 Energy consumption (left) (Philipp Beiter, Elchinger , & Tian, December 2017), Air pollution , Water pollution , Land pollution (Right) (Columbia University, 2009)

Sustainable urban planning helps to improve the living conditions of slum dwellers and to support new housing and development. By creating an enjoyable environment for pedestrians throughout the communities sustainability is achieved . Also treatment required to produce safe drinking water and any changes to treatment regimes.

2. DEFINING SUSTAINABILITY:

Meeting the needs of the present without compromising the ability of future generations to meet their own needs.” In other words, sustainability attempts to balance the needs of people today with the future needs of our children and the natural systems that sustain all life.” (Jones, 2010)

3. CHALLENGES OF SUSTAINABILITY:

Wide range of people who come from throughout the region and have varying transportation, housing, and service needs with high Demand on road facilities and of transportation nodes that may not coordinated efficiently with one another. In addition, the limited supply of housing can make it unaffordable to many people. These problems are growing faster than solutions with significant lack of policies and regulations in Egypt.[Morgan, S, 2010].

4.SUSTAINABILITY PARAMETERS:

- A. Space managements:** The Maximum use of features and assets, Strengthening the sense of place, and Encouraging habitat creation and native planting.
- B. Circulation:**Reduce the level of cars, Effectiveness of public transport, Reduce the need to travel, and Enhancing security.
- C. Quality Green space:**Transforming site constrains into environmental opportunities, Minimizing negative environmental impacts, Minimize inputs of materials and energy, Maximizing the diversity, Minimize maintenance, and Involve local communities. [Governments, U. E, 2009]

5. Sustainable urban design initiative:

Figure to shows the sustainable urban design initiative for studying the sustainable urban design strategies to achieve sustainability goad and objectives.



Figure 2 Sustainable Urban Design Initiative (Heyzer & Bárcena, 2013)

6. GOALS AND OBJECTIVES:

- 1.Closing local resources:Reduce demand for non renewable resources, Reuse and recycling, and Local water sourcing, treatment and aquifer recharge;
- 2.Enhancing local environmental qualities;
- 3.Creating healthy environment:Improve the air quality, and Encourage consumption of planted food;

4. Increasing street safety :Reduce the chance of vehicle/pedestrian accidents;
5. Increasing accessibility; and
6. Value of local communities:Facilitate accessible social networks, and Promote mental health . [Morgan, S, 2010]

7.WHAT IS SUSTAINABLE URBAN DEVELOPMENT:

Sustainable development has been defined by H. E. Daly from the view point of the depleting world resources, emphasizing the conservation of natural resources in the following words: “Development is sustainable if the rates of use of renewable resources do not exceed their rate of regeneration, the rates of use of non-renewable resources do not exceed the rate at which sustainable renewable substitutes are developed, and pollution rates do not exceed environment's assimilative capacity”. [Al-Shihri, F. S, 2013] Therefore, sustainable urban development can be defined as:Sustainable urban development specifically implies achieving a balance between the development of the urban areas and protection of the environment and at the same time achieving equity in employment, shelter, basic services, social infrastructure and transportation in urban areas. [Al-Shihri, F. S, 2013]

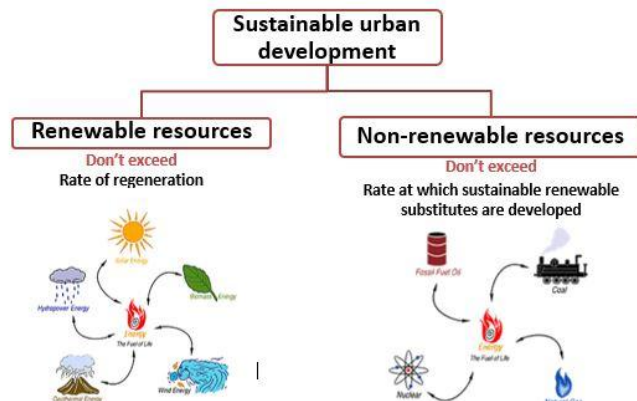


Figure 3Renewable and non-renewable energy resources done by researcher.

8.THE ROLE OR URBAN DESIGN IN THE CREATION OF SUSTAINABLE NEIGHBORHOODS

Incorporating urban design principles with sustainability approaches is essential for more material, social and energy efficiency, lead to creating communities more sustainable which is the “finishing process “of urban design. For this to occur the role of urban design needs to be refined within the planning process. To comprehend the planning regulations and policies, the built form must be clearly articulated. What is needed is not to return to the physical design only but also implement the strategies of sustainability in the design process to achieve the required goals of the sustainable urban design of environmental friendly neighborhoods.

9.DEFINITION OF SUSTAINABLE NEIGHBORHOOD

Sustainable neighborhood relies on the low density of buildings and larger amount of open spaces and walkways. The key of sustainability and health in neighborhoods is through local facilities, local hubs to support healthy lifestyles and development of local food, waste, water and energy Systems. Moreover, making effective use of natural resources and replacing the non-renewable energy resources. (Governor’s Office of Planning & Research, 2010)

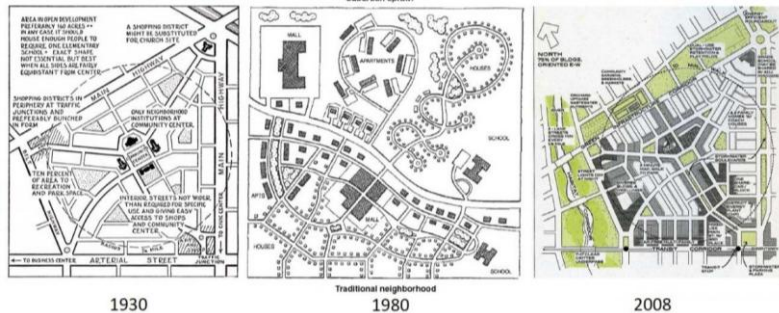


Figure 4 Evolution of neighborhood organization, Perry's Neighborhood Unit (left), the new urbanist idea of traditional neighborhood compared to sprawl (center), and Doug Farr's updated Sustainable Neighborhood Unit(Congress for the new urbanism , n.d.)

10. MAIN COMPONENTS OF A SUSTAINABLE NEIGHBORHOODS

1. **A healthy environment** with minimal ecological impact, minimal waste or pollution and maximum recycling, protection of the natural environment, wildlife and biodiversity, so that all may enjoy environmental benefits.
2. **A prosperous economy that** generates wealth and long-term investment without destroying the natural and social capital, through local jobs and services.
3. **Social well-being** arises from a sense of security, belonging, support, and integration of different social groups, based on respect for different cultures and traditions (Power, 2004)

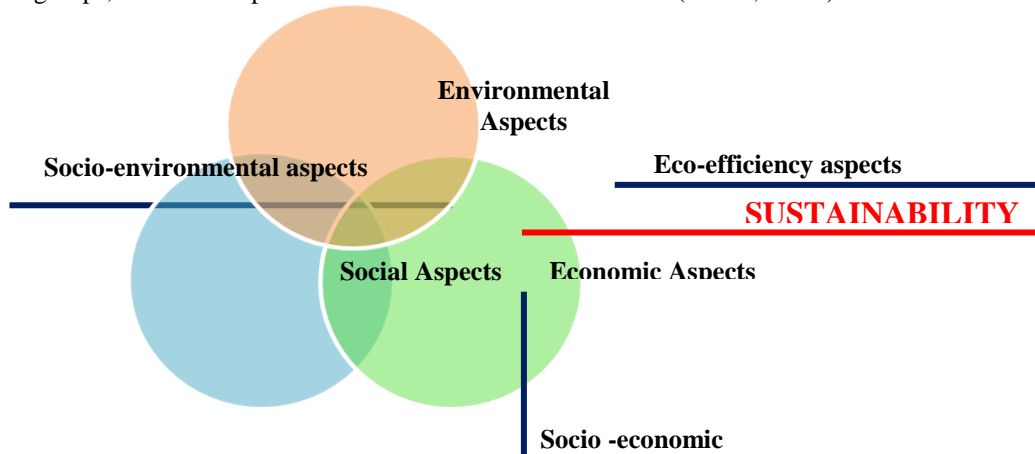


Figure 5 Sustainability aspects by researcher

11. Design principals of sustainable neighborhoods

- Provide daily needs by pedestrian ways and consider public transportation
- Fit the development to the landscape, minimize mass grading and save the soil.
- Create buffers and interconnecting open space networks with recreational pathways
- Minimize curb cuts onto arterial and collector streets. Avoid direct property access
- Minimize paving by reducing street widths, building setbacks therefore sidewalk and driveway pavements are reduced, parking and loading areas and avoid alleys.
- Low impact design principles. Maintain rainfall on site through swales, native vegetation
- Green infrastructure principles. Design stormwater detention and retention areas for esthetic, wildlife habitat and recreational value as well as to satisfy water quality
- Encourage efficient use of land through cluster open space design.
- Prepare and follow a tree preservation plan for the construction stage. (The District of Sooke, 2008)

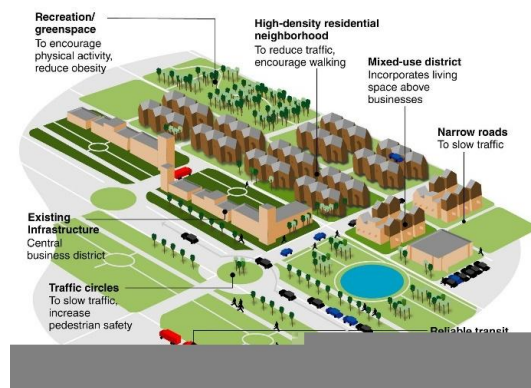


Figure 6 Building greener neighborhoods (ZGF Architects LLP, 2009)

12. COMPONENTS OF SUSTAINABLE NEIGHBORHOOD

- **Environmental:** providing places for people to live in an environmental-friendly way
- **Social and Cultural:** vibrant and inclusive communities
- **Economic:** diverse local economy

Table 1 Sustainable aspects of Neighborhoods (Governor’s Office of Planning & Research, 2010)

Sustainable Neighborhoods		
Environmental	Social	Economic
<ol style="list-style-type: none"> 1. Efficient use of resources 2. Minimizes the negative environmental impact 3. Biodiversity 4. Public and green spaces 5. Diversity and affordability of housing 6. Density, design and layout. 7. Adaptable buildings. 8. Transport facilities 9. Safe local walking and cycling 10. Local parking facilities. 	<ol style="list-style-type: none"> 1. Sense of identity and belonging. 2. Tolerance and respect with diversity of people 3. Opportunities for cultural, leisure, community, sport and other activities. 4. Low levels of crime and anti-social behavior. 5. Sense of place 6. Education 7. Health care. 8. Services providers. 	<ol style="list-style-type: none"> 1. Jobs and training opportunities. 2. Sufficient land and buildings to support economic prosperity and change. 3. Dynamic job and business creation. 4. A strong business community with links into the wider economy. Invalid source specified.

13.Environmental aspects

13.1.Master plan design and layout

A.Sustainable design and layout (density)

Concentrate density intelligent planning:

Structure development density into strategic areas and integration of environmental aspects in urban planning (Kyvelou, Sinou, Baer, & Papadopoulos, 2012)

High densities that support transit and non-motorized modes to support commercial functions in concentrated areas of community. Moreover, to provide services to every neighborhood while maintaining character.

Compact community

Compactness of the built environment is a strategy through which more sustainable urban forms might be achieved. Density is the ratio of people or dwelling units to land area determining sustainable urban forms.(Kyvelou, Sinou, Baer, & Papadopoulos, 2012)

Orientation of buildings

The physical shape and massing of the buildings and spaces has significant impact on the performance, in terms of energy efficiency, and the ability to protect occupants. (Kyvelou, Sinou, Baer, & Papadopoulos, 2012)



Figure 7 Compact planning (Left), Building orientation (Right) (Density atlas, 2011)

B.Sustainable landuse (mixed use)

Distribution and mixed-use buildings

Including homes, schools, shops, health care, leisure and employment;

Proximity to services

Facilities and public transport is increasingly essential for social and economic reasons.

A diversity of housing

Develop a strategy for supporting the development a wide diversity of housing overall across the community as well as in all new development projects, as Semi-detached, Terraced family houses, Flats, Affordable housing(Power, 2004)

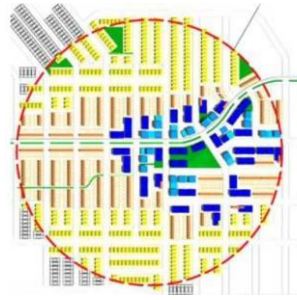


Figure 8 Sustainable Land use (Dinep & Schwab, 2010)

Sustainable landscape design (open spaces):

Green open public space should lie within 15 minutes' walk of every home; and trees and other plants should grow within sight of every home. (Power, 2004)

Types of residential open spaces:

A.Recreational spaces within residential spaces:

B.Amenity greenspace (parks and gardens):

Managed and maintained landscaped areas with no designated specific use by people but providing visual amenity or separating different buildings or land uses for environmental, visual or safety reasons.



Figure 9 Communal green spaces (Left) (auckland design manual, 2011), Malmö park (Right)(Fossum, 2008)

C.Children's play areas:

Designed safe and accessible for children's play, usually linked to housing areas.

D.Sports facilities:

Designed for practice, training and competition for recognized outdoor sports.

13.2.Mobility and accessibility

A.Sustainable urban transportation

Develop a transportation system that provides viable opportunities for non-automobile transportation and transit use.

Sustainable public transportation system:

As train stations and buses with different routes and frequencies.



Figure 10 Sustainable public transportation System (ZGF Architects LLP, 2009)

Bike networks:

Enables access to services, jobs, and providing parking spaces for them.

Pedestrian walkways:

The most important sustainable urban transport system that facilitate the movement of people with reduced mobility must be designed to fulfill the safety and aesthetic functions too. (St-Jean, 2012)

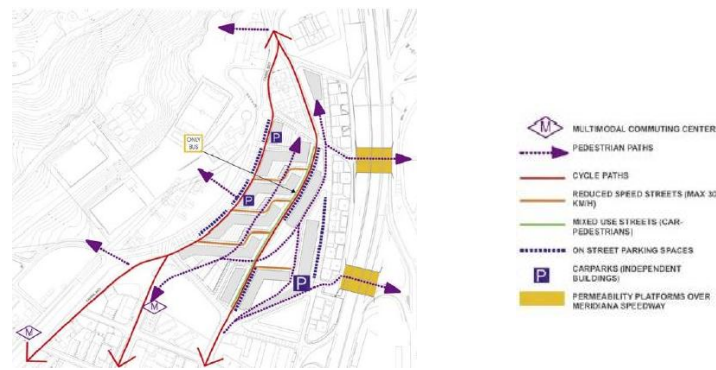


Figure 11 Sustainable transportation in Trinitat Nova, (ZGF Architects LLP, 2009)

Covered parking:

B.Sustainable street design /connectivity

Open circulation and common spaces, are often undesirable for security design. To maximize safety, security, and sustainability. (St-Jean, 2012)

1. **Connected and permeable streets** by: Orienting buildings toward the street and sidewalk with facades and entrances facing a public space but not parking areas(Power, 2004)
2. **People-friendly streets** :Vehicular and Pedestrian Circulation, the movement of people and materials in and out of a site is determined by the design of its access, circulation, and parking areas to maximize efficiency while minimizing conflicts between vehicle and pedestrian modes. (St-Jean, 2012)
3. **Shared streets:** Design streets as multi-modal corridors, with separate lanes for buses and bicycles. (The District of Sooke, 2008)
4. **Safe:** Regulate the dimensions of streets, and sidewalks to increase the safety of non-motorized users.
5. **Eco-friendly materials:** Streets and parking areas include permeable, non-toxic materials such as gravel, porous pavement, or recycled resources. (The District of Sooke, 2008)

External accessibility:

Smart Location and Linkage;

Accessibility for people with special needs;

Accessibility in open spaces and public spaces to recreation facilities;

Transit center. (Kyvelou, Sinou, Baer, & Papadopoulos, 2012)

13.3.Low-impact, efficient, infrastructure:

Conventional approaches to infrastructure in the 20th century focused on single source systems for electricity, heat, water, waste management and wastewater.

A community's infrastructure includes energy systems; water, sewer and storm water management systems; solid waste management; and integrated infrastructure systems. (United Nations Human Settlements, 2010)

A.Water management:

Rainwater harvesting and sewage treatment plants:

For recycling water to be used for flushing & landscaping purposes.

Rain Garden:

Rain gardens are small, shallow areas filled with plants that protect water supply. Rain gardens capture and filter 30% more water than from storms. This is important, because storm water runoff increases flooding; carries pollutants from streets, and parking areas to streams and lakes. (ECO environmental collaboration office , 2006)



Figure 12 Rain Gardens (Left), Green roofs (Middle), Downspot Disconnections (Right) (Governor's Office of Planning & Research, 2010)

Infiltration devices

These filter drains and porous pavements to allow rainwater and runoff to infiltrate into permeable material below ground.

Basins and ponds and Green roofs

Rain barrels:

Rain barrels capture and store rainwater from your roof for later use in watering your garden, lawn, trees, washing cars. (ECO environmental collaboration office , 2006)

Downspout disconnection:

Downspouts are the external pipes of a house that carry rainwater from the roof to a drain or the ground. During heavy rain, every downspout on your home can send 12 gallons of water a minute to the sewer system. (ECO environmental collaboration office , 2006)

Waste management:

Waste management strategies are optimized to receive, segregate & recycle or disposed waste according to their type.

Generation of waste

The generation, prevention, characterization, monitoring, treatment, reuse of solid wastes, including residential, institutional, commercial, agricultural, health care, household wastes and sewage sludge. (ECO environmental collaboration office , 2006)

Waste minimization

Management of domestic waste, construction waste and solid waste infrastructure. (Kyvelou, Sinou, Baer, & Papadopoulos, 2012)

Waste Treatment

Promote greenhouse sewage treatment facilities to minimize or eliminate the use of chemicals through recycling and composting waste, as well as minimizing its creation, help generate more sustainable life styles and also encourage local planting and growing.

13.4. Energy and emissions:

Increase facilities that rely on renewable energy sources or reduce use of fossil fuel for operations and transport needs.

A. Efficient use of land:

Land is an important resource and should be used as efficiently as possible.

Orientation

Use of regenerative energy including solar-oriented housing and neighborhood design.

The amount and types of residential development

To be accommodated must be guided by the planning authority's housing and settlement strategy sustainable locations for new housing development. (Carley, February 2012)

B. Efficient use of energy

Reduce Emissions

Increase energy efficiency and reduce energy consumption, by decreasing the amount of greenhouse gas emissions associated with the built environment and reducing dependency on declining supplies of natural gas.

Minimal resource use and impact on the environment

Effect in the energy resources

Improvement of building' energy efficiency for heating, cooling and electricity.



Figure 13 Energy production diagram (ZGF Architects LLP, 2009)

Use of renewable energy (locally)

Certified green buildings

Exhaustion of raw material

13.5.Green buildings (neighborhood unit):

Buildings with a highly energy efficient approach, and embodied energy in the mass of a building which is the amount of energy used to produce the original structures, the foundations, walls, floors and structural supports. This would reduce environmental damage and inequality.

1. High performance buildings:

- **Site:** Orientation, landscaping, storm water management, construction recycling;
- **Water Efficiency:** Efficient toilets & appliances, efficient irrigation, reclaimed/recycled water;
- **Energy/Atmosphere:** Energy efficient envelope, lighting & appliances;

Reduce waste;

Indoor Environmental Quality:

Natural ventilation, thermal comfort, views;

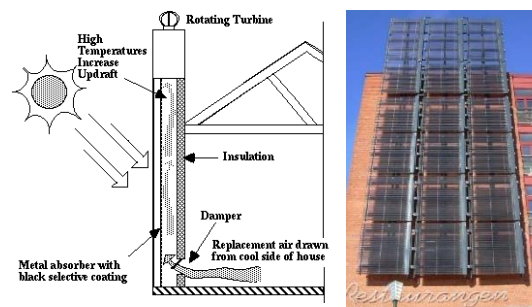


Figure 14 Indoor air quality (Left), Energy efficient building envelope (Right) (Energie-Cités, 2008)

Bio-climatic and passive techniques;

Passive solar design:

As Building orientation, Windows and shading, Thermal mass(The District of Sooke, 2008)

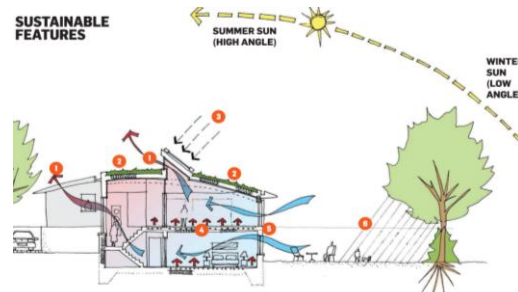


Figure 15 Section in green building (ZGF Architects LLP, 2009)

2. Green building materials:

Building materials with low "embodied energy" which are also chemical-free and toxin-free:

Raw materials

Recycled or recyclable building and finish materials

Integration of recycled and reused materials, in buildings and the public spaces (Kyvelou, Sinou, Baer, & Papadopoulos, 2012)

Locally available materials

Healthier and durable materials

Use materials and products that are environmentally preferable and safer for occupant health

Materials minimized environmental and health impacts over their life cycle (Companies & and Todd, 2009)

13.6.Climate control

The main problem is the lack of awareness of climate change, resource depletion and their negative impact on the environment. Local solutions that improve the global climate change, while reducing the environmental degradation and greenhouse gas emissions.

The concept of "Microclimate" elements, such as solar radiation, air temperature, air humid, and wind can be used appropriately to create comfortable living space; both outdoor and indoor are affected by the following:

Characteristics of the ground or terrain;
The position on a slope;
Valley or plain;
Vegetation, landscaping;
Shading; and
Locations and direct surroundings.

13.7. Local food sources

1. **Urban agriculture** : Local fruits and vegetables are cultivated on the greenway, green spaces, rooftops, terraces and green walls. (ZGF Architects LLP, 2009) Planning edible landscapes as a part of the landscaping plans
2. **Maximize access to local food** : By providing access to local food and opportunities for food production

Locating the project near a farmers' market

Zoning that allows growing procedure on residential property.

13.8. Heritage preservation (in case of renovation)

Preserving and enhancing physical and cultural assets that make a place special maintaining what existing resident's value, attracts new residents and visitors, and improves economic development based in its identity. (Megan McConville, 2013)

1. Maintenance of cultural heritage

Conservation and re-use of cultural heritage

Community planning and historic preservation strategies

2. Maintenance of built environment

Use of existing buildings

Preservation of historical resources and adaptive reuse

Community organizations preserve buildings by securing grants to restore the structure.

Brownfield redevelopment (Kyvelou, Sinou, Baer, & Papadopoulos, 2012)

13.9. Biodiversity

1. Natural resource conservation

Preservation of its rainforest and natural assets

Maintain Ecosystem

Ensuring preservation of wilderness areas, wildlife habitats

Extinction species and ecological communities (Kyvelou, Sinou, Baer, & Papadopoulos, 2012)

2. Land conservation:

Preserve and protect farmland

Protect environmentally sensitive areas

Capitalize on existing infrastructure

Restore and redevelop contaminated or underutilized land (Governor's Office of Planning & Research, 2010)

Maintenance of wetlands and natural beauty landscapes

Protection of rural land

14. MIDDLE EAST: The City Centre at 'Desert Rose'(UAE, DUBAI).

Project name & location:

Desert Rose City is a project of smart sustainable Satellite City in Dubai, designed to house local Emiratis and expats by 2020 and later.

house local Emiratis and expats by 2020 and later.

It is located at Al Rowaiyah Third (a desert land at Dubai urban fringe)(Reinventing Cities , 2017)



Figure 16 Project Desert Rose City location (Earth, 2018)

Climatic region:

The City Site is at altitudes 35m-85m above sea level with Dubai has a sub-tropical desert climate, located within the Northern desert belt. Summers are extremely hot and humid, with an average high around 41 °C and average low around 30 °C.(Reinventing Cities , 2017)

Size & Density:

The City covers 4000 hectares of land, served by the city center. Expected to house 160,000 inhabitants including national Emiratis and expatriates.

The total area of the city center is 258.9 ha of land, which is divided into three plots.

Aims:

3. Environmental: Resilient environment and city
4. Social: Livability and happy community
5. Healthy City and community
6. Economic: Local economic base

Year:

The date of release is expected early 2018 .

Problems:

The climate concerns were addressed at the conceptual design level including the spatial organization of the City Centre. All building design and construction shall consider Dubai Municipality Green Building Codes.(Reinventing Cities , 2017)

Master plan design and layout:

Sustainable layout (density): The City Centre covers 258.9 ha divided into 3 plots:

-Plot-A covers 217.7 ha and shall house most of the City Centre activities, 10,000 affordable rental dwelling units

-Plot-B covers 21.6 ha and will part of a Theme Park (Walk & Watch)

-Plot-C covers 19.6 ha and will house a Juma Mosque and civic center. (Reinventing Cities , 2017)

Sustainable land-use (mixed use):

A linear city center with 1,000,000 sq.m. of mixed, and divers uses including economic, commercial, administrative, recreational and cultural activities. It also includes affordable housing (10,000 unit) on top floors of the City Centre for non-Emiratis population.

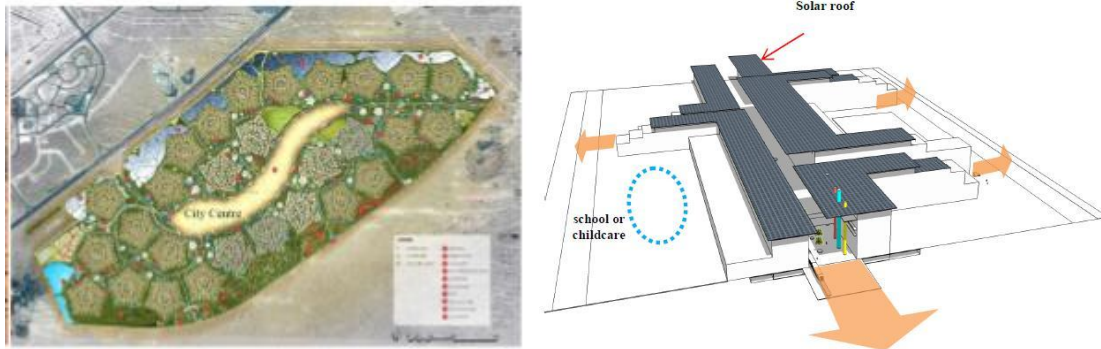


Figure 17 Desert rose city master plan (Left),Spatial organization diagram (Reinventing Cities , 2017)

Sustainable landscape design (open spaces)

The community facilities, especially the education facilities and mosques, shall be distributed within the courtyards at the outer sides of the City Centre main activity spine. Other facilities such as post office services, health facilities, etc. shall be integrated at the ground floor along the Secondary Activity Spines of the City Centre.(Reinventing Cities , 2017)

Mobility and accessibility:

Sustainable Street design / connectivity

Pedestrian routes: The City Centre is expected to serve the Desert Rose City. It adopts the principles of Pedestrian Oriented Development (POD), and the Transit Oriented Development (POD).(Reinventing Cities , 2017)



Figure 18 Pedestrian link between eco walk and city center (right), Eco-walk (left) (Reinventing Cities , 2017)
Eco walk: The City Centre shall be accessed by pedestrian and cyclists via the eco-walk; and by vehicles via the main roads circling the city center; and by elevated light rail (Reinventing Cities , 2017)
Parking spaces: All parking shall be provided in basement.

Sustainable urban transport

Sustainable transport: electric light-rail at elevated track which will be linked with Dubai Green Metro Line or be an extension of the Green Metro Line. (Reinventing Cities , 2017)

Car-free main activities spine as Linear Atrium 3.5km long approximately. The Atrium is 40m wide including 10m wide elevated light rail shelf at the north-west side of the Atrium

Basement levels for service vehicles, public tra

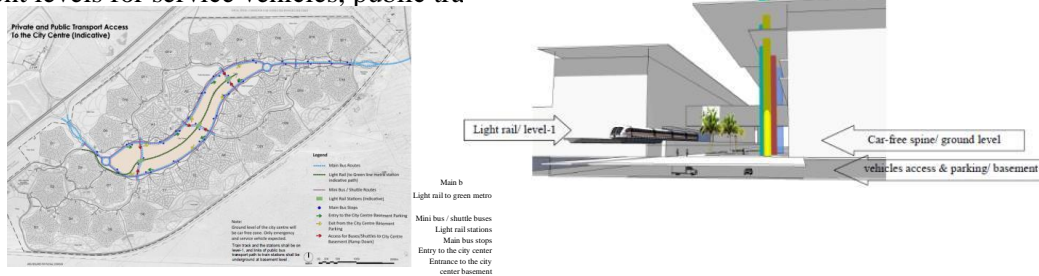


Figure 19 Sustainable urban transport system plan (Reinventing Cities , 2017)ections showing accessibility in site (Reinventing Cities , 2017)

External accessibility

Mobility and communication networks, including a light rail through the City Centre Spine. Integrated infrastructure provisions via multi-utilities tunnels. (Reinventing Cities , 2017)

Develop low-impact, efficient, green infrastructure

Water and waste management: The Desert Rose City embraces the recycled economy principles and will be served by renewable energy system and eco-park for comprehensive treatment and recycling of water and solid waste management. (Reinventing Cities , 2017)

Energy and emissions

Efficient use of energy

The linear Atrium is semi covered, and a semi air-conditioned linear space. Its design intention is to offer climate comfort and natural ventilation all year round, reduce noise and echo; and reduce energy consumption.

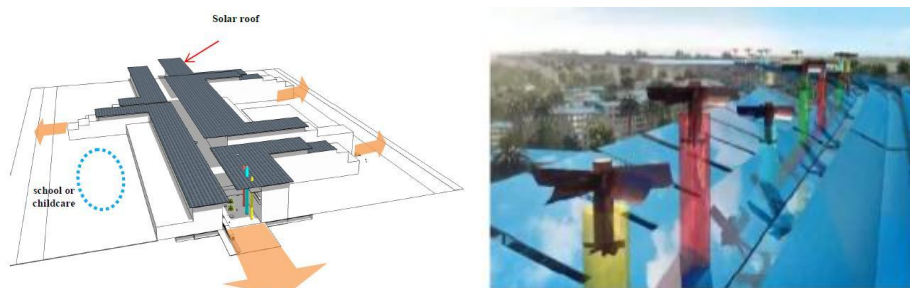


Figure 20 Direct cooling plants plan (Left), solar roof (Right)(Reinventing Cities , 2017)
Green buildings

High performance buildings

Renewable energy will be provided from solar panels to be installed on all roofs including possible vertical axis turbines.

Green building materials

All building design and construction shall consider Dubai Municipality Green Building Codes.(Reinventing Cities , 2017)

Climate control

This cross-section functions as wind catcher for northern breeze and shelter the Atrium from the desert hot air and sand.(Reinventing Cities , 2017)

Local food sources

Natural 'biodome' greenhouses, organic farm and individual garden farms for local food production.
(Baharash Architecture, 2017)

Conclusions:

Table 2 Availability of environmental aspects

	Guide line	Application method	Availability
Environmental	1. Design and layout:		
	Sustainable layout (density):	The City Centre covers 258.9 ha divided into 3 plots	✓
	7. Compact community		
	Sustainable land-use	Includes economic, commercial, administrative, recreational and cultural activities.	✓
	8. Distribution and mixed-use buildings		
	Sustainable landscape design		✓
	9. Recreational spaces within residential spaces:		
	10. Pedestrian streets	Secondary Activity Spines of the City Centre.	
	2. Mobility and accessibility		
	Street design / connectivity		✓
	11. Connected and permeable		
	12. Shared streets	Eco walk	
	Sustainable urban transport	Electric light-rail at elevated track	✓
	13. Sustainable public transportation system		
	14. Bike networks		
	15. Pedestrian walkways		
	External accessibility	Light rail through the City Centre Spine	✓
	Smart Location and Linkage		
	3. Develop low impact, efficient, green infrastructure		
	Water management	Eco-park for treatment and recycling of water	✓
	16. Rain Garden:		
Waste management	Eco-park for treatment and recycling solid waste.	✓	
17. Waste Treatment			
4. Energy and emissions			
Efficient use of land		<u>NOT AVAILABLE</u>	
Efficient use of energy	Natural ventilation all year round, reduce noise	✓	
18. Reduce Emissions			
19. Certified green buildings			
High performance buildings	Renewable energy will be provided from solar panels to be installed on all roofs	✓	
20. Indoor Environmental Quality			
21. Passive solar design	Vertical axis turbines.		
Green building materials		<u>NOT AVAILABLE</u>	
6. Biodiversity			
Natural resources preservation		<u>NOT AVAILABLE</u>	
Enhance and protect the eco-system		<u>NOT AVAILABLE</u>	
7. Climate control			
	Internal This cross-section functions as wind catcher	External The spatial design of the linear Atrium tends to offer pleasant outdoor environment	✓
8. Local food sources			
	Natural 'biodome' greenhouses		✓

15.EUROPE: Clichy- Batignolles at a glance (PARIS):

Project name & location:

Located in the 17th district of Paris, Clichy- Batignolles is currently under construction.

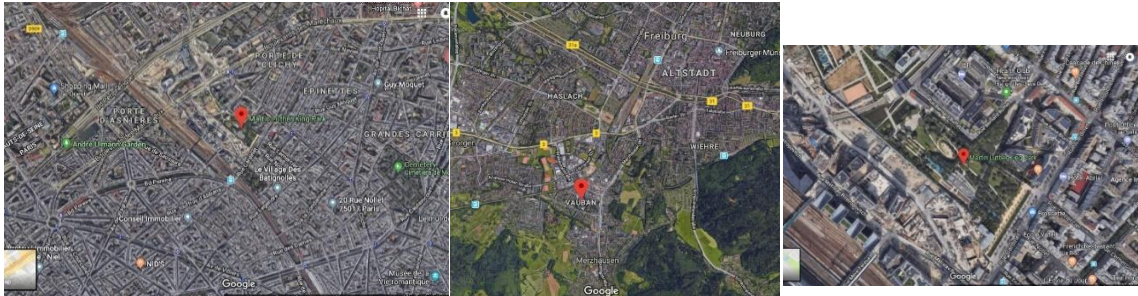


Figure 21 Location maps (Earth, 2018)

Climatic region:

Three types of climate may be found within France: oceanic, continental, and Mediterranean. The oceanic climate, prevailing in the western parts of the country, is one of small temperature range, ample rainfall, cool summers, and cool but seldom very cold winters.

Size & Density:

540,000 square meters overall, with 10,000 square meters of park
Clichy-Batignolles will bring together 7,500 inhabitants and 12,700 jobs. (Bazard, 2016)

Aims:

The City of Paris wanted to make Clichy-Batignolles a model for sustainable urban development, in terms of mixed functions and social diversity, energy efficiency, reduction in greenhouse gas emissions and biodiversity. (Bazard, 2016)

Year:

Launched in 2002, an initial phase of the park was completed in 2007.
The first inhabitants moved into the development in 2012.(Bazard, 2016)

Master plan design and layout:

Sustainable layout (density):

A dense, multi-functional city is being organized compactly around the park's open public space. (Bazard, 2016)

Sustainable land-use (mixed use):

Several functions such as retail, schools and recreational facilities are designed.

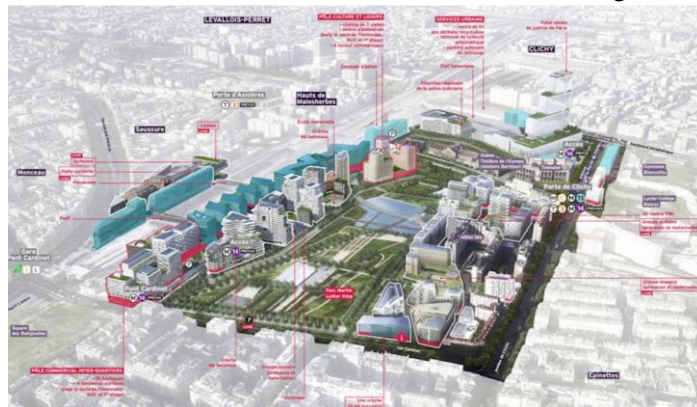


Figure 22 Master plan showing diversity of housing (Bazard, 2016)

Sustainable landscape design (open spaces)

The park was awarded the *Eco-jardin* in 2015, in the eco-friendly management of green spaces. (Bazard, 2016)

Mobility and accessibility

Sustainable Street design / connectivity

Connected: Located at the heart of the eco-district, can be easily crossed.
Creation of cycle lanes, wider sidewalks, occupying 2.25% of the total area

Safe: Vegetation lining the paths and wide sidewalks will safe means of transport through the neighborhood.

Sustainable urban transport

This is the case, for example, of the concrete plant and the freight hub, where city-center logistics activities can make use of electrically-powered light utility vehicles.

New metro stations will beshown through the way they areincorporated amidst the buildings.(Bazard, 2016)

External accessibility

Their location near points of use and taking advantage of railway areas helps curb heavy vehicle traffic in the city.

In particular, metro line will help to ease congestion and to link the neighborhood with major hubs in the center of the capital. (Bazard, 2016)

Develop low-impact, efficient, green infrastructure:

Water management:

Rainwater: promoting the natural water cycle

Impermeable roadways make up only 12% of the total surface area of the eco-district.

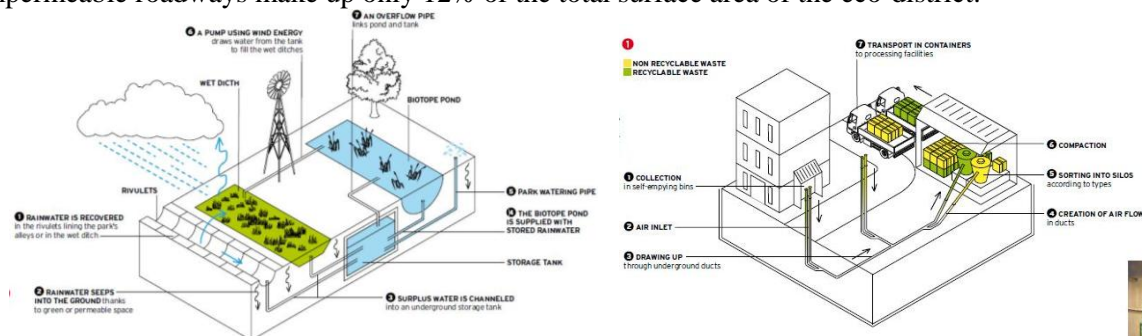


Figure 23 rain water harvesting (Left), Pneumatic waste collection plant (Right)(Bazard, 2016)

Waste management:

Pneumatic waste collection: household waste is collected using an underground pneumatic network, a first in Paris. This system helps reduce the need for containers in public areas and eliminates trash removal vehicles.

Energy and emissions

Efficient use of energy

Geothermal energy:

Buildings are connected to a heating grid supplied with geothermal energy, using the natural heat from warm groundwater.

Green buildings

22. High performance buildings

The energy consumption of buildings is limited to 50 kWh per sq. m. per year, making it lower than required by current energy regulations in Paris through:

- Solar energy; Compactness; Thermal slab; ;
- Bioclimatic design; Dual exposure; and Recovering heat from greywater:

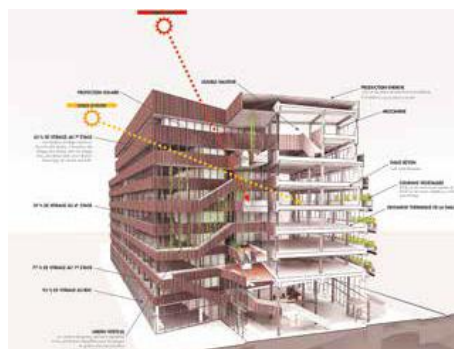


Figure 24 High performance building (Bazard, 2016)

Green building materials

Exterior building double insulation using very high performance mineral wool help reduce the buildings' energy needs to the minimum. (Bazard, 2016)

Biodiversity

23. Natural resources preservation

24. Enhance and protect the eco-system

The park is managed using a specific type of vegetation, around 500 plant species are found.

Biotope pond: The park is landscaped biotope pond, rare in Parisian parks, suitable for many plant and animal species form a rich ecosystem.(Bazard, 2016)



Figure 25 Green spaces providing requirements for many species (Bazard, 2016)

Climate control

The park acts as an urban “air conditioner” from the shade of the trees and to the natural evapotranspiration generated by the greenery. The plants and trees collect rainwater, sprinkler water and underground water and transform it into water vapor that cools the ambient air. (Bazard, 2016)

Conclusion:

Table 3 Availability of environmental aspects

	Guide line	Application method	Availability
Environmental	1. Design and layout:		
	Sustainable layout (density):	A dense, multi-functional city	✓
	Density	Organized compactly	
	Compact community		
	Sustainable land-use	Functions such as retail, schools and recreational facilities	✓
	Mixed-use buildings		
	Sustainable landscape design	Park will be over 6,500 sq. m. of private green	✓
	Amenity greenspace		
	2. Mobility and accessibility		
	Street design / connectivity	Easily crossed due to shortdistances	✓
	25. Connected and permeable	Parking is limited	
	26. Parking	Sidewalks	
	27. Safe streets		
	Sustainable urban transport	Electrically-powered light utility vehicles.	✓
	28. Public transportation system	New metro	
29. Pedestrian	Wide range of public transport. Sidewalks		
External accessibility	Near points of use of railway	✓	
30. Smart Location and Linkage	Metro line to link the neighborhood with surround		
3. Develop low impact, efficient, green infrastructure			
Water management	Impermeable roadways.	✓	
31. Rainwater harvesting	Park and green spaces on rooftops		
32. Rain Garden	Runoff water collected is used to		
33. Infiltration devices	water green spaces or wash floors		
34. Downspout disconnections			
Waste management	Pneumatic waste collection:	✓	
35. Waste regeneration			

4. Energy and emissions		
Efficient use of land		NOT AVAILABLE
Efficient use of energy	Geothermal energy	✓
36. Energy production		
5. Green buildings		
High performance buildings	Solar energy	✓
37. Indoor Environmental Quality		
	Compactness	
	Thermal slab	
38. Passive solar design		
	Bioclimatic design	
	Dual exposure	
Green building materials	Exterior building double insulation using very high performance mineral wool	✓
6. Biodiversity		
Natural resources preservation	Green spaces designed to bring a wide diversity of environments	✓
Enhance and protect the eco-system	Biotope pond	✓
7. Climate control		
	park acts as an urban "air conditioner"	✓
8. Local food sources		
		NOT AVAILABLE

16. Case study:

Location:

Over looking Mariout Lake on Mehwar el Tameer one side and by the north coast road from k22 - k26.

Description:

Alex West is planned to grant its residents a comfortable life with clean air, spacious streets as well as a wide range of facilities. There are three residential villa zones: Saint Catherine, Antoniadis and Pharos. The residential areas are arranged to ensure privacy and yet are networked at moderate distances to the central touristic area, "Alexandrina," where there are five star hotels, shopping mall, hypermarket, cinemas and conference centre. As Alex-west facilities spreading all around from Educational areas, Medical Center and sports club.

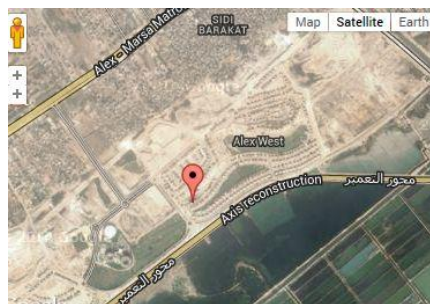


Figure 26 Location of Alex west (Earth, 2018)

Table 4 SWOT analysis for lake Mariot and its influences on the site chosen

Strength	Weakness
<ul style="list-style-type: none"> ▪ Has good access to Alexandria's gates and access to north coast, desert road, international road and agriculture road; ▪ Located near Borg el Arab Airport and Borg el Arab stadium; ▪ Different land uses in the other side of the lake: El max fishing, Dehkeila industrial, Agami touristic; 	<ul style="list-style-type: none"> ▪ Polluted area because of the existing factories ▪ The lake is cut off into: polluted area, salt lake, fish basin; ▪ Train railway is passing near the area ▪ Existing informal housing near the factories ▪ The lake is polluted as it's receiving the industrial wastes

ENVIRONMENTAL GUIDELINES FOR SUSTAINABLE NEIGHBORHOOD PLANNING
CASE STUDY: ALEX-WEST COMPOUND, ALEXANDRIA

Opportunities	Threats
<ul style="list-style-type: none"> ▪ Mining activities shall be held to serve residential area; ▪ can have a wide recreational area ▪ It is situated in linking point with Alexandria's access to highways it can provide a perfect landuse ▪ Land high cost 	<ul style="list-style-type: none"> ▪ The lake is turning into marshes; ▪ Pollution; ▪ Circulation in the lake is having many obstacles:



Zone 1: Saint Catherine



Components:

2nd Residential Zone consists of villas and town houses. The International Medical Center of Alex West is designed to be located in Saint Catherine

Area:

Built on an area of about 435,000 m2.

View:

Saint Catherine is surrounded by the greens of the Alex West Golf (9 holes) and overlooking the blue of Marriot lake.

Zone 2: Alexandrina



Components:

Alexandrina Commercial Zone is the pumping heart of Alex West consisting of a Central Park with entertainment and commercial outlets with approximately

Area:

65,000 m2 of shops, restaurants, cinemas and hypermarket.

View:

The central park will be connected with Radisson Blu hotel and the Holiday Inn hotel by beautiful promenades. There will also be a 60,000 m2 business park with small and medium sized offices with the latest hi-tech facilities.

Zone 3: Antoniadis



Components:

1st Residential Zone consists of different types of villas. It is surrounded by the green view of the Alex West golf overlooking Marriot lake.

Area:

The beautifully landscaped area consists of about 725,000 m2 and it holds the international schools

Zone 4: Pharos.



Components:

3rd Residential Zone, Pharos.

Area:

with an area of about 580,000 m2 is adjacent to the Alex West Club. This area is currently under planning.

Figure 27 Master plan (Parons court company, 2011)

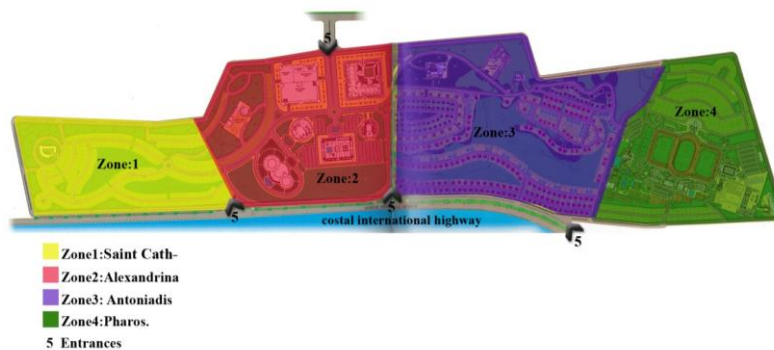


Figure 28 Site zoning By researcher

Site Accessibility:



Figure 29 Site Accessibility By researcher



Figure 30 Highlighted environmental aspects edited by researcher

Sustainable guide lines of Alex west:

1. Design and layout: [Sustainable design, Site layout, Landscape and Urban Design]

- The site is designed with maximum view of the lake and with consideration to the wind direction. Attention has been given to the orientation of the buildings in the site.
- The site has a wide range of landscape and green open spaces.

2. Street design: [Sustainable urban transport, Connected and permeability, Vehicular and Pedestrian, Circulation]

- The site plan uses the maximum view and best orientation of the site.
- Pedestrians have access across the site plan;
- To reduce the need for transport, the area has been planned with services and recreation.

3. Public open space [Greens space, Grey space]

- Urban parks, meeting places and social areas are provided across the site to encourage interaction.
- Alex West Golf (9 holes)

4. Waste management

- Separation of waste

5. Land use considerations

The site plan is a mixed use plan providing the neighborhood with facilities and services for the users.

Application of sustainable site planning criteria on Alex west gated community:

Table 5 Application of sustainable criteria By researcher

Guideline	Alex west	Comment
1. Design and layout	√	75% of the sustainable site design and layout is achieved in Alex-west. Other criteria can be applied.
2. Street design	√	60% of the sustainable street design is achieved in Alex-west. Other criteria can be applied.
3. Efficient use of resources	x	There is no efficiency in uses of resources in Alex-west.
4. Public open space	√	80% of public open spaces are designed in Alex-west. More open spaces and services can be added.
5. Water management	x	There is no water management strategies in Alex-west, but the criteria can be applied.
6. Land use considerations	√	50% of the land use considerations are achieved in Alex-west.
7. Waste management	√	20% of the water management strategies in Alex-west, but the criteria can be applied.

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