

ARCT 421 Introduction to Urban Design and Planning
Spring Semester 2015
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SUSTAINABLE URBANISM

Assignment 3 - Types Of Urbanism

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WHAT IS SUSTAINABILITY?

- ▶ According to the World Commission on Environment and Development) in a panel convened by the United Nations in 1983,
“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”
- ▶ It contains two key concepts:
 - ▶ the concept of 'needs', the needs of the world's poor must be prioritized; and
 - ▶ the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs



WHAT IS SUSTAINABLE URBANISM?

- ▶ SUSTAINABLE URBANISM is the concept of applying the principles of sustainability and resilience to the design, planning, and administration of cities.
- ▶ It aims to
 - ▶ eliminate environmental impact of urban development by providing all resources locally
 - ▶ makes sure that all the products are made sustainably
 - ▶ Sustainable urbanism brings electricity and food production into the city

Everything that the town or city needs is right there which makes it truly self-sufficient and sustainable.





SUSTAINABLE URBANISM AND ITS DEVELOPMENT

There are 3 elements contributing to the development of sustainability:

1. Environmental Sustainability,

- energy efficiency, the reduction in pollution, and recycling of output

2. Social Sustainability,

- equitable development outcomes across all social groups

3. Economic Sustainability

- an economy that thrives while respecting the long term environment and equitable development for all people

SUSTAINABLE URBANISM AND ITS DEVELOPMENT

- Sustainability is influenced by the design of the cities.
- The modern cities are increasingly unsustainable. The industries in the 20th century have polluted wetlands and killed surrounding ecosystems as well as harmed human health. Modern non-sustainable buildings use resources and energy that could be better utilized elsewhere.
- Good sustainable urban design can alleviate these harms and promote environmental, social, and economic benefits in the long term.



- **Jevons paradox-** as things become more efficient, we consume more of them
- Sustainability should be embedded in our objects - cheaper



Electric bulb



Electric Car



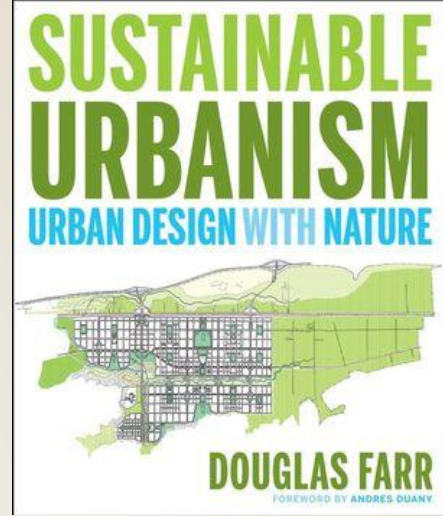
Green houses

LITERATURE REVIEW

- Movement for energy efficient building started in the 1970s but did not get much attraction
- USGBC (United States Green Building Council) was founded in 1993
- **LEED** (Leadership in Energy and Environmental Design) was adopted in 1996
- Integrated design – Optimization of the overall building performance without adding construction cost

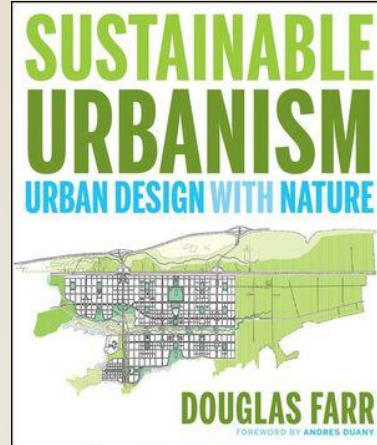


LEED Certified Project



Author: Douglass
Farr

LITERATURE REVIEW

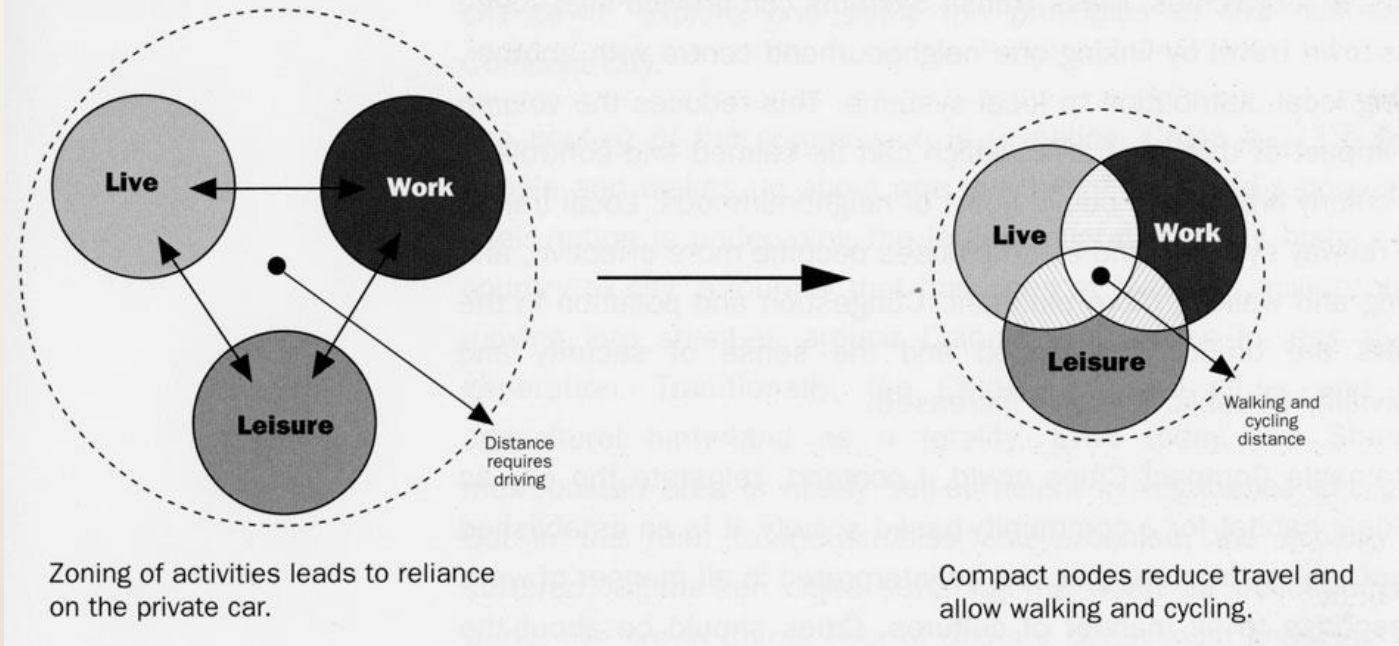


- “Sustainable Urbanism is **walkable and transit-served urbanism** integrated with **high performance buildings and infrastructure**”
- Compactness and the human access to nature (biophilia) are the important values of sustainable urbanism
- *Density, corridors, biophilia, high-performance buildings and infrastructure and neighborhoods* are the most challenging opportunities in sustainable urbanism

COMPACTNESS

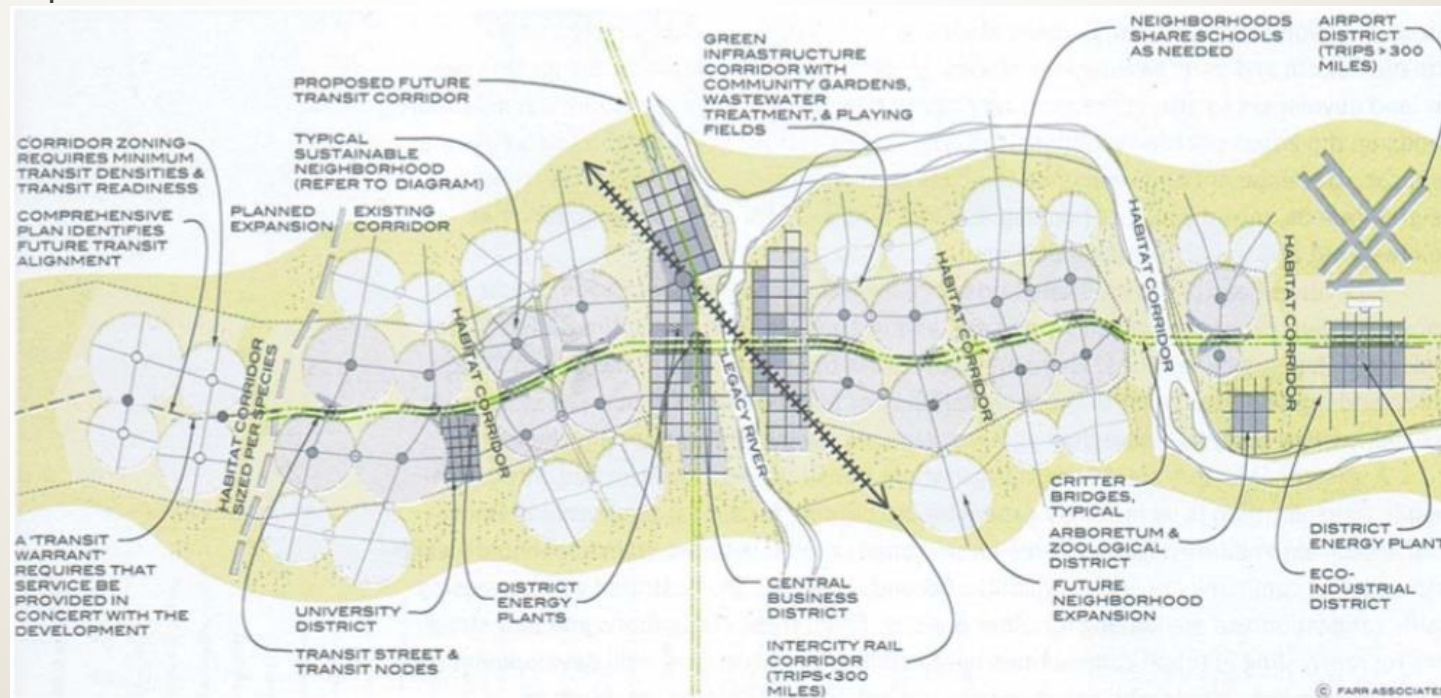
- Achieved in neighborhoods with housing types ranging from multifamily dwellings to large lot detached single family homes all in one neighborhood
- Adds vitality and pedestrians, Improved public transportation, Encourage walking with reduced walking distance

Compact mixed-use nodes reduce journey requirements and create lively sustainable neighbourhoods



SUSTAINABLE CORRIDORS

- Building blocks of sustainable regions
- Main parameters of such a corridor are its
 - density and land use mix
- Transit corridors - linking neighborhoods together with districts and other regional destinations
- Biodiversity corridors - support sustainable populations of native and rare species and connect isolated habitat patches



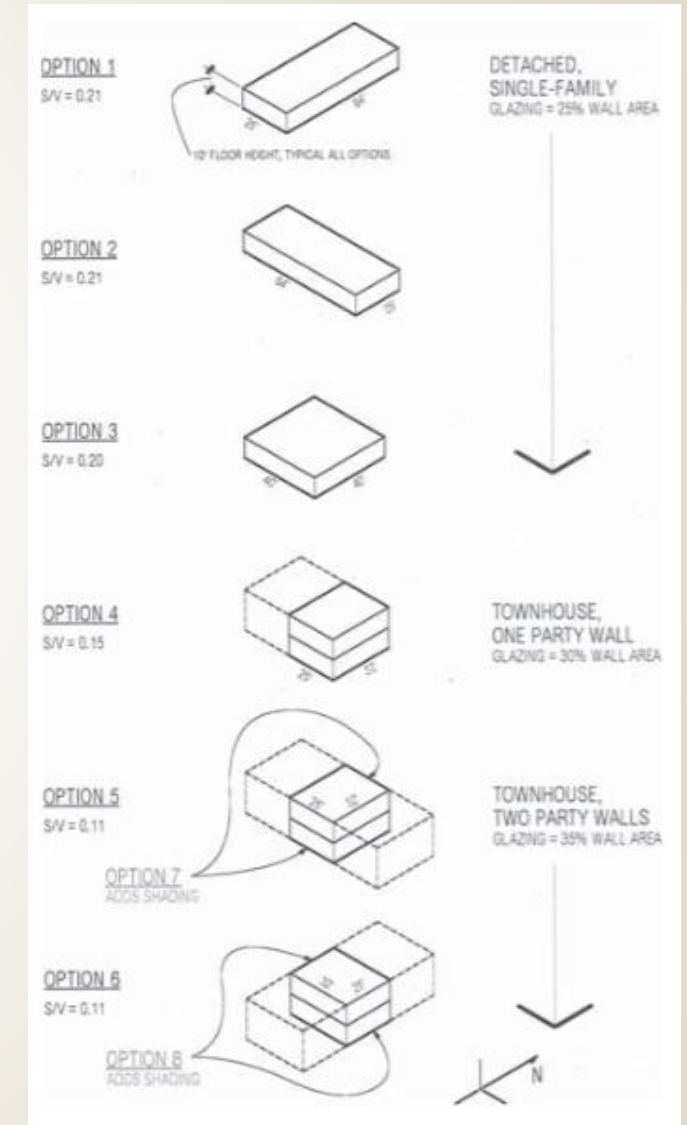
BIOPHILIA (Human Access to Nature)

- ▶ Human settlements need to be designed to make resource flow as visible and experiential
- ▶ For example, a wastewater system that extracts nutrients to grow food in one's neighborhood creates an incentive not to dump chemicals down the drain
- ▶ Open spaces such as parks and recreational areas, sustainable food production and agricultural land use practices linked with humans' concern and relationship with natural systems



HIGH EFFICIENCY BUILDINGS AND INFRASTRUCTURES

- ▶ Building orientation and massing influence the energy used by the unit, before any energy efficiency measures are incorporated into the design (e.g. well insulated walls etc.)
- ▶ Reduce surface-to-volume ratio as much as possible
- ▶ Reduce south-facing glass that receives direct sunlight (in terms of over proportional heating)
- ▶ Improving the performance of the entire roadway system that includes street and sidewalk, underground utilities, storm water infrastructure, landscapes, and streetscape elements





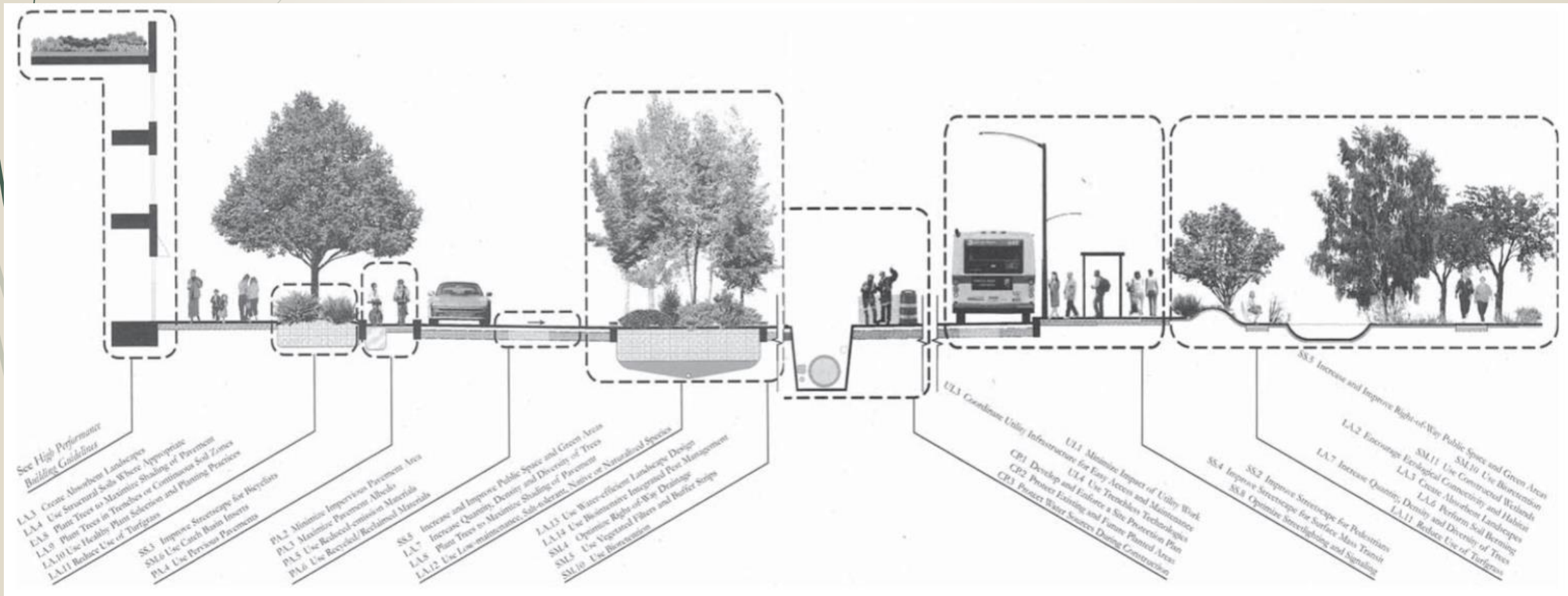
HIGH EFFICIENCY BUILDINGS

- ▶ Energy efficiency/clean energy resources
- ▶ Improved indoor environment
- ▶ Source reduction, pollution prevention and recycling
- ▶ Building operations resource management

HIGH EFFICIENCY INFRASTRUCTURES

- ▶ Component optimization
 - ▶ Using a single component with standard details to optimise performance and minimise environmental impact. Eg. using supplementary cement material to increase pavement strength or designing water-efficient landscapes to reduce irrigation needs and water consumption.
- ▶ Multifunctional optimization
 - ▶ Minimize the conflicts among the single component parts leading to long-term savings, improved performance, and increased returns on municipal investments. Eg. using permeable pavement to reduce storm water runoff and peak demand on storm water management infrastructure while providing an adequate driving surface for vehicles
- ▶ Integrated design
 - ▶ Improving the performance of the entire roadway system

HIGH EFFICIENCY BUILDINGS AND INFRASTRUCTURES

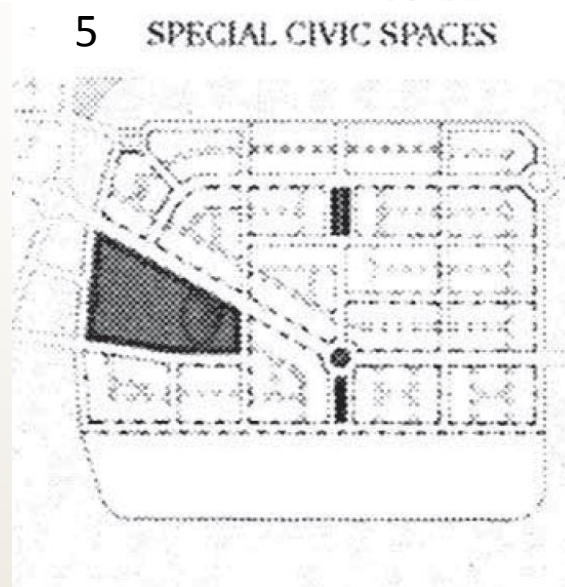
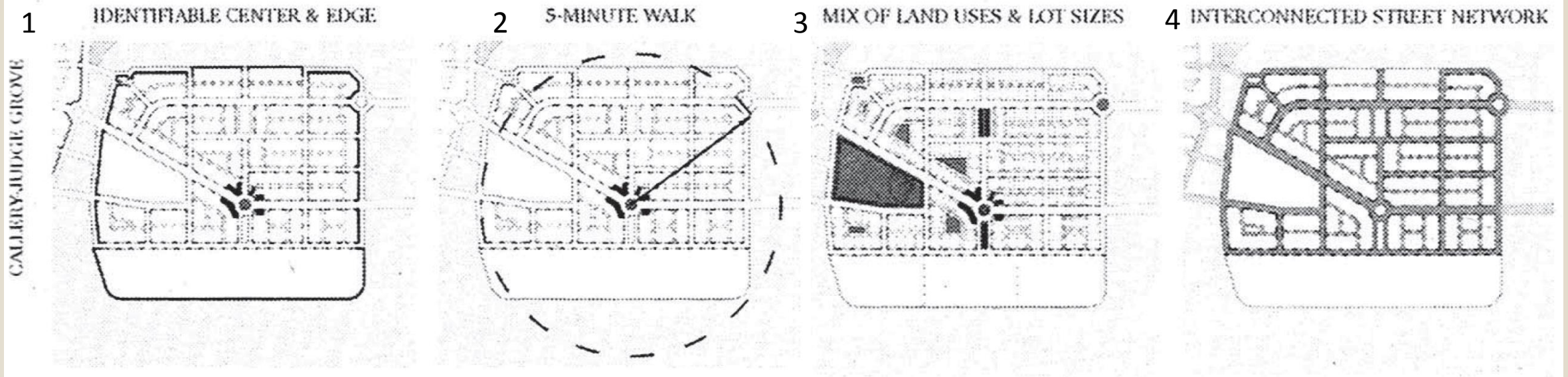


SUSTAINABLE NEIGHBORHOODS

- Compact, complete and connected
- Centered on a core with elementary school, neighborhood services, and markets, allowing people to accomplish daily activities efficiently at one time, gives sense of place and opportunities for community interaction and builds a sense of unity.

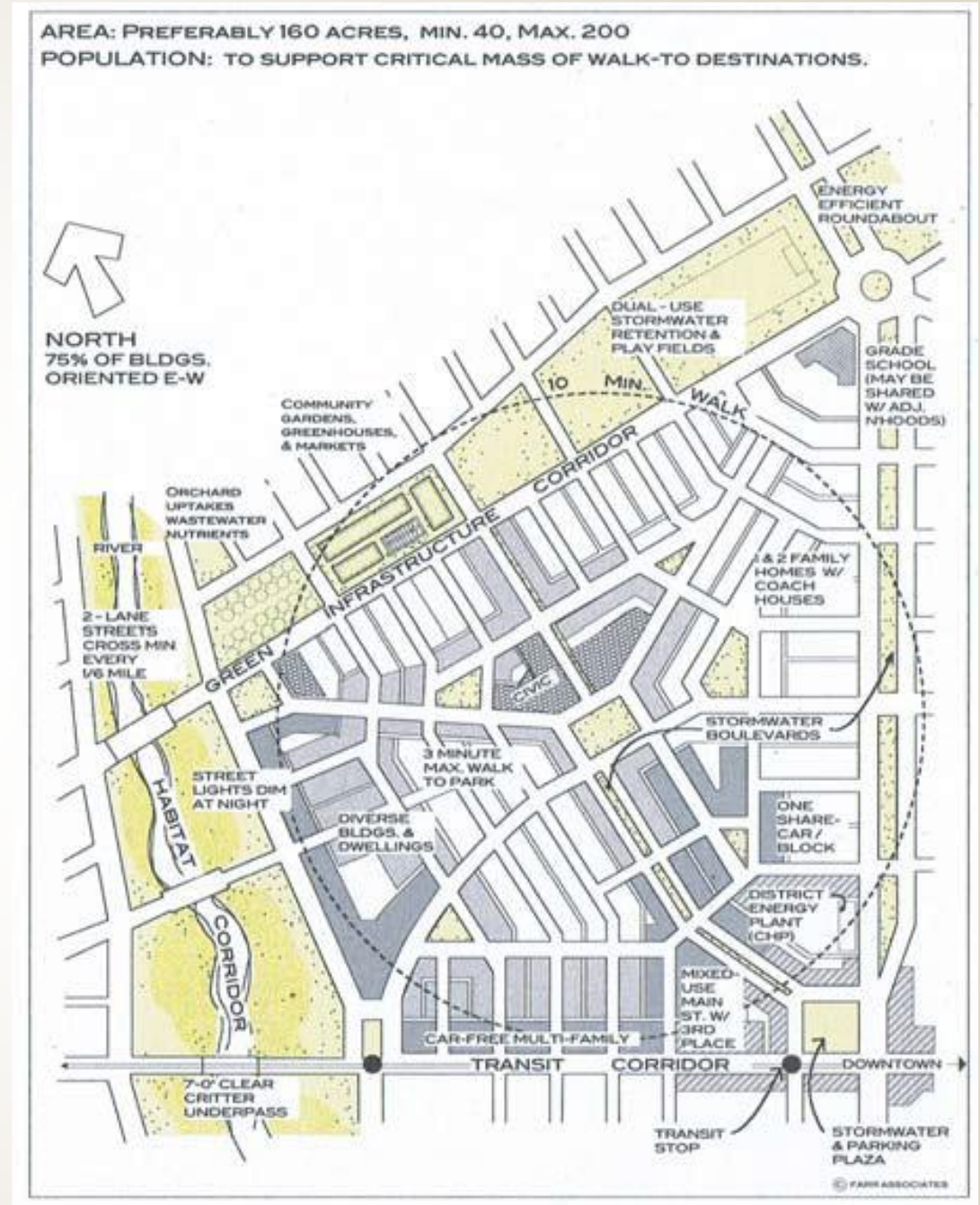


SUSTAINABLE NEIGHBORHOODS – 5 Basic Design Conventions




SUSTAINABLE NEIGHBORHOODS

- The neighborhood is a building block of a transit corridor
- The central bus stop is replaced with a higher density transit mode
- It is fitted with high-performance infrastructure: district power, dimmable streetlights and a share car per block
- The mix and density support car-free housing
- Habitat and infrastructure greenways give the neighborhood distinct edges



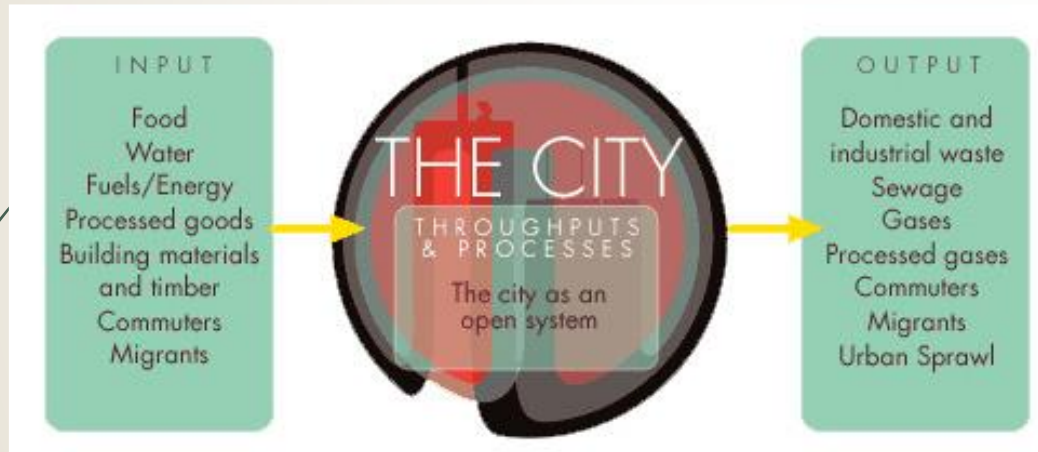


BASIC PRINCIPLES OF SUSTAINABLE URBANISM

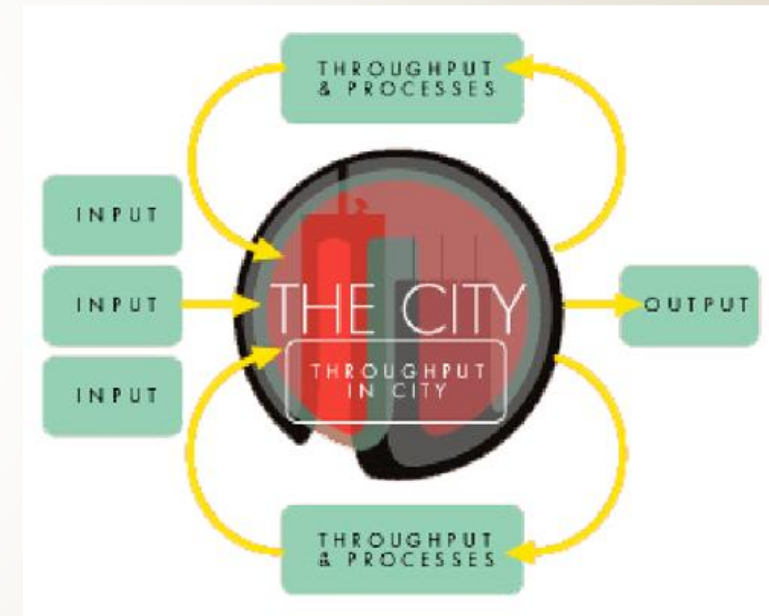
- USING NATURE'S WISDOM
 - DENSITY, MIXED USE, AND CO-LOCATION
 - SUSTAINABLE TRANSPORTATION AND TRANSIT
 - LIVABILITY: DESIGNING FOR PEOPLE'S EVERYDAY LIVES
- 

USING NATURE'S WISDOM

- Inputs are reduced and outputs are recycled through the system



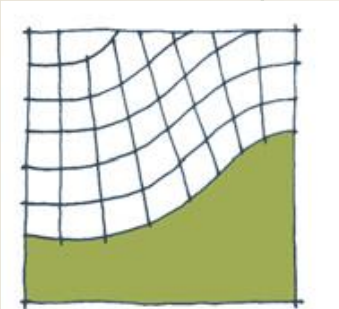
Linear Metabolism



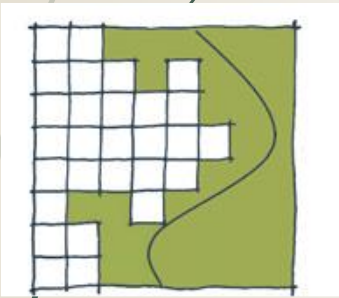
Circular Metabolism

USING NATURE'S WISDOM

- 1. SLOPES, WETLAND & VEGETATION-** The landscape features mentioned below are respected and protected

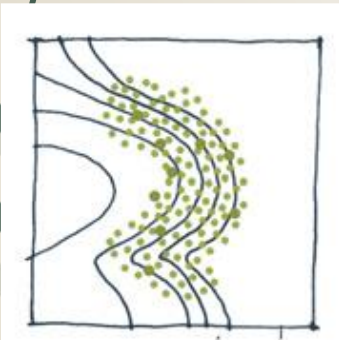


STREETS - follow topography



NATURAL FEATURES:

- Slope
- Floodplain
- River



PRESERVE NATURAL FEATURES -
Forest 1:4 Slopes

- 2. STORM WATER DRAINAGE-BLUE TRANSECT SYSTEMS –**

- Follow natural watersheds and natural corridors to harness gravity, to harvest rainwater and treat storm and wastewater runoff
- Natural watersheds are defined from tops to bottoms of hills and storm water is channeled by gravity. This is a cheap way to guide water without the use of any infrastructure and piping, while at the same time avoiding erosion and beautifying communities with water retained.



Channeling Storm water



Constructed Wetlands

USING NATURE'S WISDOM

2. STORM WATER DRAINAGE-BLUE TRANSECT SYSTEMS –

- ▶ The figure shows several elements of a sustainable infrastructure system used to plan the Sub Area projects, including bioswales, stepped rain gardens, bioretention and constructed wetlands, graywater reuse and environmental treatment zones



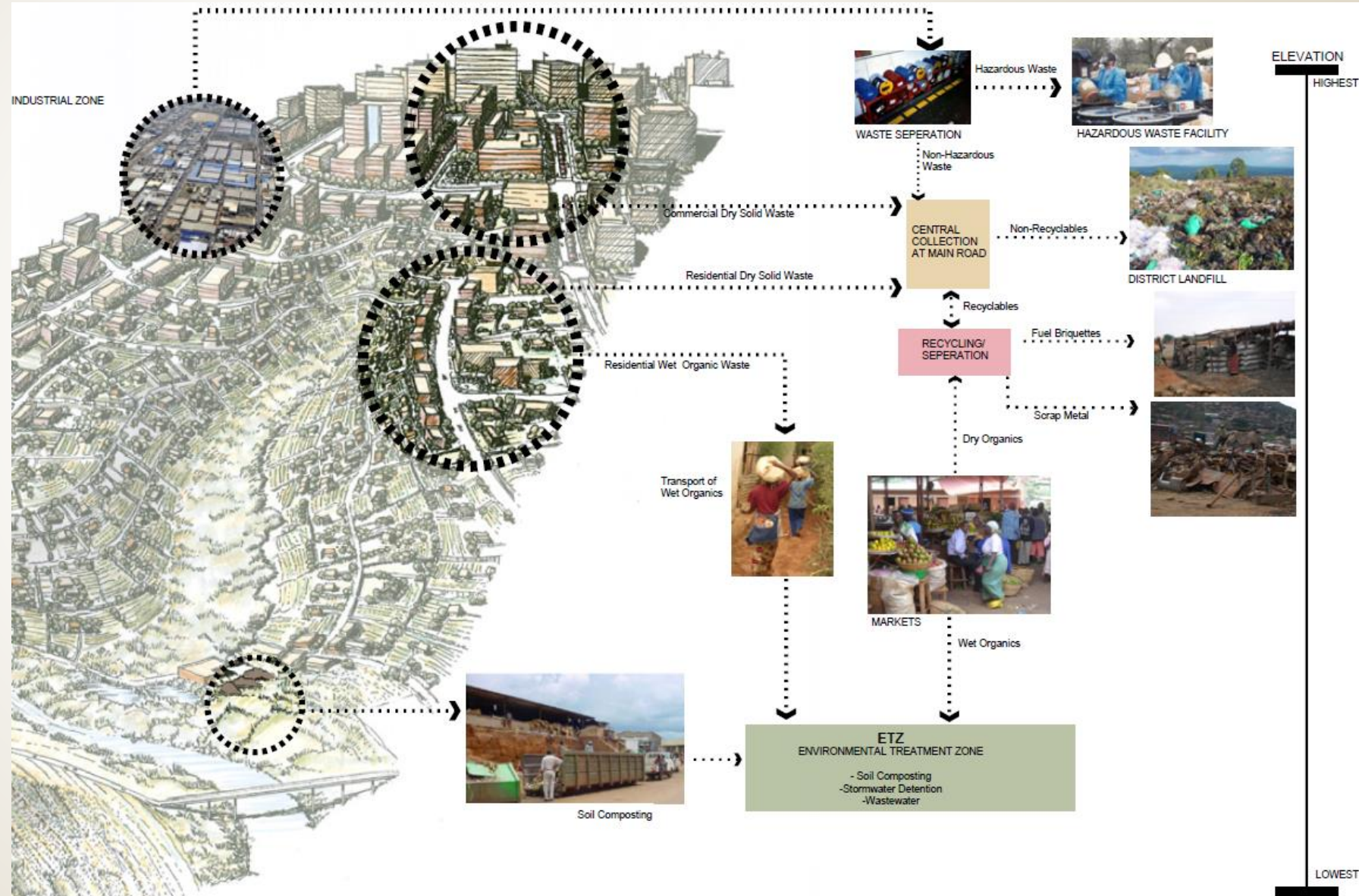
USING NATURE'S WISDOM

3. SANITARY SEWAGE & TRASH RECYCLING SYSTEMS –

- Use gravity to remove and treat wastewater
- Reuse the waste by recycling it close to the site
- Biogas digesters produce cooking gas or soil composting/fertilizers
- Grey water can be re-used for irrigation and flushing

USING NATURE'S WISDOM

TRASH RECYCLING SYSTEMS

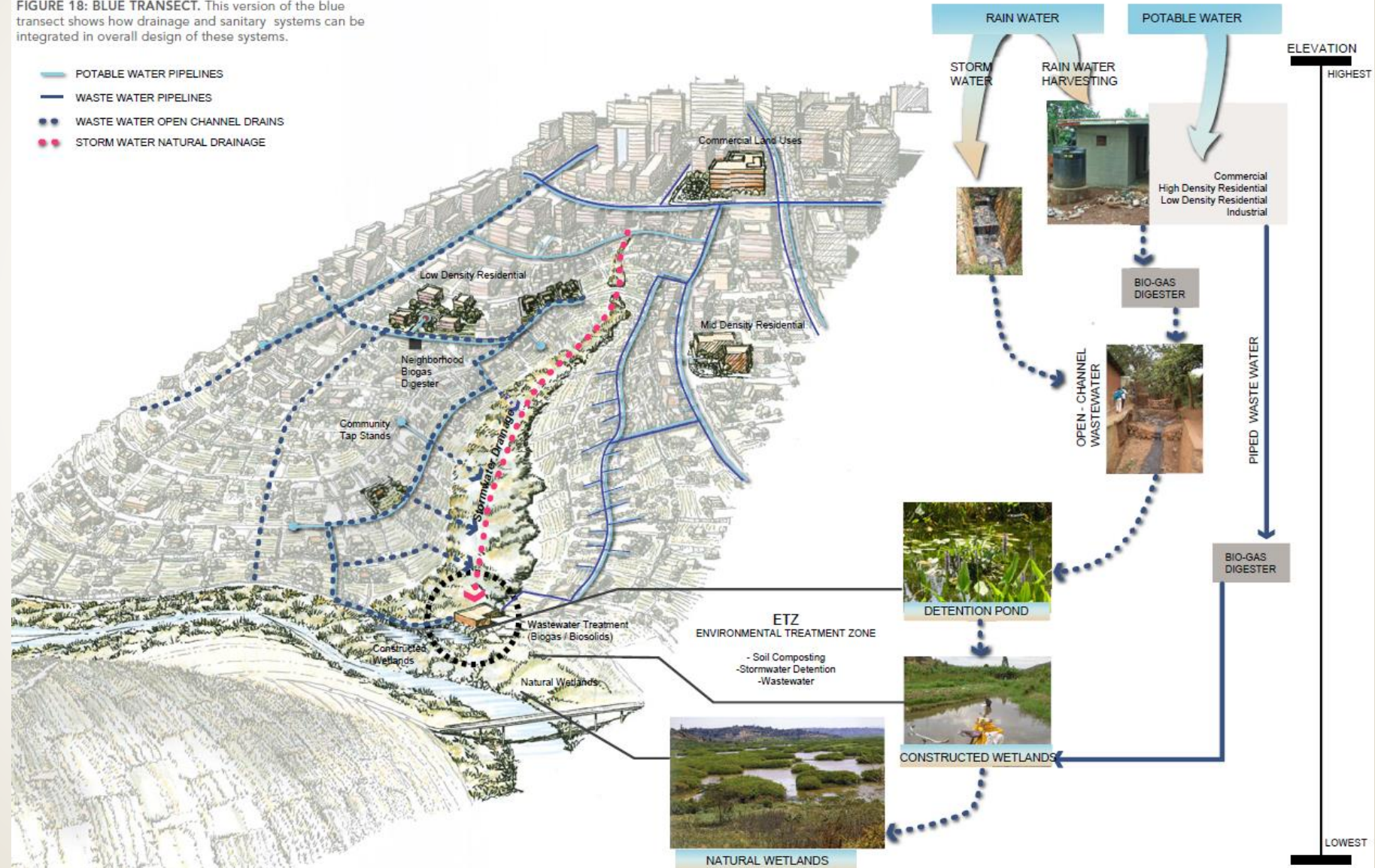


USING NATURE'S WISDOM

SANITARY SEWAGE SYSTEMS

FIGURE 18: BLUE TRANSECT. This version of the blue transect shows how drainage and sanitary systems can be integrated in overall design of these systems.

- POTABLE WATER PIPELINES
- WASTE WATER PIPELINES
- ⋯ WASTE WATER OPEN CHANNEL DRAINS
- ⋯ STORM WATER NATURAL DRAINAGE



USING NATURE'S WISDOM

4. URBAN AGRICULTURE, GARDENS, & LANDSCAPING –

- Expansion and support of urban agriculture will provide fresh healthy food for the growing urban population
- Provide food and fresh air and enhance the urban quality of life and bring opportunities for biophilia and well being



4. GREEN ROOFS & WALLS -

- Insulate and beautify buildings and to alleviate heat island effect



USING NATURE'S WISDOM

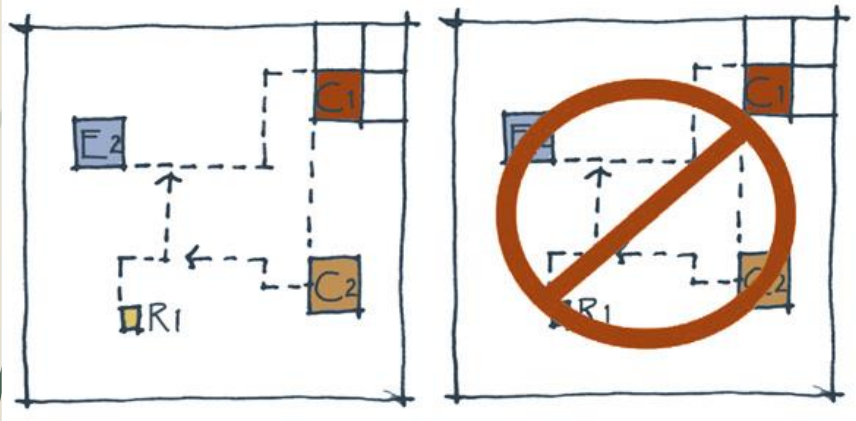
4. RENEWABLE ENERGY & SUSTAINABLE MATERIALS –

- Renewable energy should be integrated at all levels of the city design, including buildings, infrastructure and landscaping



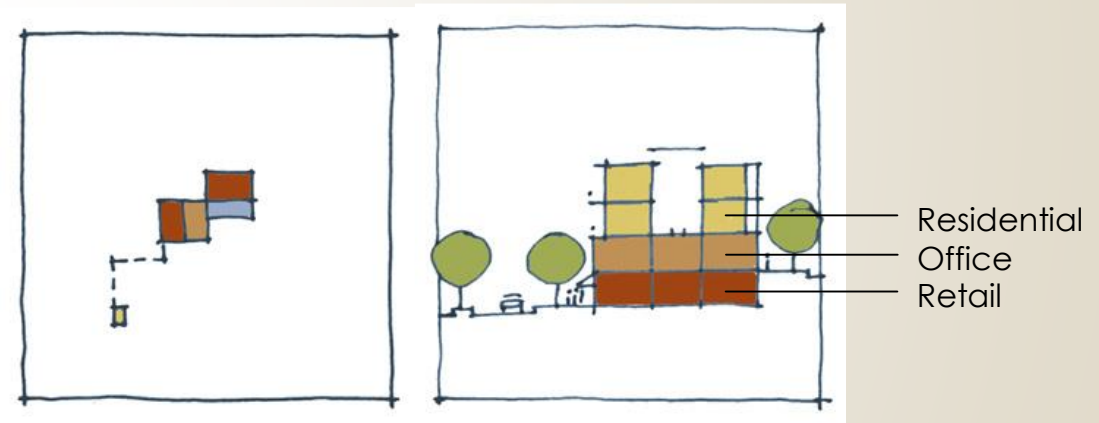
DENSITY, MIXED USE & CO-LOCATION

- **Density** should be located where it is environmentally feasible.
- It preserves ecological systems such as wetlands and open space.
- It also allows for increased use of public transportation



Segregated Used Zones must be avoided as it uses transportation time and fuel

- **Mixed Use and Co-Location** is done by mixing uses, such as residential, work, school, and others.
- It promotes economic efficiency by reducing vehicle miles travelled, fuel use and pollution.
- It is safer for families and children because there is activity and "eyes on the street" during much of the day.

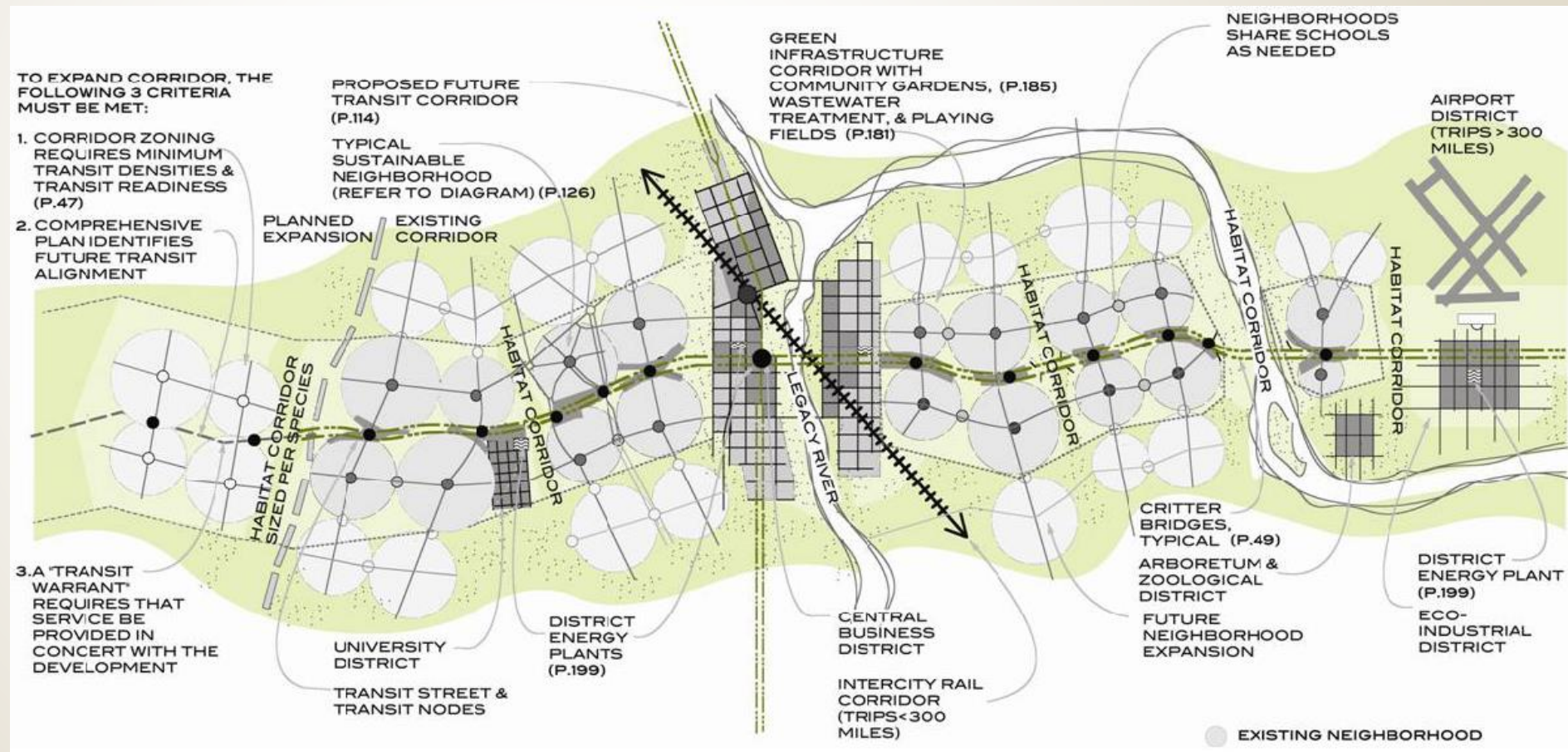


Mixed Use building designed OZ Architecture in Boulder, Colorado

SUSTAINABLE TRANSPORTATION & TRANSIT

- When transit is integrated with dense and mixed-use development through sustainable corridors, it provides the “bones” of the sustainable city
- Alternative transport, cycling and pedestrian systems create a sustainable urban system

This Urban corridors system maximizes the benefits of integrating density, mixed use, greenways, and alternative transportation. At each point along the corridor, development is concentrated around a node of public space/public transportation that links to surrounding neighborhoods.



SUSTAINABLE TRANSPORTATION & TRANSIT

TRANSIT ORIENTED DEVELOPMENT (TOD)

- Sustainable cities have transit lines through clearly defined corridors that carry people efficiently between two points.
- These line have multi-modal stations that have commercial and/or residential uses mixed into the building or located close by in an integrated site plan, this is called Transit Oriented Development (TOD).
- Easy for people to better understand and use the transportation and provide plentiful and comfortable room for people to wait for their transportation.



Bus System



Fixed Rail



SUSTAINABLE TRANSPORTATION & TRANSIT

COMPLETE STREETS

- ▶ Multipurpose streets blend with vehicular, transit, bikeway, and pedestrian traffic
- ▶ Designed and operated to enable safe access for all users, especially children
- ▶ Pedestrians, bicyclists, motorists and transit riders of all ages and abilities can safely move along a complete street
- ▶ Promote economic development because walkers are closer to stores
- ▶ Reduces traffic



LIVING STREETS

- ▶ They enable safe access for all users: drivers, transit users, pedestrians, and bicyclists, as well as for older people, children, and people with disabilities.
- ▶ Streets become important parts of the public realm, linking to parks, plazas etc.



GREEN STREETS

- ▶ Green Streets are special Complete/Living Streets that are designed along with sustainable drainage systems.
- ▶ They have storm water runoff channels that recycle water.
- ▶ They can include linear parks along which people can cycle or walk.



SUSTAINABLE TRANSPORTATION & TRANSIT

- ▶ **GREEN STREETS-** Map of Kinyinya Sub Area Green Streets



 Green Streets

LIVABILITY: DESIGNING FOR EVERYDAY LIVES

- ▶ **Sustainable cities** are designed for children and how they go to school, they are designed for their families.
- ▶ They are designed to care for people's health before they get too sick by providing small clinics that are easily accessible locally
- ▶ They provide meeting places for people's organizations and community groups, as well as churches and mosques so that people can worship every day easily.
- ▶ Markets are varied and provide healthy food for urban dwellers as well as places for people to sell products from their own gardens.
- ▶ Post offices and ICT centers help people communicate
- ▶ Create harmony by providing easy access to the daily needs of residents.



CASE STUDIES

➤ Sustainable Urbanists Projects organized by Size

Project Scale	Type of Construction	Sample Project with Select Sustainable Systems	Project Image
Less than 1/4 acre	Single building	Bethel Commercial Center <ul style="list-style-type: none"> ● Transit-oriented design ● Mixed-use, multimodal center ● Green roof 	
1/4–1 acre	Multiple buildings	Christie Walk <ul style="list-style-type: none"> ● Solar hot water ● Community gardens ● Thermal mass construction 	
1–5 acres	An urban block	BedZED <ul style="list-style-type: none"> ● Natural ventilation ● Combined heat and power system (CHP) ● Passive solar design ● Car share 	
5–40 acres	Fraction of a neighborhood	Dockside Green <ul style="list-style-type: none"> ● All buildings LEED Platinum ● Biomass co-generation ● Biodiesel facility 	
40–200 acres	Neighborhood	High Point <ul style="list-style-type: none"> ● Seamless integration of affordable housing ● Community gardens ● Streets relinked to Seattle grid 	
200+ acres	Corridor	Green Line Initiative <ul style="list-style-type: none"> ● Complete neighborhoods developed ● Transit-oriented design ● Density concentrated in mixed-use buildings near transit stops 	

CASE STUDY – HANNOVER, KRONSBURG

- ▶ The Kronsberg project is the city of Hannover's vision for sustainable development in Germany
- ▶ The planning process included ambitious energy reduction goals, transit oriented design, and mixed-income residential areas
- ▶ When the city of Hannover won the bid to host the Expo 2000 World Exposition, the city made a decision to pursue a sustainable development under the motto "*Humankind – Nature – Technology*"
- ▶ Kronsberg's big success is, by 2001, a 74 % reduction in CO2 emissions compared with conventional developments
- ▶ They adapted:
 - ▶ Compactness
 - ▶ Walkable streets and networks
 - ▶ Open space
 - ▶ Storm water systems
 - ▶ Integration of transportation
 - ▶ Land use and energy
 - ▶ Impact of planning on building energy usage
 - ▶ Large district energy systems



Hannover-Kronsberg Master Plan

Hannover-Kronsberg Master Plan (zoomed in)



CASE STUDY – HANNOVER, KRONENBERG



Systems for infiltration, buffering and drainage



Building Project with microclimate



“Habitat” – Multicultural Living

CASE STUDY - Dockside Green Victoria, British Columbia, Canada

- ▶ A reclaimed industrial wasteland near to the waterfront to host Victoria's most ambitious green project
- ▶ A zero carbon development, regenerating the land that was formerly contaminated with petrochemicals and toxic heavy metals.
- ▶ Dockside Green is famous for its plan to certify all 26 buildings in the development as LEED Platinum, in addition to incorporate green infrastructure.
- ▶ They adapted:
 - ▶ Walkable streets and networks
 - ▶ Car sharing
 - ▶ Neighborhood Retail
 - ▶ Biodiversity corridors
 - ▶ Open space
 - ▶ Storm water systems
 - ▶ Wastewater treatment
 - ▶ Integration of transportation
 - ▶ Land use and technology
 - ▶ The impact of planning on building energy usage
 - ▶ Large district energy systems



Dockside Green Victoria,
Canada. Masterplan

CASE STUDY - Dockside Green Victoria, British Columbia, Canada



Dockside Green Victoria, Canada. Bird View



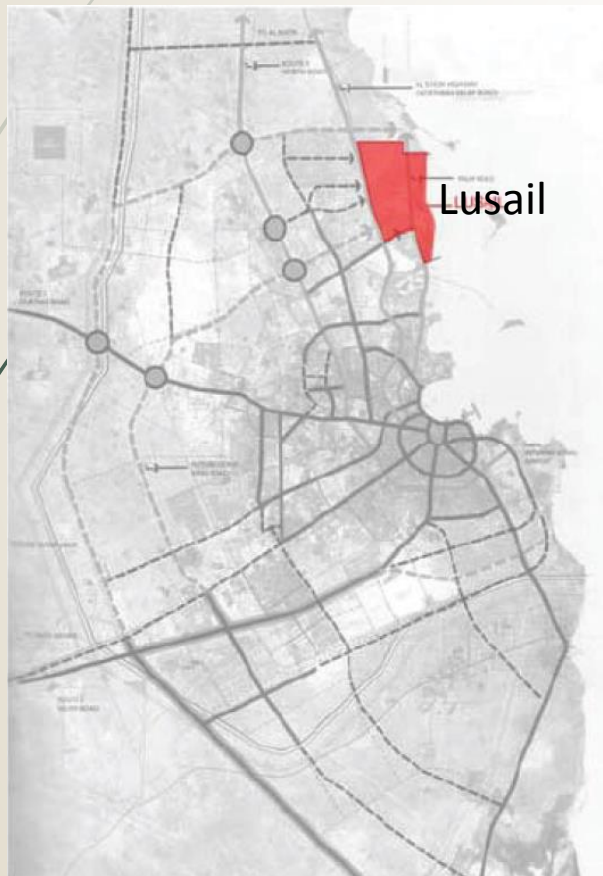
Dockside Green Victoria, Canada. Living Green Streets



Dockside Green Victoria, Canada. Biodiversity Corridor

RELEVANCE TO QATAR'S URBAN DESIGN PROJECT

- **LUSAIL CITY** - Commenced the application of QSAS (Qatar Sustainability Assessment) which promotes sustainable development to protect the natural environment and the community health. The city is called the "Smart City" and is the first green city in Qatar. This approach designs energy efficient and environmentally sensitive buildings in the city.



LUSAIL CITY

Focus on Improved Sustainable Living



DISTRICTS - 19 major districts defined by land use, density, and adjacent amenities
Distinct identities within the larger development



NEIGHBORHOODS - Smaller neighborhoods within each district, defined by a 5min walking radius and support services



SUPPORT SERVICES - Open space, schools, neighborhood retail, and/or community facilities

LUSAIL CITY

► Sustainable Open Space Network

- 200,000 m² of open Green space in the project
- The green space connects the City from its western edges all the way to the waterfront to promote a *pedestrian lifestyle*
- The sustainable green parks and the wadi were planned by world class landscape architects after competing in an international competition.



LUSAIL CITY

► Parks and green Open space



LUSAIL CITY

► Integrated Public Transport Strategy

- Integrated with Future Highway Network Development
- Consistent with Roads Department Plans
- Introduce & promote Public transportation systems
 - Bus
 - Train
 - Water Taxi
 - Pedestrian net work
 - Bicycle ways



LUSAIL CITY

- Focus on Improved Sustainable Living



LUSAIL CITY

Public Car Parks



LUSAIL CITY

► Sustainable Utilities



**District Cooling,
Pneumatic Waste
Collection and Gas
Network**

LUSAIL CITY

► Pneumatic waste collection



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