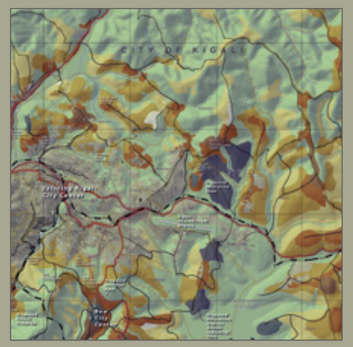
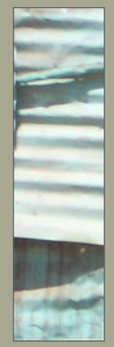
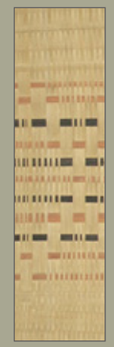
Kigali Sub Area Plans

SCHEMATIC DESIGN








R W A N D A

SUSTAINABLE URBANISM

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DECEMBER 2010

SUSTAINABLE URBANISM

REBERO

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THE CASE FOR SUSTAINABLE URBANISM

This chapter of the Sub Area Planning report sets the stage for the urban plans and designs in this report. It introduces the concept of Sustainable Urbanism, which lies at the foundation of the work that follows. Herein is presented the Case for Sustainable Urbanism, exploring why this issue is so important in the 21st Century. Second, key elements of Sustainable Urbanism are summarized. Third, a conceptual framework, "From Region to Neighborhood," is presented to help planners, policy makers and stakeholders learn about and apply Sustainable Urbanism. It is hoped that these principles will become commonly understood by the planning and urbanist community in Rwanda and help support sustainable urbanization of Kigali.

SUSTAINABLE URBANISM & DEVELOPMENT

In 1987, the Brundtland Report (WCED) brought the term sustainable development into the popular sphere, describing it as "development that meets the needs of present generations without compromising the needs of future generations." Sustainable Development includes three elements:

- **Environmental Sustainability,** which uses nature as a model and emphasizes energy efficiency, the reduction in pollution, and recycling of output. William McDonough, the architect, calls this a "cradle to cradle" economy that recycles endlessly in a closed cycle loop.
- **Social Sustainability,** which emphasizes equitable development outcomes across all social groups. Development that only meets the needs of one group will not be sustainable for a healthy society in the long run.
- **Economic Sustainability,** which strives for an economy that thrives while respecting the long term environment and equitable development for all people. It aims to help all people participate in the economy by bringing their resources and capabilities to bear in creative and innovative ways that enhance quality of life for all.

Urbanism and the design of cities directly influence sustainability. But modern cities are increasingly unsustainable. 20th century industry has polluted wetlands and killed surrounding ecosystems as well as harming human health. Modern non-sustainable buildings use resources and energy that could be better utilized elsewhere. Cities (both suburbs and redevelopment) can divide social groups instead of helping people to collaborate across boundaries . Sprawling urban design and expensive infrastructure are expensive to build and maintain. Good sustainable urban design can do much to alleviate these harms and promote environmental, social, and economic benefits in the long term.

URBANISM, THE ENVIRONMENT & CLIMATE CHANGE

The layout of our regions, cities and towns can have a great impact on our environment. Historically, environmental damage was represented by the image of heavy industry spewing air and water pollution, harming people, plants and animals and interfering with ecosystem integrity. But it has become clear that the *layout* of cities can also contribute to environmental degradation and climate change.

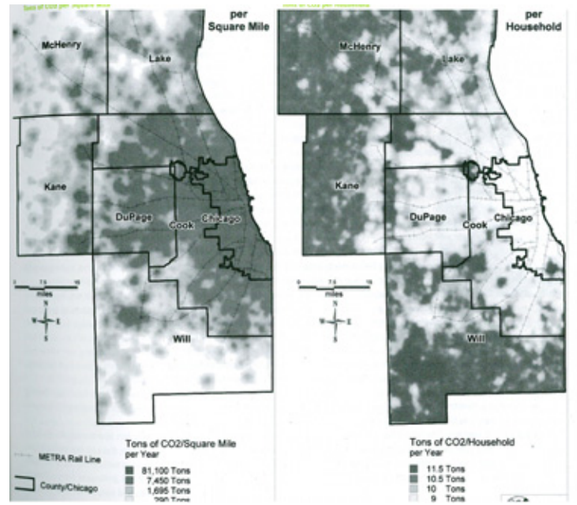
While factories are becoming cleaner as a result of environmental regulations, urban design has caused increasing amounts of pollution and greenhouse gases. The typical sprawling layout of much 20th century suburbia (especially in the US) has contributed to growing use of the automobile, miles traveled to reach daily destinations, and use of carbon-based fuels which produce greenhouse gases. The result is increased carbon and particulate emissions into the atmosphere in addition to point sources such as factories. Designing dense cities instead of sprawling suburbs can cut emissions.

FIGURE 1A: NEW ICONS OF POLLUTION. The iconic image of environmental pollution in the past was an image of a chimney belching black smoke. However, sprawling urban design is now an even more significant contributor to pollution and greenhouse gas emissions.

Farr. 2008. Sustainable Urbanism

FIGURE 1B: THE TRAGIC IRONY OF EFFICIENCY: Many wonderful inventions have brought efficiency and comfort to modern life. However, these have also had unintended consequences to personal health, environment, society and economic viability. Even with more efficient technologies and increased regulations for automobile emissions, energy use continues to grow, as do vehicle miles travelled (VMT). Even with energy efficiency, houses are getting bigger. By designing cities in compact ways, providing alternatives to the automobile, and by designing attractive multi-family denser housing, these trends can be addressed.

Farr. 2008. Sustainable Urbanism



Farr. 2008. Sustainable Urbanism

FIGURE 2: TWO VIEWS OF CARBON EMISSIONS: THE PAST AND THE PRESENT. These two maps of Chicago depict traditional and modern images of carbon emissions. The map on the left shows tons of carbon emissions/square mile per year. Clearly, the dense city center had higher emissions than the surrounding suburbs. As the right-hand image shows, this has changed in recent years. It depicts tons of carbon emissions per household and shows how city dwellers produce relatively lesser amounts of greenhouse gases because their compact dense neighborhoods require fewer vehicle miles travelled (VMT).

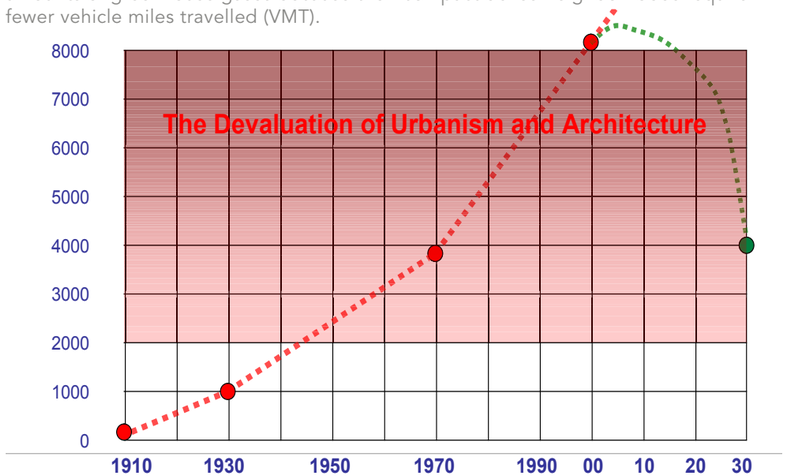


FIGURE 3: THE 2030 COMMUNITY CHALLENGE: This table shows increased vehicle miles travelled (VMT) in the US between 1910 and 2000, during the period when US cities expanded into their suburban hinterlands. This was a period when urban quality and good urban design were devalued in US society. Sustainable urbanists argue that by using sustainable design, this number can be reduced in the future.

Farr. 2008. Sustainable Urbanism.

URBANISM & PERSONAL HEALTH

The design and layout of cities can have a profound impact on personal health. In cities around the world where people live below the poverty line, research shows that personal gardens go far to enhance nutrition and health. By encouraging community gardens throughout the urban sphere, people are nourished and can use additional produce to supplement their income. Research also shows that when people have access to nature, they experience greater psychological and spiritual wellness. This idea is sometimes known as Biophilia.

In countries where cities are spread out and cars are the main mode of transportation, obesity has become a prevalent problem (and trends show this pattern emerging even in newly developing cities in the developing world). By designing dense interconnected cities where people can use alternative transportation, ride bikes or walk, obesity is curtailed.

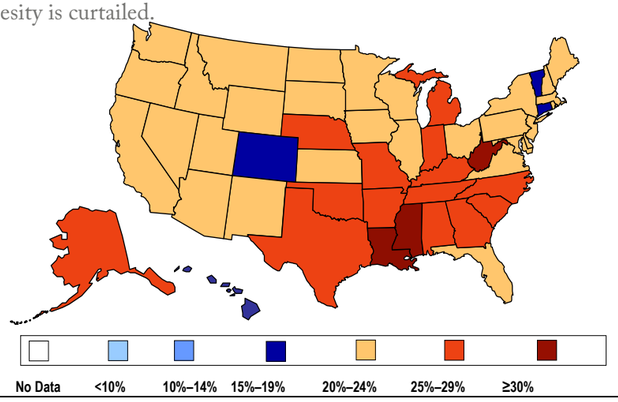
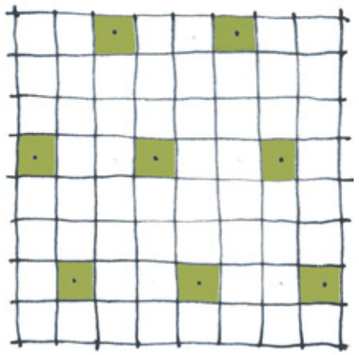


FIGURE 4: HEALTHY CITIES, HEALTHY BODIES. While malnutrition is a serious issue in developing cities, obesity is a threat when sedentary/automobile cultures develop. It can be offset by designing cities with plenty of outdoor recreation space. This map shows obesity trends among US adults, in which states with an outdoor recreation orientation and walkable cities are the healthiest (brfss. States 2005)

Farr. 2008. Sustainable Urbanism

CHILD DEVELOPMENT & GREEN SPACE

There is a growing amount of research that shows how children develop more healthy bodies and minds by spending more time out of doors and in nature. The Center for Children, Youth and Environments at the University of Colorado has documented this phenomenon in both the global north and south (see http://www.colorado.edu/journals/cye/). Pollution lowers children's IQ and they are disproportionately vulnerable to climate change; but walkable neighborhoods keep them safe and well designed and plentiful playgrounds help them thrive.



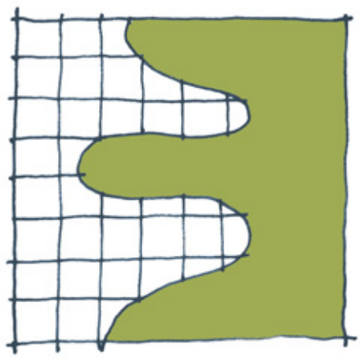


FIGURE 5: GREEN SPACE can be distributed across cities in small pockets, or it can be integrated in fingers of green.

FIGURE 6: CHILDREN BENEFIT in many ways from playing outdoors, being in green space and participating in gardening.

WATER, WATER, SANITATION, PUBLIC HEALTH, & SAFETY

One of the most important services provided by our cities is provision of water and sanitation and the removal of waste. Sustainable infrastructure is a key element of a healthy city. Lack of these services is a top cause of illness, especially diarrheal illness in children. Provision of these services, especially water, releases children who would normally carry water to go to school. Increasingly, engineers are designing services that are more affordable to build and maintain because they align with natural systems. And communities are devising public systems that are both healthy and profitable.

Girardet, Cities, People, Planet

Girardet, Cities, People, Planet

Girardet, Cities, People, Planet

FIGURE 7: WATER AND SANITATION SYSTEMS contribute to health and they produce safer, cleaner environments for all urban citizens. Above is a monitor in the Brazilian city of Curitiba that counts the number of trees saved by recycling of paper and other materials instead of putting them into landfills. This also helps reduce overflowing and unsafe landfills.

SOCIAL COHESION, SECURITY & DEVELOPMENT

Social integration and cohesion are key issues in Rwanda where people are still recovering from the violence of the past and trust is being rebuilt. Cities can promote positive social change or it can exacerbate tension. Often, cities are designed without this goal in mind, but with forethought they can help create healthy families, communities and societies.

For example, it is important to design for people and families' real lives, to make it easy for them to accomplish their daily activities and still have energy and resources left over to build their households, communities, and society.

One way to emphasize the daily lives of families is to plan around the neighborhood as a building block. A neighborhood should be centered on a core with elementary school, neighborhood services, and markets, allowing people to accomplish daily activities efficiently at one time. A strong center to neighborhoods can also promote sense of place and opportunities for community interaction and understanding that may build a sense of unity.

At the same time, social and psychological health can benefit from a variety of urban spaces that allow people a range of experience. These can include public spaces for group activity or private spaces for quiet contemplation, all of which make the city richer for its inhabitatnts. Spaces and place should consider the wide range of diversity welcomed by the best and most vital cities, promoting a sense of personal opportunity.

Safety and security for children, the elderly, and the handicapped is a key element of good neighborhood design. Mixed-Use neighborhoods and districts have "eyes on the street" which promote security and safety. Neighborhood design with close and secure access to schools via networks of pedestrian and bike trails let children walk to school and parks and play safely in the neighborhood. When children have independence in the neighborhood, they grow in responsibility and their ability to solve problems on their own.

Neighborhoods are the building blocks of communities, and when they agglomerate, they can form a healthy and viable city that can promote ownership of space and pride. Together, all these factors promote social cohesion, security and when people feel safe and secure, they are free to unleash their generative powers to enhance their own development.

FIGURE 8: SUSTAINABLE NEIGHBORHOODS
provide safe and harmonious places for children, elders and communities in general.

URBAN ECONOMICS: EFFICIENCY, PRODUCTION AND ECONOMIC DEVELOPMENT

Sustainable infrastructure and urban design are much more economical in the long run than non-sustainable design for many reasons. Whether it is reducing up front costs, minimizing citizens daily costs, or promoting economic production, sustainable urbanism can promote economic development and growth.

The best way to minimize cost is to design sustainable infrastructure using nature. For example, it is always cheaper to use gravity to design downhill water treatment facilities, including Environmental Treatment Zones. It is always cheaper to design roads that follow contours and minimize up-slope design.

Density is also economically sustainable. Dense urban development captures a much higher tax revenue stream than low density development. It also minimizes hard systems infrastructure, which is expensive. If density is concentrated and co-located in Mixed-Use developments, the linear foot length of roads and piped systems is reduced. Mixed-Use development also allows shared parking (daytime workers leave and nighttime residents return); thus reducing the amount of parking needed.

For individuals, sustainable design can save time, which saves money. Mixed-use (live/work) and alternative transportation networks reduce the cost of transportation. Neighborhood Centers where elementary schools, community centers, markets, and other neighborhood facilities are centrally located allow parents to drop off children and attend to other business at the same time without spending all day going to dispersed sites. Greenways that carefully lay out pedestrian and bikeway systems allow people to use bicycles and motos, which are cheaper than cars. If mass transit systems are designed into the urban fabric from the beginning, they are efficient resources as an alterantive to expensive private vehicles.

When sustainable urbanism is used correctly, it not only cuts long term costs, it frees up peoples' time and energy to promote economic development. It can also promote productivity when eople's priorities for their own economic development strategies are integrated into urban design. For example, when farmers' markets, "production retail", and other micro-enterprise spaces are designed into urban landscapes, they become spaces of economic vitality instead of just spaces of consumption.

When a city is designed with sustainable economic strategies in mind, costs are reduced, time can be used more efficiently, and economic development can be promoted. All of these strategies produce efficiency and accelerate productive long term development.

BASIC PRINCIPLES OF SUSTAINABLE URBANISM

Sustainable Urbanism is a function of several basic principles. Combined together, these four elements center cities on people instead of the automobile, utilize modern technologies to their best advantage, and most importantly, they depend on viewing cities as living entities.

- 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

In modern times, the city has been seen as a linear system or metabolism, with inputs and outputs. As outputs have increased over the 20th century to create unsustainable amounts of pollution and climate changing carbon emissions, a new vision of the city has emerged.

This is a circular system or circular metabolism, modelled on nature's cyclical wisdom. In this approach, which sees outputs as damaging to urban and environmental quality, inputs are reduced and outputs are recycled through the system again and again. Thus, outputs are reduced, much as nature cycles outputs through its own system continuously.

A circular metabolism incorporates design that reduces inputs at the front by a wide range of means outlined in this section. It also includes maximum recycling of outputs through the system over and over.

This vision, using nature's own wisdom, is the fundamental basis for all of the following approaches to urban planning and design.

FIGURE 9: LINEAR METABOLISIM

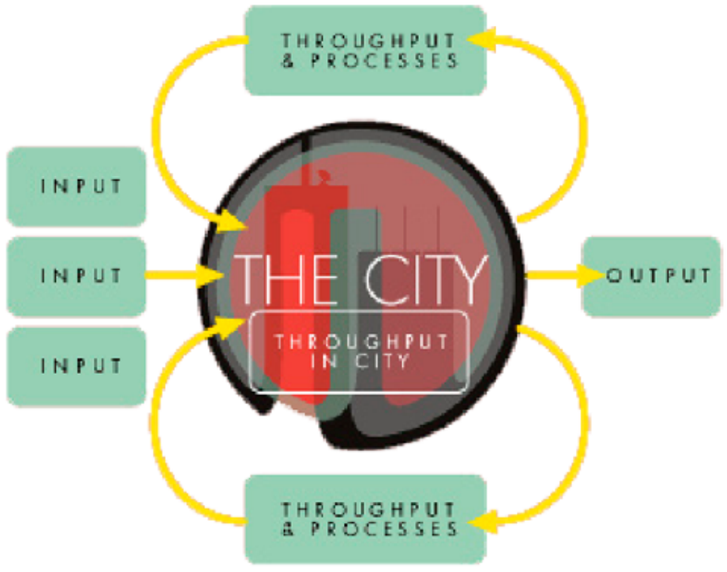
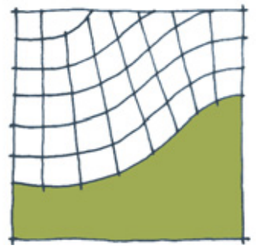


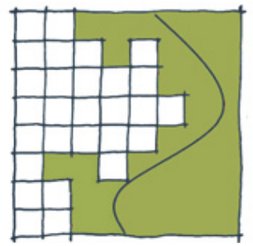
FIGURE 10: CIRCULAR METABOLISIM

SLOPES, WETLAND & VEGETATION

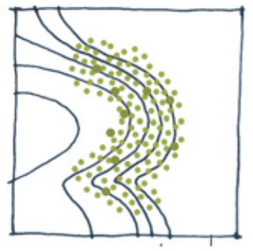
The first rule of using nature's wisdom is to let it serve as a guide to designing the city. It should be a strong element in shaping the form of the sustainable city and it should also be used as a tool to minimize impact and expense.



STREETS: follow topography



NATURAL FEATURES:
- Slope
- Floodplain
- River



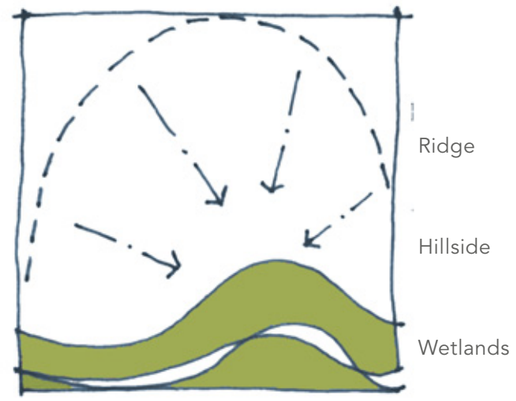
PRESERVE NATURAL FEATURES:
Forest 1:4 Slopes

FIGURE 11: USING NATURAL FEATURES, such as steep slopes, drainage basins and other features of topography, wetlands, floodplains, and forests to guide planning, the landscape and natural processes are respected and protected. The outcome is a system that works WITH instead of AGAINST nature and in doing so, becomes more efficient in the short run, and more sustainable in the long run.

STORM WATER DRAINAGE-BLUE TRANSECT SYSTEMS

A very simple way to use nature's wisdom is to follow natural watersheds and natural corridors to harness gravity to harvest rainwater and treat storm and wastewater runoff.

The Blue Transect (Figure 13) shows several elements of a sustainable infrastructure system used to plan the Sub Area projects, including bioswales, stepped rain gardens, bio-retention and constructed wetlands, graywater reuse and environmental treatment zones. The application of these principles is discussed in detail in the Infrastructure sections of all Sub Area Plans.



WATERSHEDS: Use Gravity to distribute water and control storm water

FIGURE 12: NATURAL WATERSHEDS are defined from tops to bottoms of hills and storm water is channeled by gravity. This is an inexpensive way to guide water without expensive infrastructure and piping, while at the same time avoiding erosion and beautifying communities with water retained.

LEGEND

WETLAND

CISTERN LOCATION

STORMWATER RUNOFF CHANNEL/SWALE

PERCOLATION OF STORMWATER THROUGH PERMEABLE PAVEMENT

GREY WATER RE-USE

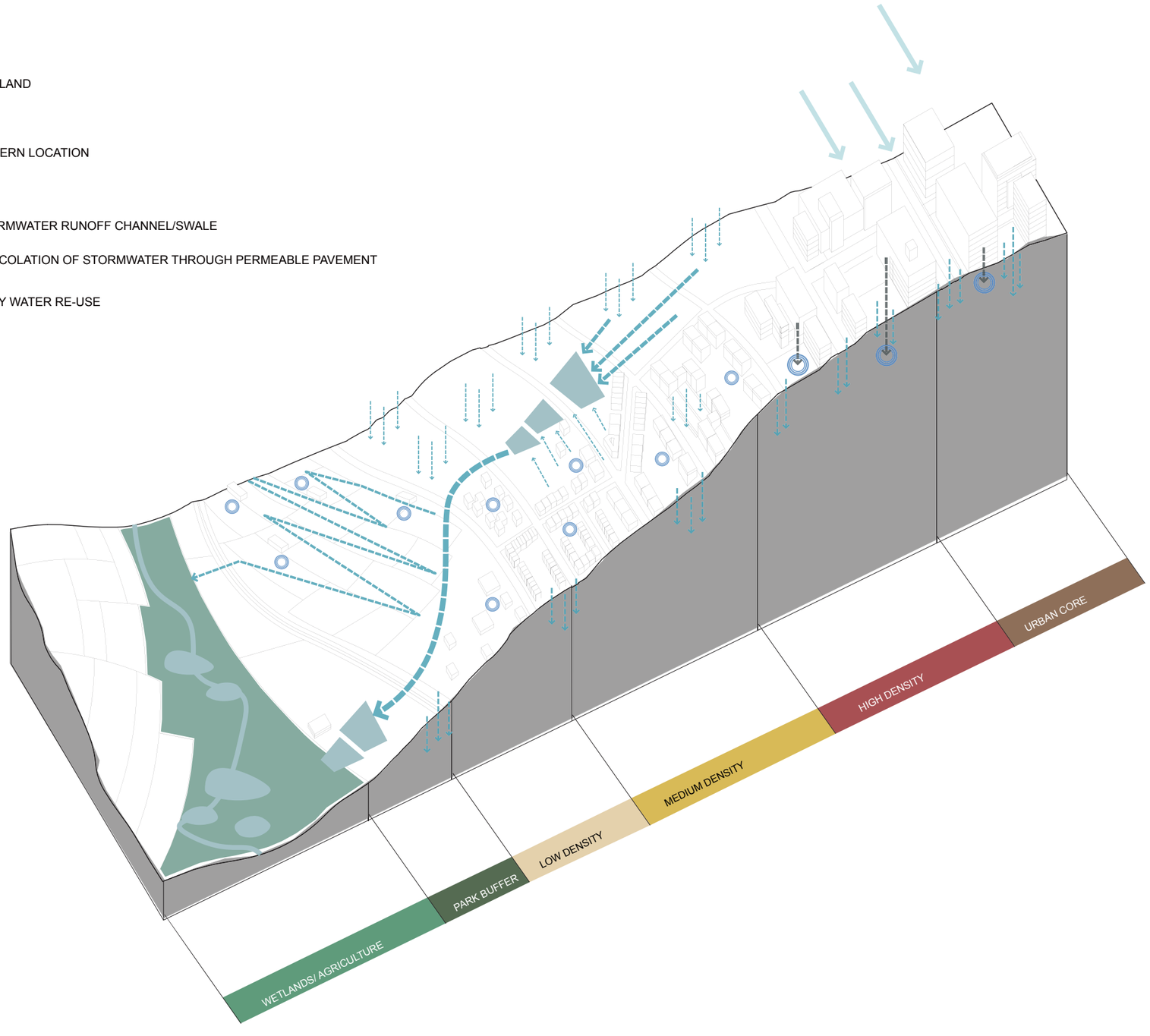


FIGURE 13: BLUE TRANSECT

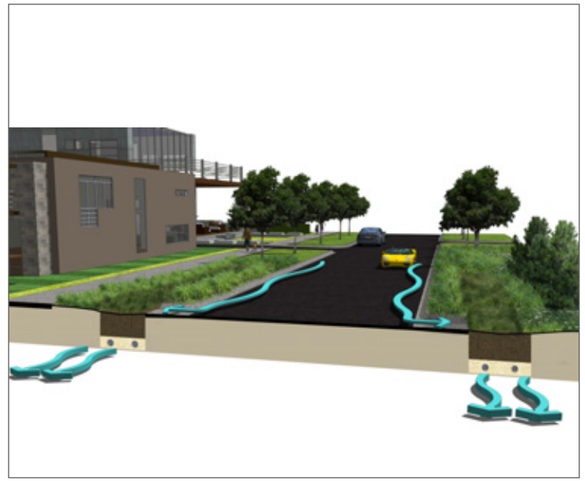


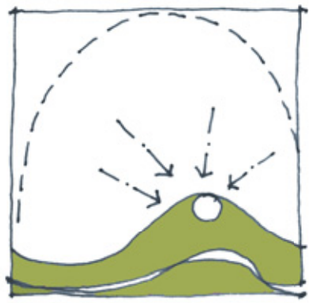
FIGURE 14: URBAN STORM WATER RUNOFF AND DRAINAGE systems can utilize water maximally by channelling it through bioswales to irrigate urban landscaping and rain gardens.

FIGURE 15: CONSTRUCTED WETLANDS can be a beautiful amenity in the neighborhood while also retaining water and preventing erosion.

USING NATURE'S WISDOM

SANITARY SEWAGE & TRASH RECYCLING SYSTEMS

Sanitary and household waste can also be treated sustainably, using a variety of techniques to recycle it for productive means. The first principle is to use gravity to remove and treat wastewater. "Reuse" strategies can cut down the amount of waste by recycling it close to the site. Biogas digesters produce cooking gas or soil composting/fertilizers, and grey water can be re-used for irrigation and flushing. These opportunities are discussed under "reuse" in the Sub Area Infrastructure sections, as well as in Appendix 2, Environmental Treatment Zones.



ETZ's are located at the bottom of slopes, where gravity brings waste to be treated environmentally.

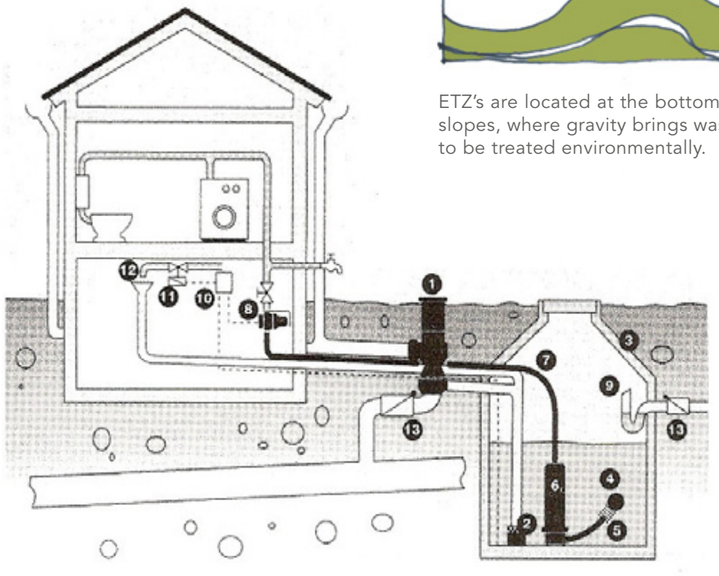


FIGURE 16: BIOGAS DIGESTERS are most useful when designed for groups of buildings or complexes. They are one of several appropriate sustainable sanitary system technologies.

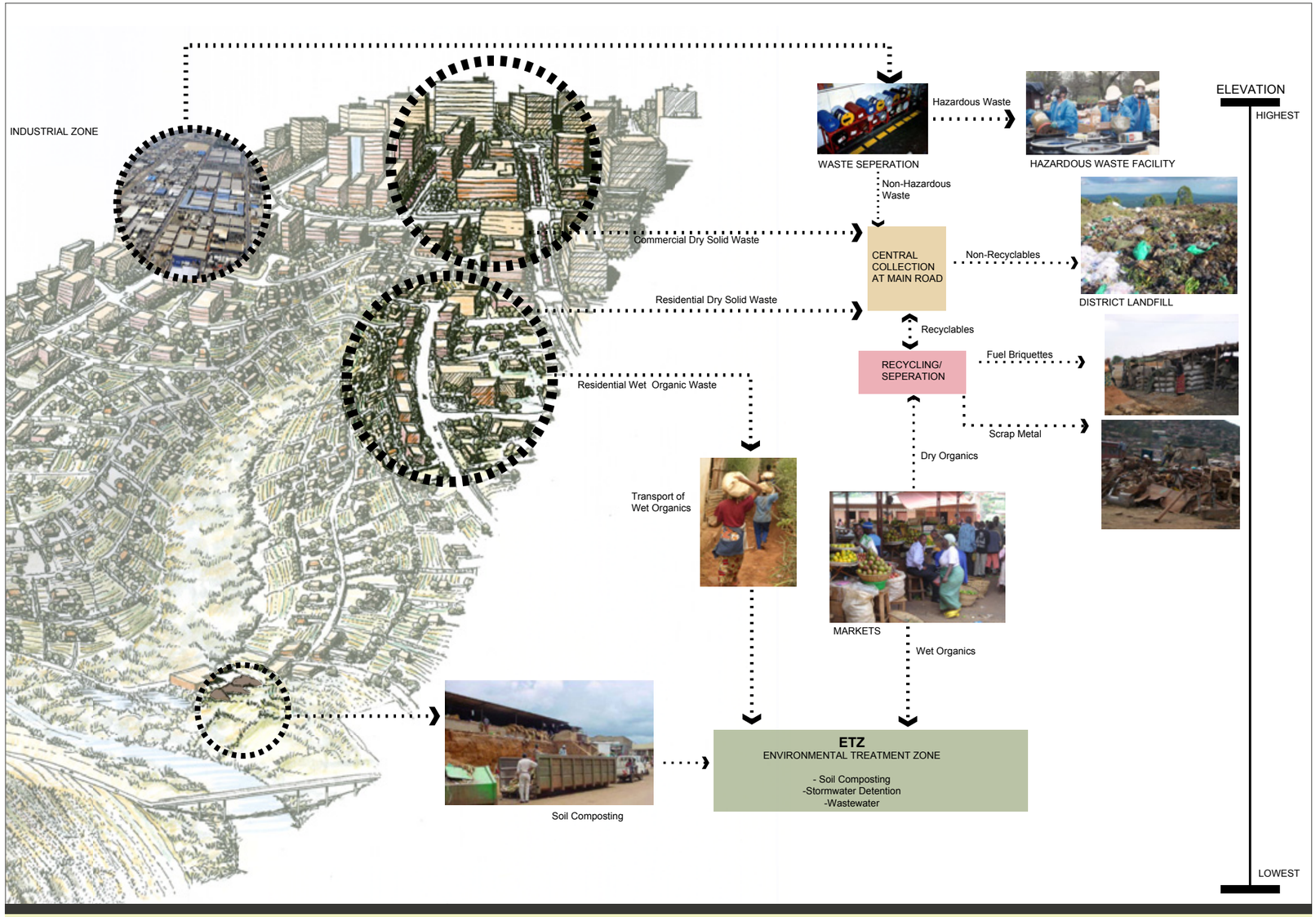
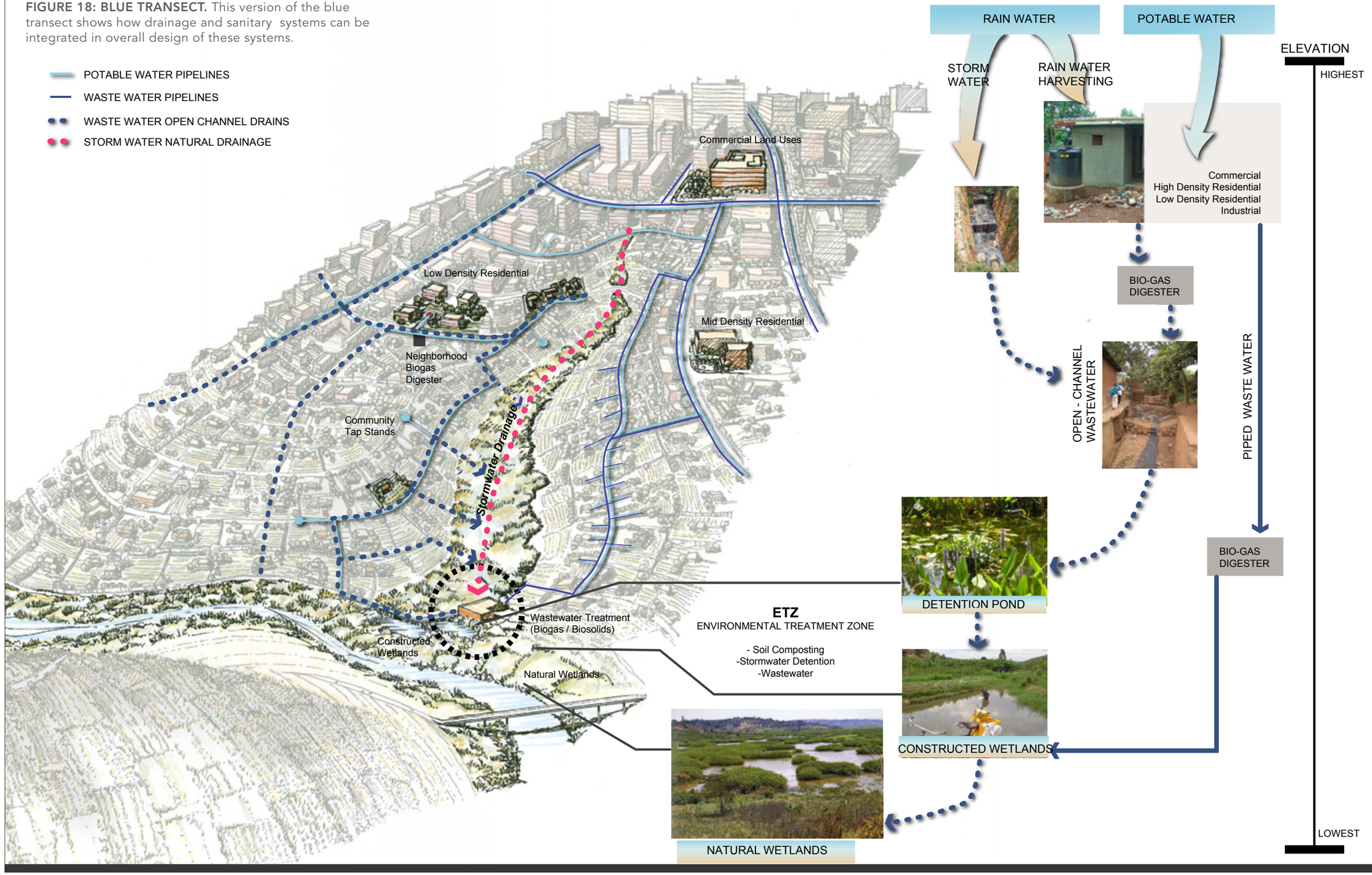


FIGURE 17: TRASH RECYCLING. Although it is often overlooked when thinking about urban infrastructure, trash reduction, removal, and recycling is as important as drainage and sanitary systems. Systems should be thought through from the beginning and integrated into urban design at all levels from the block to the neighborhood and including civic/commercial uses. Trash can also become recycled, becoming an input into industrial reuse. In addition, community recycling businesses can be very economically lucrative for small business owners. The location of these facilities can encourage small business development for neighborhoods instead of expensive outsourcing to large public or private operations.

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.



USING NATURE'S WISDOM

GREEN SYSTEMS

In addition to the Blue Transect, the Green Transect (Figure 19) also follows nature's wisdom. The Green Transect System consists of wetlands, agricultural zones, forests, linear and urban parks, school athletic fields, urban agricultural plots, urban landscaping, and green roofs and walls. By preserving and linking as many green systems as possible throughout the city, several positive outcomes result, as follows.

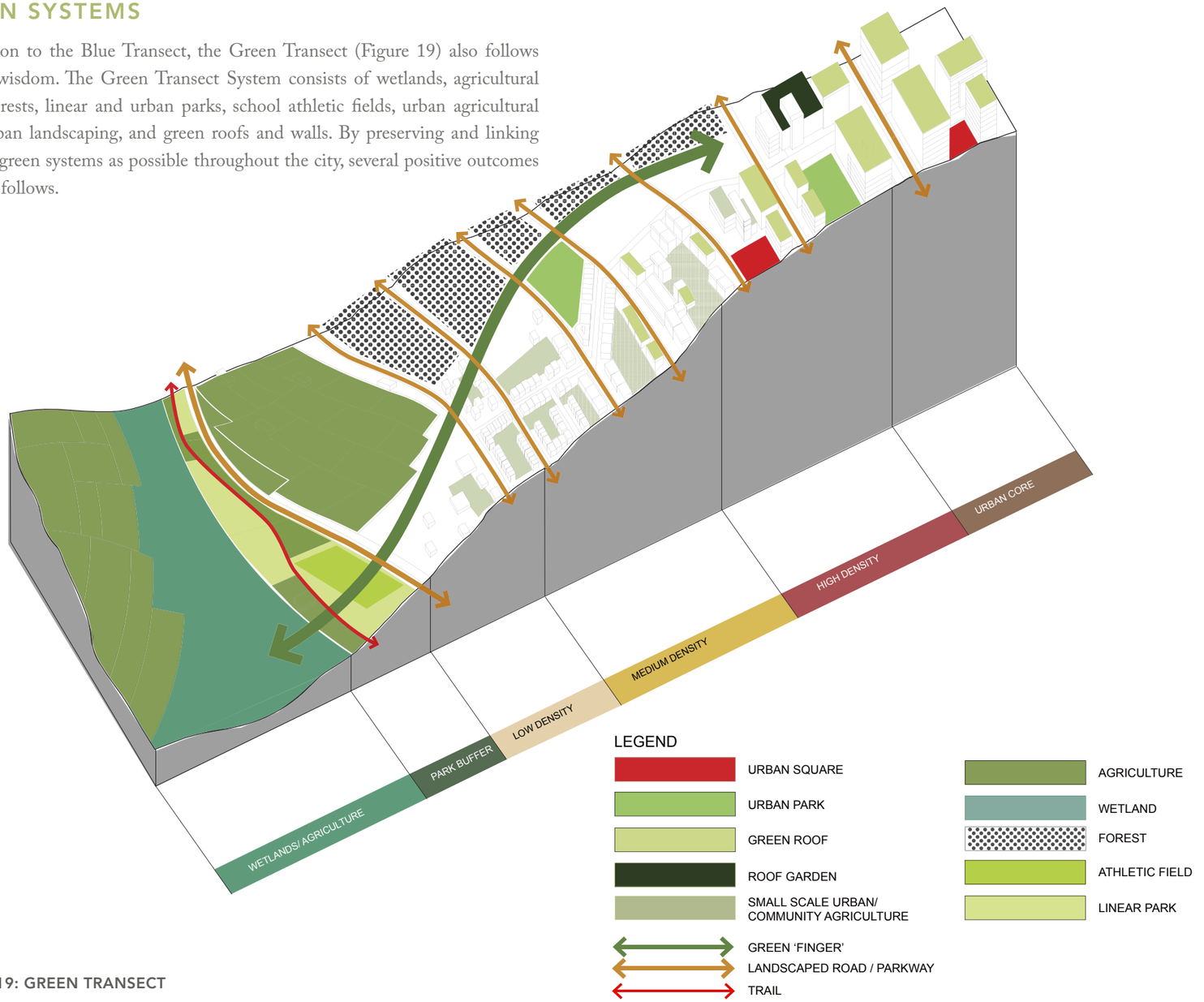


FIGURE 19: GREEN TRANSECT

WETLANDS & AGRICULTURE

Both wetlands and agriculture provide important natural benefits as well as providing places of biophilia. Linking them to more urbanized Green Systems can help produce Greenway networks throughout the City.

FIGURE 20: WETLANDS are a key natural element of the Rwanda landscape that should be preserved without reservation. Their benefits to nature's cycles are inestimable, including groundwater preservation, prevention of erosion, and protection of wildlife habitat and general ecosystem integrity.

FIGURE 21: AGRICULTURE is not only a traditional way of life in Rwanda, it will continue to provide important economic and health benefits for many years to come. Agriculture should be encouraged to be sustainable, avoiding artificial inputs and utilizing productive alternative systems.

URBAN AGRICULTURE, GARDENS, & LANDSCAPING

Agriculture and food production normally take place in the countryside, but peri-urban and urban agriculture is seen increasingly in Rwanda and growing in popularity around the world. The expansion and support of urban agriculture is crucial as it will provide fresh healthy food for the growing urban population. Urban and community gardening should be integrated into neighborhood designs as it will provide less expensive food for residents as well as providing micro-enterprise options and teach children about the value of healthy food, nature and the earth.





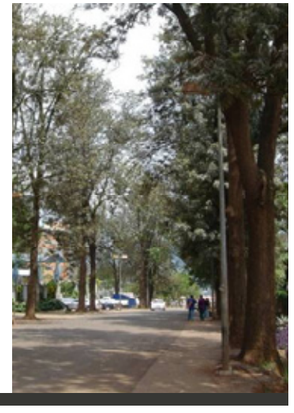


FIGURE 22: URBAN AGRICULTURE, GARDENS AND LANDSCAPING provide practical outcomes, such as food and fresh air, but also enhance the urban quality of life and bring opportunities for biophilia and well being.

GREEN ROOFS & WALLS

Food and plant production can be part of high density urban spaces too. Urban roof top gardens are sprouting up all over the world in sustainable architecture. These grow plants to insulate and beautify buildings and to alleviate heat island effect. They can also grow flowers for micro enterprise and enjoyment.

Likewise, green wall systems are also becoming increasingly popular. These systems insulate and beautify buildings and cities; and they even provide fruits, flowers and vegetables for consumption or market.



FIGURE 23: ROOF AND WALL GARDENS can be beautiful and productive. They also help control climate inside buildings by cooling and freshening air.

RENEWABLE ENERGY & SUSTAINABLE MATERIALS

Renewable energy should be a primary component of all urban and building systems. Materials are not a separate element of Sustainable Urbanism; they should be integrated at all levels of the city design, including buildings, infrastructure and landscaping. A City-wide Renewable Energy Policy would link energy demand and supply systems across all scales from the regional to the household. A SmartGrid system that would formally integrate systems of supply and demand should be explored. Sustainable building materials can also be used at every scale and type of urban use.






FIGURE 24: RENEWABLE ENERGY should be a central focus of energy demand and supply as well as factored into urban and architectural design and materials.

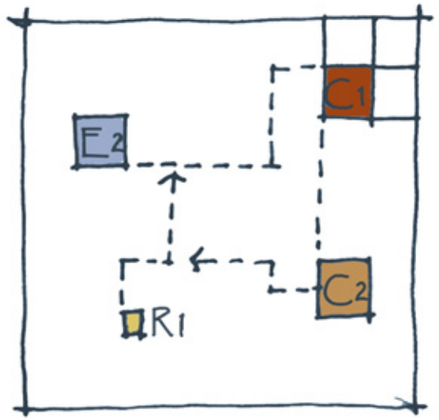
DENSITY, MIXED USE & CO-LOCATION

Density is a key element of sustainable cities. The KCMP transect in Figure 28 shows how high density on the hill top gradually gives way to sparse development closer to the wetlands. Density should be located where it is environmentally feasible. It is an important element of the sustainable city because it preserves ecological systems such as wetlands and open space. It also allows for increased use of mass transportation instead of the automobile, which contributes to pollution and climate change.

Mixed Use and Co-Location are other key elements of sustainable urbanism. By mixing uses, such as residential, work, school, and others, there are multiple benefits. Mixed use promotes economic efficiency by reducing vehicle miles travelled, fuel use and pollution. By saving travel time and energy, it increases personal productivity and raises quality of life for families. It is safer for families and children because there is activity and "eyes on the street" during much of the day.

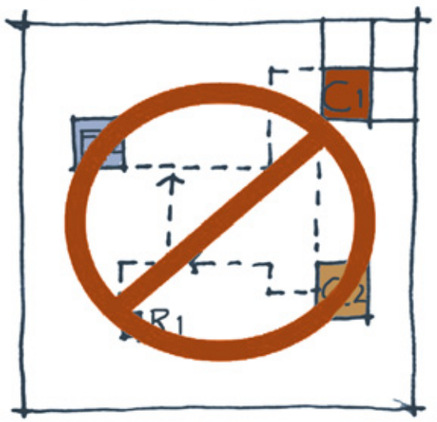
FIGURE 25: MIXED-USE BUILDING designed by OZ Architecture in Boulder, Colorado contains commercial uses on the first level and residential uses above. In addition to the economic and social benefits noted above, Mixed-Use can promote a lively and vibrant street life, which is good for business and makes neighborhoods more secure.

SEGREGATED USE ZONES



This layout burdens transportation infrastructure travel time and fuel use

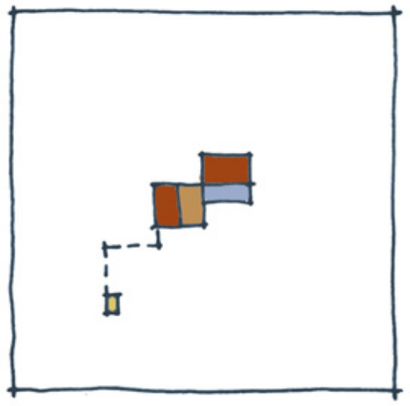
SEGREGATED USE ZONES



It should be avoided in favor of Mixed-Use development.

FIGURE 26: DENSITY instead of sprawl has many positive effects. It saves land, is more economically efficient to build, increases liveability for busy families, and can be safer for children.

MIXED USE COMMUNITY CENTER



Park, School, Retail, Workplace, and Transit center in walking distance

Live-Work Mixed-Use

FIGURE 27: MIXED-USE DEVELOPMENT can promote economic development by co-locating residential and business uses. People can more easily attend to their businesses while simultaneously taking care of family life. Both benefit in the end.

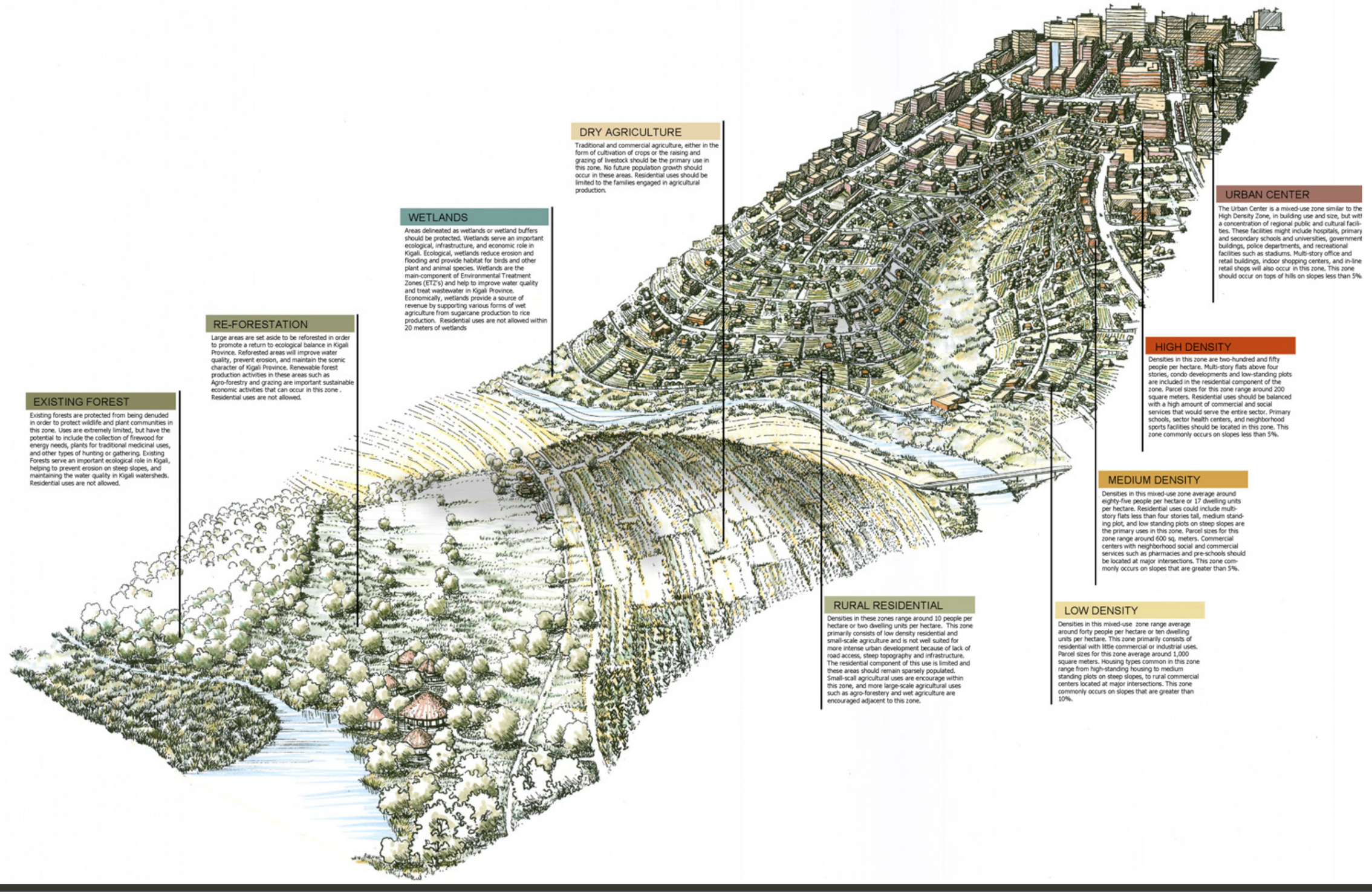


FIGURE 28: KIGALI CONCEPTUAL MASTER PLAN DENSITY TRANSECT. This transect is the backbone of the density and land planning for Kigali.

SUSTAINABLE TRANSPORTATION & TRANSIT

Transit is a key part of the solution for sustainable development. A City-wide plan for both automobile and public transport is essential to developing a system that is integrated and reduces vehicle-miles travelled (VMT). By addressing bus, taxi, light rail/monorail, bicycle, mototaxi and other forms of transit systematically, and along with land-use, many of the other basic principles of Sustainable Urbanism are also achieved.

When transit is integrated with dense and mixed-use development through sustainable corridors such as if shown in Figure 31, this provides the "bones" of the sustainable city. Coupled with alternative transport, cycling and pedestrian systems, a sustainable urban system looks very different than a traditional one that is geared towards the auto.

FIGURE 29: TRAFFIC IN GROWING CITIES can cause gridlock, waste precious time, and produce pollution. The alternative is Sustainable Transportation and Transit. By designing integrated systems of transit, starting with the "Big Picture" problems can be avoided, distances shortened, and people can move about the city more freely. Parking for hundreds of bicycles, shown above, only takes a small amount of space.

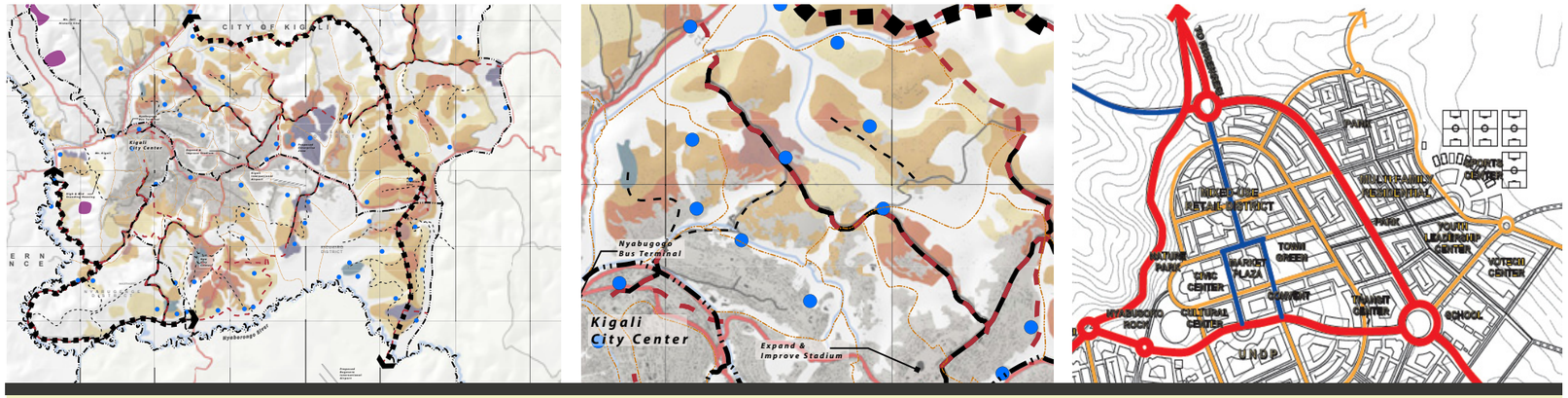


FIGURE 30: TRANSPORTATION AND TRANSIT SYSTEMS. The Kigali Conceptual Master Plan laid out a conceptual transportation system that was followed when designing these Sub Areas. For example, an arterial corridor was designated to run through the Kinyinya Sector, and this was incorporated into the Kinyinya Sub Area Plan. At this time the City of Kigali is undertaking a more detailed transit plan, which is excellent procedure. Every development project should consider the City-wide Transportation and Transit master planning in its design. Blocks and buildings should be designed with the needs of human circulation in mind. For example, transit stops, taxi/mototaxi stands, bicycle parking, entrances to parking lots should all be part of the design of neighborhoods, blocks and buildings.

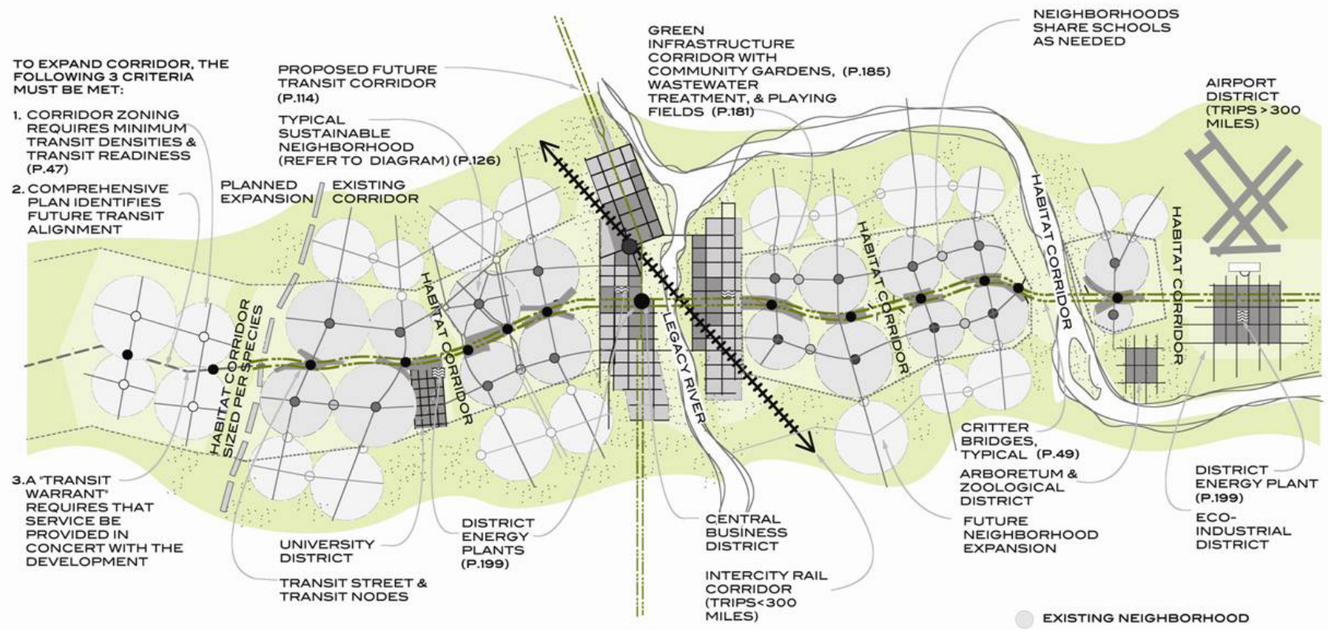


FIGURE 31: URBAN CORRIDORS: Urban corridors de-emphasize the auto in favor of people and nature; and utilize neighborhoods as a building block. A sustainable urban corridor is designed in advance (or retrofitted into an existing road corridor) along with sustainable neighborhoods and districts. This approach 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 (TOD) that links to surrounding neighborhoods.

Farr. 2008. Sustainable Urbanism

TRANSIT ORIENTED DEVELOPMENT (TOD)

When public or mass transportation is a guiding element in combination with density, cities take on new forms. Sustainable cities have transit lines snaking through clearly defined corridors that carry people efficiently between two points. They have multi-modal stations where people can move between various forms of transport in one place. When multi-modal stations also 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). TOD's center their public spaces around transit, making it easy for people to better understand and use the transportation. TOD's provide plentiful and comfortable room for people to wait for their transportation.

FIGURE 32: URBAN TRANSIT SYSTEMS can include fixed-rail, monorail, or bus systems.

FIGURE 34: TOD. Many TOD's have become the "heart" of the town. Mass transit stations, as well as mass transit vehicles, are now beautifully and creatively designed.

FIGURE 33: BICYCLE PARKING is a key element of multi-modal TODs. It can be conveniently covered and dispersed (with handy bike maps and shelters), or it can be located on parking lots.

FIGURE 35: RAILWAY ORIENTED TOD. This TOD Transit Center has a rail line that takes nearby resident to the next City. Rail TODs are best located nearby bus and other transit stops, as well as taxi (or moto-taxi) stands, bicycle parking and automobile parking, so people can mix modes of transit on their journeys.

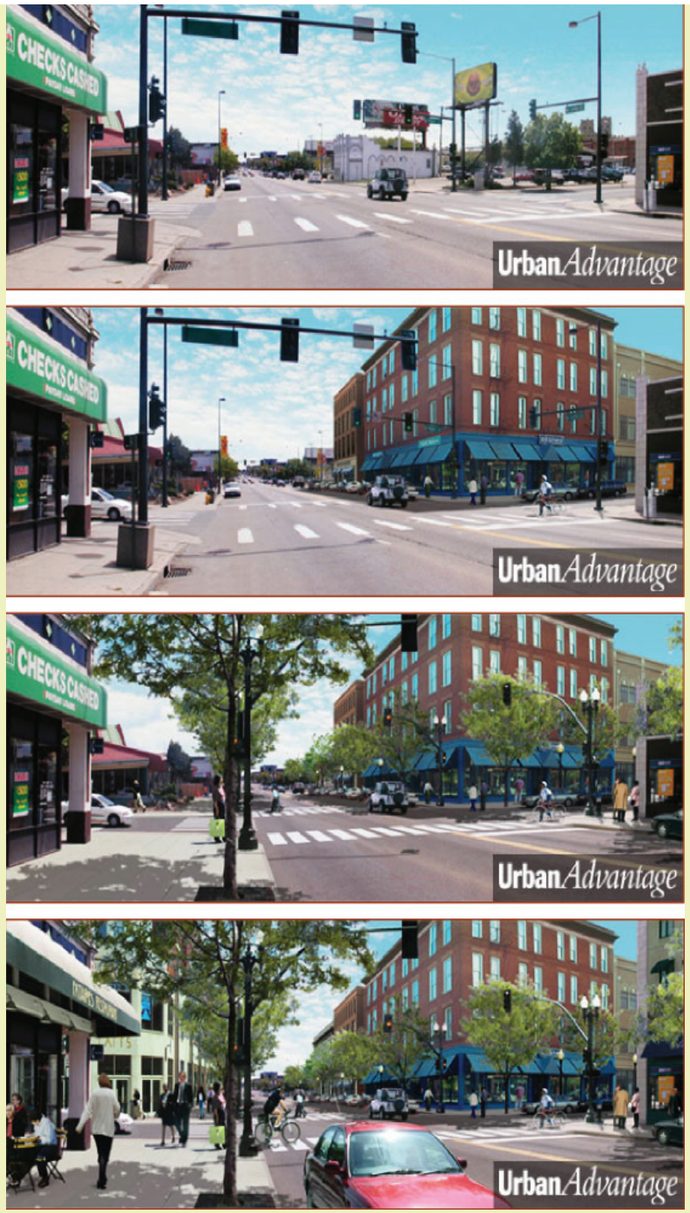


FIGURE 36: COMPLETE STREETS incorporate elements such as: "walls" by placing buildings close to the street, landscaping for shade and ambiance, arcades and canopies for more decorative shade, street cafes and furniture for sitting, special paving to help pedestrians cross safely, bicycle parking, signage and other features that help streets become "complete" spaces, not just afterthoughts. Denver Living Street Initiative 2010

"COMPLETE STREETS," "LIVING STREETS," & "GREEN STREETS"

Sustainable Transportation can include a variety of new ways of configuring streetscapes. A key concept is that streets are not just leftover spaces between buildings, but real opportunities to make pleasant, livable, functional and sustainable environments. Here three approaches are introduced.

As shown in Figure 36, **"Complete Streets"** or multipurpose streets blend vehicular, transit, bikeway, and pedestrian traffic with respect for all. Complete Streets are designed and operated to enable safe access for all users, especially children. They encourage healthy pedestrian behavior for all and they encourage independence in children. Pedestrians, bicyclists, motorists and transit riders of all ages and abilities can safely move along and across a "complete street." They promote economic development because walkers are closer to stores, and they make fiscal sense, integrating all elements of the roadway section. Finally, they are good for the air and reduce transportation jams by providing options to the automobile.

"Living Streets." Creating complete streets means transportation planners must change their orientation toward building primarily for cars. Instituting a "Complete or Living Streets" policy ensures that 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. They have life and they encourage healthy lives for all their users.

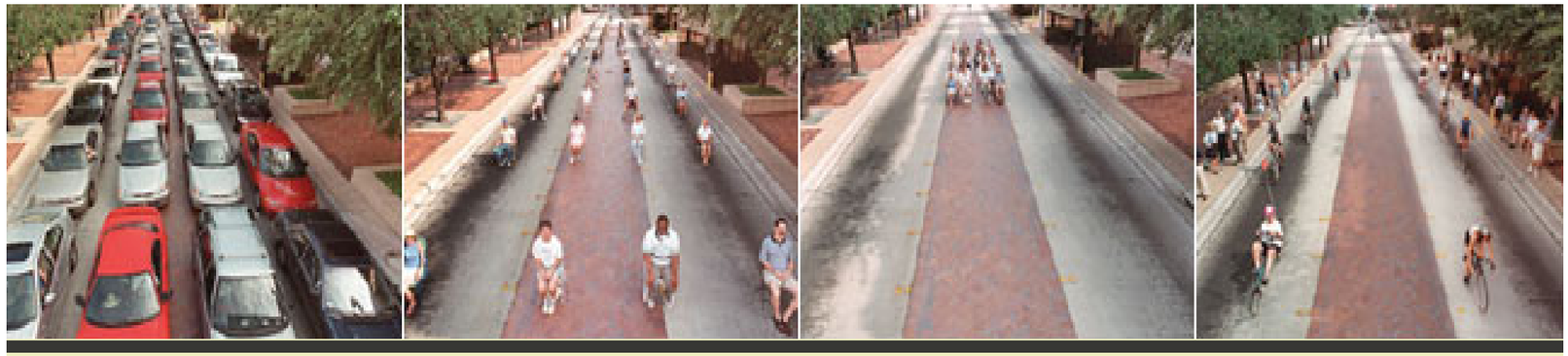


FIGURE 37: LIVING STREETS Creating complete streets means transportation planners must change their orientation toward building primarily for cars. Instituting a "Complete or Living Streets" policy ensures that they enable safe access for all users: drivers, transit users, pedestrians, and bicyclists, as well as for older people, children, and people with disabilities. Denver Living Street Initiative 2010

FIGURE 38: "LIVING STREETS" AND "COMPLETE STREETS" offer options for users besides the car, including bicycles, bus and mototaxi.

"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 for the benefit of urban plants, landscaping and gardens. They can include lovely linear parks along which people can cycle or walk, thus enjoying their neighborhoods both inside the block and outside on the street. The more people on the street, the safer the neighborhood.

FIGURE 39: GREEN STREETS include landscaped drainage ways that channel and reuse stormwater runoff to create linear parks and urban gardens. The recycling of nature's bounty is economical because it reduces water usage, reduces erosion, and creates beauty in the city. Above, a map of Kinyinya Sub Area Green Streets.

FIGURE 40: URBAN WALKING CORRIDORS

Within the urban area, urban walking corridors provide beautiful intimate spaces that contrast with large open plazas, providing a variety of experiences for the pedestrian.

These people-scaled places give attention to pedestrians overheads, using arcades, awnings and canopies, as shown in the examples below. There are usually no cars in these walking corridors, although auto and bus access can be provided on the back sides of buildings and blocks.

Walking corridors can also contain public/private space such as restaurant patios, outdoor market space, seating areas, and kiosks, etc.

LIVABILITY: DESIGNING FOR EVERYDAY LIVES

Cities designed for livability and quality of life differ from those that are not people-centered. Urban design that starts from the premise of making average people's lives easier and more joyful center on the wide variety of daily routines that people undertake, and they offer sociability, community and health to all people.

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 if they chose. 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 with loved ones far away. Sustainable cities can help create harmony by providing easy access to the daily needs of residents.

FIGURE 41: CHILDREN WALK TO SCHOOL in Liveable Communities. Not only are homes within walking distance to school; walking routes are safe and secure. Children spend more time in school when they are close by; they spend more time out of doors which is good for their health; and parents feel comfortable knowing their children are safe. When schools are co-located with Neighborhood Centers, parents can walk their children to school, and then undertake daily business.

FIGURE 42: NEIGHBORHOOD CENTERS also include space for small enterprise and production retail. People can start businesses that will cater to the daily needs of their neighborhoods, and with proximity to schools and other activities, they can also keep an eye on their children.

FIGURE 43: NEIGHBORHOOD CENTERS provide opportunities for people to undertake their daily activities in one location, including marketing, selling products, visiting the health clinic, going to local agencies like the post office, attending community meetings or church/mosque etc. The result is that they have more time to do other productive activities, greet their friends and neighbors, and nurture a higher quality of life than if all their daily activities were scattered about.

FIGURE 44: PUBLIC SPACES attract people to gather in groups. They can be urbanized or natural; they can be large or small. Their variety is key to animating the city and creating civic pride that will help maintain, protect and nurture the city and its residents.

FIGURE 44: PRIVATE SPACES are equally important. People need places away from crowds to reflect, enjoy nature, or just walk comfortably and quietly with a friend or family member. Children love to be in quiet places amidst nature, where they can commune with the world around them.

PUBLIC SPACE AND PRIVATE SPACE

Sustainable cities that cater to people's lives provide a variety of different types of places outside of buildings. Public spaces can attract those who desire social interaction or entertainment. They can be urbanized or natural. Private spaces for contemplation or quiet are also important parts of the city, as are unexpected places. Together, this variety of places and spaces can help make the city more enjoyable no matter what one's mood; and it can make the city beautiful and appreciated by all its inhabitants.

INTERLOCKING SCALES OF SUSTAINABLE URBANISM

How are the basic principles of Sustainable Urbanism applied to the Planning Process? In this section, a simple framework is presented that will help practitioners think through the logic of how to implement Sustainable Urbanism. It uses the concept of "scales" to organize the principles and to create a checklist for analysis, planning and design. Although these scales are presented from large to small, it is important to remember that they are all important; and their interlocking roles make the city work in a sustainable system. The key scales outlined here include:

REGION AND CITY
TOWNSCAPE
DISTRICT AND ITS CORE
THE NEIGHBORHOOD
BLOCKS AND PUBLIC SPACE

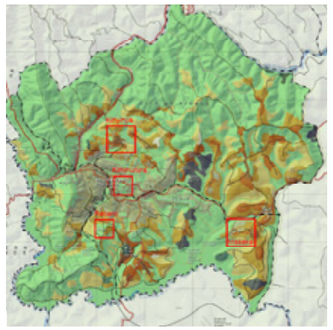


FIGURE 46: THE KIGALI CONCEPTUAL MASTER PLAN, REGIONAL PLANNING, AND NATIONAL LAND USE PLANNING are the starting points for all planning. Before planning for even a block can begin, it is important to understand the "big picture," as shown to the left by the Kigali Conceptual Master Plan and below, by regional planning linking Kigali and the Eastern Province.

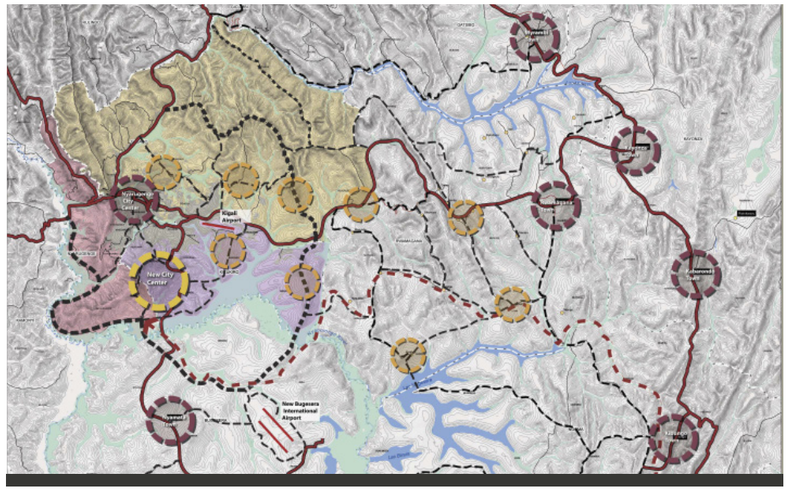


FIGURE 47: KIGALI CONCEPTUAL MASTER PLANNING AND REGIONAL PLANNING have been completed as shown above.

REGION & CITY

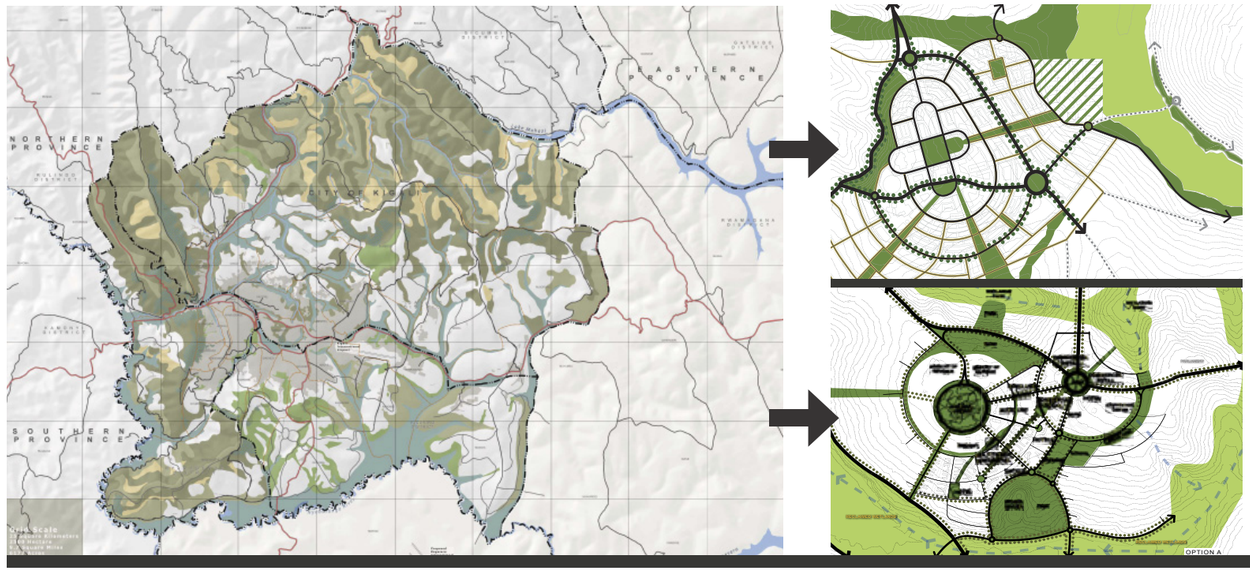


FIGURE 49: THE CITY WIDE OPEN SPACE SYSTEM comprised of steep slopes, wetlands and important forests (shown to the left in green and blue) is the most important large scale structuring element in Sustainable Urbanism. Always link Sub Area planning to "big picture" open space network.

FIGURE 48: KIGALI CONCEPTUAL MASTER PLAN (KCMP) OPEN SPACE PLAN lays out a city wide network based on wetlands, steep slopes, forests, and other protected areas. The Sub Area planning began with this framework and linked all Open Spaces and Greenways to the city wide network.

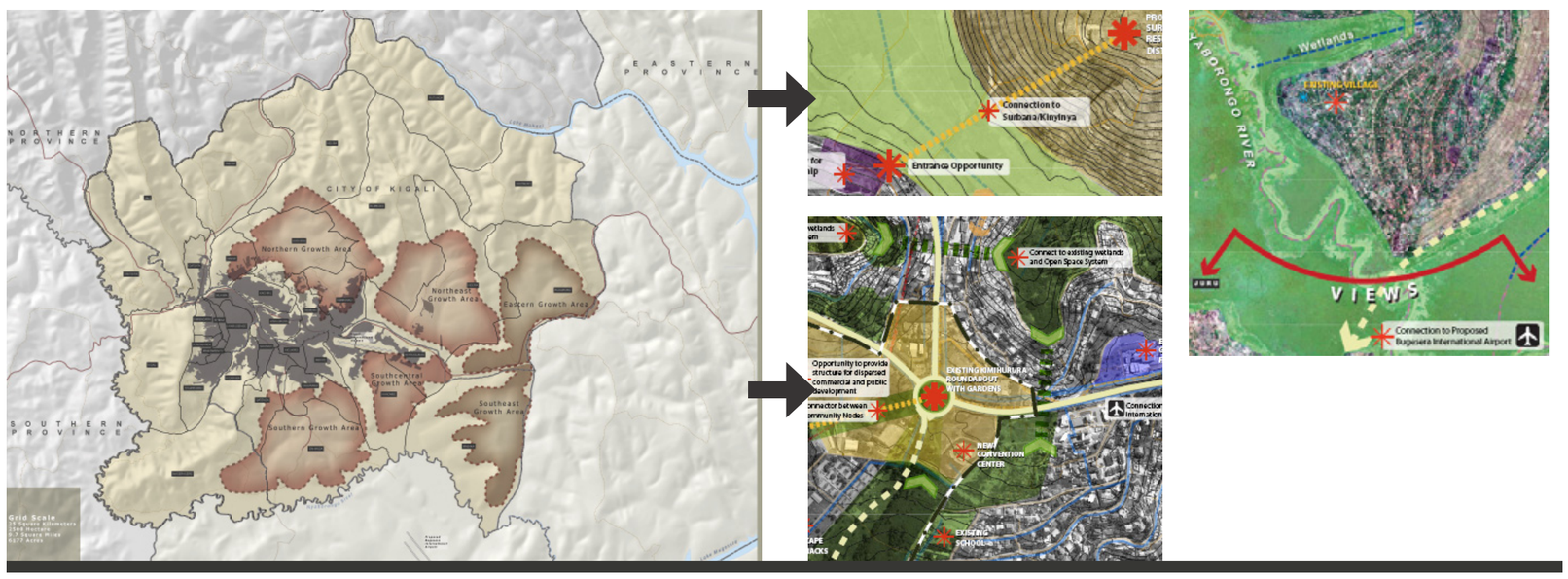


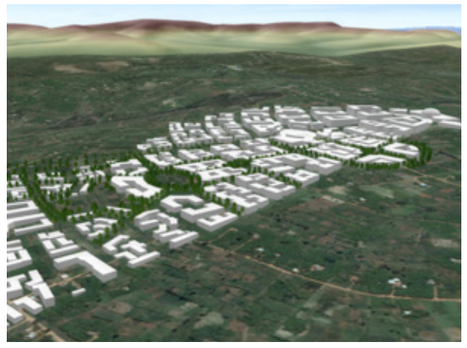
FIGURE 50: KIGALI CONCEPTUAL MASTER PLAN (KCMP) DEVELOPMENT ZONES outline the appropriate areas for development, ruling out the Open Space Network. These zones and guidelines from the KCMP were used to determine boundaries and development programs for the Sub Areas. In addition, the clips from Sub Area "Existing Conditions" analysis maps above show how surrounding factors, views, proposed development and other city-wide and regional factors guided urban design of the Sub Areas.

TOWNSCAPE

Townscape Seen From Afar. Urban design at the townscape scale is an important component of townscape identity and people's memories. Traditional towns had distinct and recognizable forms that mirrored the hills they were built on. People could tell where they were from afar. A unique townscape can create pride of place.

FIGURE 51: TOWNSCAPE is an important element of urban design. The photo of Jerusalem, above, is memorable to many people around the world.

Townscapes for Kigali Sub Areas can become memorable too. Masaka New City Center Prototype District, above right, and Kinyinya Sub Area, below right.



Entrances Give a Sense of Arrival. The entrance to the city is also important. People should be aware when they have arrived. Here are three different entrances to the Kinyinya Sub Area. Each is distinctive.

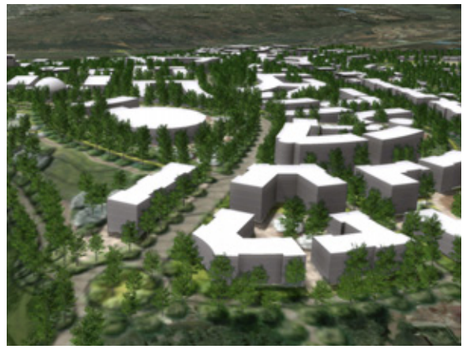
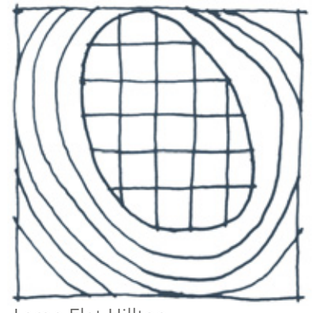
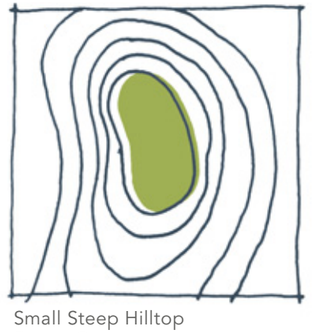


FIGURE 52: CITY ENTRANCES at Kinyinya Sub Area. Above is the entrance from the south showing the Transit Center. To the right is the entrance from the west, showing the civic buildings. Below, is the entrance from Batsinda to the north.

Responding to Hills. The most ineresting towns around the world have often been built on hills; and Rwanda, "the Land of a Thousand Hills" is no exception in its sensitive respect to the topography. New towns and cities should continue this heritage as they grow.



Large Flat Hilltop
Urban Grid



Small Steep Hilltop
Forest Cap

THE DISTRICT AND ITS CORE

District Centers Have High Activity. They are a core structuring element of Sustainable Cities because they provide a centralized location for many of the high level land uses needed by a large population. They are usually more energetic than neighborhoods; and they should have strong focal points of mixed-use buildings, civic uses and parks, as well as markets and retail.

District Centers Have Focal points: Civic Buildings, Transit Centers and Public Plazas. Public buildings and spaces are important at the District level. Central places where people can gather to market, meet, and conduct the business of citizenship are a tradition in Rwandan towns. Enhancing these spaces can promote pride and loyalty by citizens. Districts are organized around the community. High schools, civic centers, and community parks are at the heart of the District.

FIGURE 53: DISTRICT CENTERS have focal points: civic buildings, transit centers, and civic parks. These are places where many people gather to undertake the business of the city or to relax; and they should be both functional and beautiful.

District Markets and Civic Centers. District scale commercial and public facilities are larger and more intensive than neighborhood community facilities; and they are near the center of the District. These include shopping streets, zones, and markets with lots of public and pedestrian vitality; office and business buildings. District Centers also include high schools, post offices, central health clinics, and police posts and cultural facilities, which are often sculptural icons.

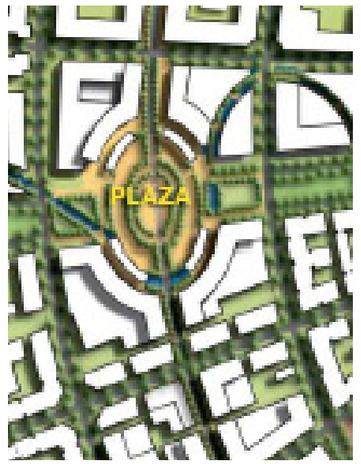


FIGURE 54: DISTRICT CENTERS have large market plaza and public gathering plazas, secondary and post-secondary education, performing arts centers and sport/recreation centers that cater to the entire population. Often these buildings are designed to generate pride and care among the population they serve.

NEIGHBORHOODS

Neighborhoods: the Building Blocks of Urban Centers. The neighborhood is a step smaller than the scale of the District. It is a good starting point at which to think about peoples' daily needs as an organizing force for urban design. As one of the key principles of Sustainable Urbanism, this idea results in the formation of neighborhoods that cater to real people and their daily lives.

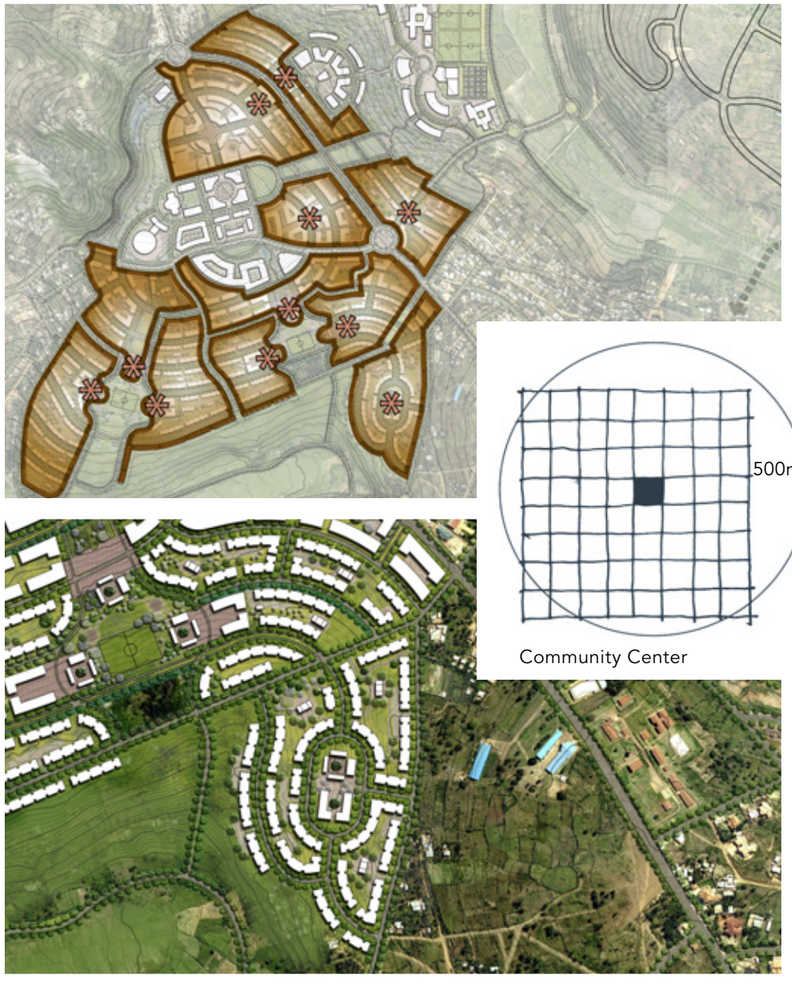
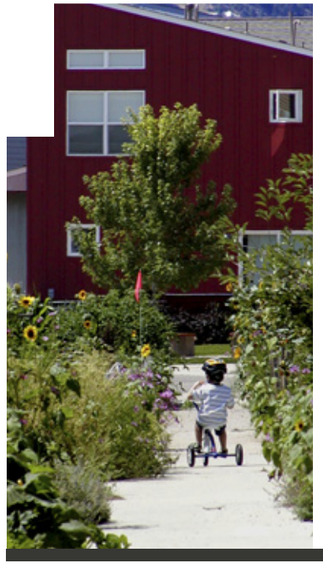
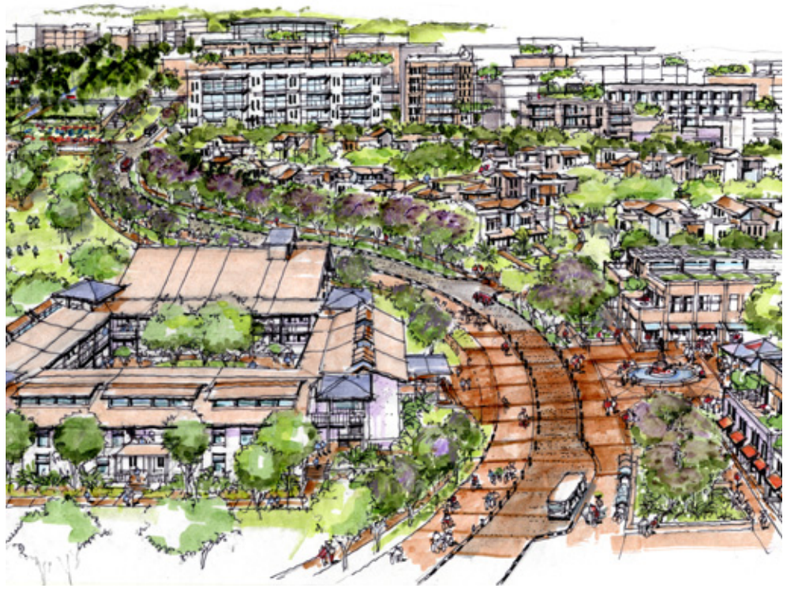


FIGURE 55: NEIGHBORHOODS ARE THE BUILDING BLOCK OF CITIES. Kinyinya Sub Area has eleven neighborhoods shown in the map above. The map below shows a typical neighborhood layout. Neighborhoods have Centers that should be approximately 1/2 kilometer from the periphery of the Neighborhood.

Neighborhoods are Family Focused. Children should be safe and independent using neighborhoods. They should be able to freely use walkways, indoor and outdoor facilities. Neighborhoods should provide facilities for children to gather and be cared for throughout the day in order to support working parents. Neighborhoods should also provide places for teenagers to access healthy activities (indoor and outdoor facilities) The needs of special households, including the elderly, single people, and extended/mixed families should also be considered in the design of neighborhoods.



Neighborhood Centers. Neighborhoods should have small local Mixed-use centers with a variety of uses designed to support the daily activities of neighborhood residents. They should be centered around primary schools. They should have health and other civic facilities such as post office/ICT center, police post, and meeting rooms. They should encourage and support civic engagement with outdoor and indoor public space, economic development with central and shared spaces for markets, incubations of micro-enterprise; production/retail and shared commercial/ office incubation.



Neighborhood Blocks and Buildings. Like district level buildings, neighborhood buildings should also be seen as part of a whole, not self referential or isolated. With appropriate development guidelines that suggest their articulation with the "whole" through massing, setbacks, facades and entrances, they can create a neighborhood landscape instead of a set of isolated buildings.

Neighborhood blocks can include a variety of housing standings, styles, and sizes. Densities should be high enough to promote mass transit.

- Min. 45-100 DU/Ha within 1/2 km of rail/bus
- Min. 20-30 DU/Ha within access to bus

Housing for sustainable neighborhoods can include innovative approaches such as co-housing, which are clustered and provide community centers with a mixture of supporting uses in one location or Live/Work Buildings, which allow people to live above or adjacent to their businesses.

FIGURE 56: NEIGHBORHOOD BLOCKS can include community centers where residents can share childcare, kitchens, laundry, office and gardening space. This reduces costs, reduces work and increases productivity for all residents.

FIGURE 57: NEIGHBORHOOD BLOCKS should be designed as a unit, with consideration for their context and the holistic needs of the residents.

Neighborhood Streets and Transit are important elements of sustainable neighborhoods. Streets should be highly connected with grids for multiple pathways. Transit through neighborhood should be available for mobility challenged, children, and elderly. A neighborhood's transit entrance should be clear and symbolic. Development at the center of the neighborhood should be clearly linked to transit (TOD) and bus stops. Greenways through neighborhoods should accommodate pedestrians and cyclists in safe non-auto corridors.

FIGURE 58: NEIGHBORHOOD STREETS AND TRANSIT should be small scaled to accommodate all residents safely. There should be a highly connected grid with multiple forms of transit, especially local collector buses that circulate regularly through the streets. Greenways are good places for bike and pedestrian ways away from automobile oriented streets.

Community Gardens and Urban Agriculture. Community gardens are a key part of the sustainable city. They can be small scaled and attached to the residence or they can be a larger community fields. They can be for consumption or for market, providing health and economic income.

FIGURE59: COMMUNITY GARDENING can take many forms, but they always provide health by producing locally grown products, encourage biophilia, and can provide extra income generation for families.

BLOCKS AND PUBLIC SPACE

Public space is an important but often overlooked element of cities. Indeed, it is the element that gives form and quality to many of the world's most beautiful cities. Instead of seeing only the buildings in a city, it is useful to think of the spaces formed by the buildings as an entity in themselves: the figure to the building's ground.

When designing the blocks that create districts and neighborhoods, buildings should be thought of as "part of an ensemble' of neighboring buildings that also create a public space. Public spaces should not be privatized, but can link to private outdoor spaces.

Buildings around public spaces should be designed to create rhythm and balance in relation to surrounding buildings, giving a sense of cohesion and urbanity, instead of being isolated buildings. Building facades should be complex and articulated. This enhances and animates the interdependency of public/private life.

FIGURE 60: URBAN PLAZAS AND TOWN SQUARES are formed by buildings that create their "walls." Small building setbacks and "build to" lines can be flexible as long as a majority of the building reaches close to the property line. In this way, the plazas and squares feel festive and secure for the users.

FIGURE61: SMALL PLAZAS are equally charming when bounded by buildings and populated with cafes and restaurants. Kinyinya Town Center to the right shows a shopping street.

FIGURE 62: ITALIAN PLAZAS are world renowned for their beauty and liveliness. They encompass space, holding it in the arms of their buildings. Similarly, the Kimihurura Mixed-Use Center embraces the roundabout as well as its own pedestrian plaza and promenade with buildings that frames these spaces. Buildings around public spaces should be designed to create rhythm and balance in relation to surrounding buildings, giving a sense of cohesion and urbanity, instead of being isolated buildings. Building facades should be complex and articulated. This enhances and animates the interdependency of public/private life.

FIGURE 63: BLOCK INTERIOR COURTYARDS are also important public spaces that should be designed as if their space mattered. This rendering shows a prototypical Kinyinya block community center.