INSTITUTE FOR CONSCIOUS GLOBAL CHANGE

Architecture & Urbanism Infrastructure Plan

for

ST Raphael,
Haiti

August, 2013

Table of contents

Overview of Raphael

St-Raphael
St Raphael is a city as well as a municipality (commune) bearing the same name located in the North Department, in Haiti. The city of St Raphael is the seat of the St Raphael commune. It is located 77 kilometers / 48 miles from Cap-Haitien, the second largest city in Haiti. This municipality of St Raphael includes four communal sections: Bois Neuf, Mathurin, Bouyaha and Sanyago. For the purpose of this report, we will focus on the city of St Raphael.

[Add Map showing city, commune, North Dept. winthin Haiti – better than the one above]

Climate
There are two distinct seasons: a rainy season from April to September and a dry season from January to March. St Raphael's climate is tropical, and both the mild micro-climate of the humid mountains of the North Department and the arid climate of the Central Department (plateau) can be found. The lowest temperatures are typically recorded in December and January. May, June, and July have the highest temperatures (up to 40C/104F). The average annual rainfall is circa 1100 mm of water (source, agricultural office in St-Raphael).

Topography
Saint Raphael sits in a valley, dominated in the northeast and northwest by high mountains whose peaks reach 1100 meters (Bois-Neuf, Fort Moise & Mathurin).


St Raphael, Photocredit: Bondyebon

The soils of these mountains are highly eroded and their rocky slopes vary from 30 to 60%. When used for agricultural purposes, they are mostly devoted to cash crops that supply the markets of the region.

[Add topography map]
[Add forest cover map]
[Add agricultural map showing what is grown were, or any other type of agricultural data available]

The valleys at the base of Bois Neuf and Mathurin extend into the communal sections of Sanyago and Bouyaha. These soils are deep and consist predominantly of clay or clay loam, however, their fertility is closely linked to the availability of irrigation water and regular rainfall. Most of the fertile soils are concentrated in the communal sections and Sanyago and Bouyaha.

Vegetation
In the mountainous communal sections of Bois-Neuf and Mathurin, most of the dense vegetation that used to cover the region has been lost. The old growth forests are long gone and efforts have been made to reforest the mountains again with new growth. Today's vegetation consists of fruit trees (i.e. plantain, orange, grapefruit, coconut, mango, avocado, guava). Oak and mahogany trees are also found.


St Raphael mountains, Source: Heiffer

Wildlife
Due to the significant reduction of forest cover, wildlife is scarce in the municipality. The most common species of birdlife are guinea fowl, ducks, chickens and partridges.

[Add wildlife map 50 years ago and today]

Water Resources
Surface waters are quite abundant. Two rivers, Bouyaha and Wallondry, pass through the municipality. There are also seven springs.
The Bouyaha river which connects to the Guayamouc, a tributary of the Artibonite River, remains the most important waterway. It feeds a large irrigation system, particularly in the communal sections of Bouyaha and Sanyago.

Along the mountainous limestone slopes, there are permanent creeks. They are used for irrigation and to supply water to rural populations.

Communities also get their water from several wells drilled by Community Development programs found on the roadsides - some are 100 feet deep.

[Add map of water ressources (rivers, creeks, springs, wells, etc.)]

Peligre dam, Photo credit: Stanley Hilaire

Photo credit: Stanley Hilaire

Photo credit: Stanley Hilaire

Photo credit: Stanley Hilaire

Population

Age groups	Total	% of total population
0 – 18	21,618	40.32
18 – 60	19,531	36.43
60 +	12,460	23.25
Total	53,612	100

Source: Municipal Monograph, March 2003

75% of the population lives in the rural areas. The city of St Raphael has approximately 13,000 inhabitants. Only 8% of the population is employed.

Housing
Houses are one, two or three stories high, but most are one level. They are typically built from concrete blocks covered with stucco, or wood twigs covered with stucco with a gable or hip roof of corrugated metal. Construction quality varies greatly.

[Add map of building types if it exists; which buildings are 1 story vs. which are two or three stories]
[Add map of average size of buildings i.e. less than 400sf, 400 to 800sf, over 800 sf]

Roads
Two National Roads cross St Raphael, Route Nationale no. 3 (National Road no. 3) which runs north-south, and another primary road running east-west to St Michel de L'Attalaye. Many of the secondary roads, consisting of dirt roads are poorly maintained and littered with holes, which makes them barely usable during rainy season. There are many footpaths, both in the mountainous rural areas, and between urban lots.

[Add map showing primary roads (national roads), secondary roads (city streets), unpaved roads, footpaths]

Electricity
St Raphael has 24-hour electricity, the result of a project launched by President René Préval in the large Péligre central plateau dam.

Communication network
The population has access to two cellular telephone companies: Digicel and Natcom. 85% of the population uses cellular phones and very few houses have land lines. The town has three radio stations. The installation of a cyber cafe is planned, but newspapers, television, cinema and internet access are absent.

[Add telecommunication map showing areas of cell reception and areas where no cell receptin exist]

Waste management
No waste management facilities exist in St Raphael.

Churches
In St Raphael as in all of Haiti, Christianity is the dominant religion. There are 72 Catholic and Protestant churches, and close to 300 voodoo shrines.


Cathedral of St Raphael, photo credit: Stanley Hilaire

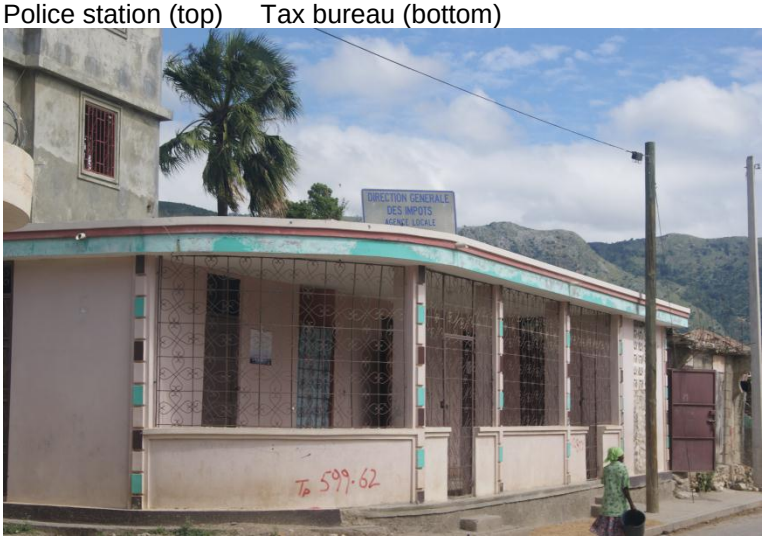
[Add map showing locations of all churches]

Government buildings
Most civic buildings are in poor condition. The government recently built a market and just recently, a new school.

Tribunal

[Add map showing locations of all civic / government buildings]

Police station (top) Tax bureau (bottom)



Hospitals & Clinics

Health infrastructure includes one center with beds, two clinics and two pharmacies.
The main health institution is the Hospital of Charity located in Pignon, approximately 15 km south of St Raphael. The average age of death is 41 years (men) and 45 years (women) with the main causes of death being hypertension, diabetes, epidemics and malnutrition.

[Add map showing locations of all health facilities (hospitals, clinics, pharmacies)]

Health facility, Photo by Stanley Hilaire

Industrial Parks
At present, there are no industrial or manufacturing facilities in St Raphael.

Market
The large St Raphael market attracts farmers and citizens from the surrounding Departments (Center, Artibonite, North-East). The market, recently built by the Government, is booming and many consider it the most beautiful market in the entire north region.


St Raphael Market, Photo by Stanley Hilaire

[Add map showing location of market and commercial buildings for trade (markets, hardware store, clothing store, etc.]

Tourist attractions

St Raphael offers many tourist attractions. Natural sites such as rivers and caves, historic sites, beautiful scenery and mild climate, as well as proximity to sandy beaches of the northern coast and historic Cap Haitien, make it a worthy tourist destination.

[Add map showing all the tourist attractions in a reachable within 2hr drive radius (within 100km radius) of St Raphael]

Education

St Raphael has a literacy rate of 40%. There are many primary schools, but few secondary institutions and no universities or trade schools. 75% of the students live in rural areas and commute. The closest university or trade schools are located in Cap Haitien.
There are no public vocational training centers in St Raphael. There are however two private trade schools, one in St Raphael and the other in Sanyago.

[Add map showing all the education facilities – preschool, primary, secondary & trade schools]

Economy
The economic characteristic of the municipality of St Raphael is primarily oriented towards self-sufficiency. The relatively low level of development in all sectors is based on the following observations:

[Add graph showing income levels of inhabitants]

Agriculture
The St Raphael commune is predominantly agricultural, with an excellent irrigation system and other small catchments to assist the population to engage in the cultivation of the earth. The majority of the population makes their living from the earth. This is considered the main economic source of the inhabitants, despite the dismal state and degradation of the environment. Because of its abundant agricultural production, it is considered the breadbasket of the Northern Department. It should be noted that on Thursdays, main market day in St Raphael, shipments of goods and supplies of all kinds make traffic denser compared to other parts of the country.

Production, however, is low compared to the potential of the natural environment. The problems of intensification and diversification are certainly linked to a lack of structure and design, but they are also due to the lack of organizational structure to commercialize the products. These two factors affect the farmers' choice of either producing the necessary amount for their own consumption or selling their products at prices that escape their control.
Agricultural fields which are relatively accessible during the dry season are hard to reach during heavy rains, further aggravating delivery of goods.

[Add graph /map showing the different agricultural products cultivated in the area]

Banks
There are no banks in St Raphael. There are a few money transfer facilities where residents receive funds from relatives abroad.

Gas stations
There are no gas stations in St Raphael.

Saint Raphael infrastructure
St Raphael is virtually devoid of infrastructure. Basic services are not available. Infrastructure and community facilities have not been renewed for decades.

Challenges of Development in St Raphael

- Chronic under-education of the population
- Inaccessibility to basic health care
- Very high rate of unemployment of the population, particularly youth
- Loss of population control
- Inability to create wealth
- Considerable weakening of the local government
- Considerable environmental degradation
- Continuing impoverishment of the population
- Lack of professional or technical expertise
- Almost total dependence on the outside world

Many of these factors are intrinsically inter-connected, i.e. Chronic under-education contributes significantly to the lack of technical or professional expertise, high unemployment, overpopulation, incapacity to create wealth, environmental degradation, continued impoverishment of the population, dependence on the outside world, and social exclusion.

Environmental degradation can significantly contribute to poor agricultural soils to best agricultural yields. The continued impoverishment of the population contributes to their incapacity to create wealth and their chronic dependence on the outside world, and so on.

Successful societal and urban development requires tackling many of these challenges, often at the same time since they are so inter-connected. If one were to conduct a survey in St Raphael among its citizens with regard to the most important problems their city faces, the following would be the answers at the top of the list: poverty, hunger, no jobs, poor health, followed by poor infrastructure and lack of technical expertise.

The goal of this report is to display the urban development needs of the city so that solutions can be more easily sought.

Urban Development

Urban planning is the technical and political process concerned with determining land use and the design of the urban environment, including transportation networks. Its main role is to guide and ensure the orderly development of communities. It concerns itself with research and analysis, strategic thinking, urban design, public consultation, policy recommendations, implementation and management.

There is an increasing need to address unplanned urbanization and its challenges. Insufficient attention to development control can have disastrous results, such as inadequate urban infrastructure and the proliferation of sub-standard housing.

Urban planning practices directly affect the health and well-being of the population. Healthy urban planning is a core element for sustainable development and must focus on the positive aspects, in particular, to make health objectives central to the decision-making process, in order to improve both the quality of the built environment and the quality of life for communities in cities. It supports the creation of a healthy economy, a healthy environment, and a healthy society.

Architects and urban planners are trained to observe and provide recommendations to ameliorate the built environment, but often that task is impossible without research and analysis of the greater issues such as environmental and economic challenges, as well as social and cultural factors. We now have a powerful tool at our disposal to provide us with that knowledge, and that tool is called Geographic Information System.

Geographic Information System

GIS (Geographic Information System) is a computerized database management system merging cartography, statistical analysis and computer science technology designed for capture, storage, retrieval, analysis and presentation of all types of geographical data. Many different types of data can be integrated into GIS and represented as map layers. When these layers are placed on top of each other, spatial patterns and relationships often emerge. GIS can be used to generate answers to queries, or as part of spatial statistical analysis.

GIS allows a glimpse, through maps, into the different facets that make the natural, social and built environment, and allows to merge different data as needed, bringing different elements (layers) of these maps together as needed to analyze the interaction of multiple elements.

As ESRI puts it so well*, 'GIS is becoming essential to understanding what is happening—and what will happen—in geographic space. Once we understand, we can prescribe action. This new approach to management—managing geographically—is transforming the way that organizations operate'.*

GIS gives us a new way of looking at the world around us and GIS makes Haiti available to the world.

GIS can help monitor what's happening and take specific action by mapping what is inside a specific area.

GIS can map the change in an area to anticipate future conditions, decide on a course of action, or evaluate the results of an action or policy. By mapping where and how things move over a period of time, one can gain insight on behavioral patterns. For example, a meteorologist might study the paths of hurricanes to predict where and when they might occur in the future.

GIS facilitates the collection of data necessary for conducting analysis. The type of data and the geographic scope of the project will help direct the methods of collecting data and conducting the analysis.

The results and presentation of the analysis can then be shared through reports, maps, tables, and charts and delivered in printed form or digitally over a network or on the web.

Land/Property Ownership

Less than 5% of the land in Haiti is officially recorded in the registers of public lands, according to the United Nations, compounding the difficulty of establishing who owns land. Even before the earthquake, land issues were a serious problem in Haiti, contributing to the violence and poverty in a country where land is concentrated in the hands of a few large landowners.

There is no apparent system of registering real estate property. Most of the land is transmitted orally from one generation to another "With the prevalence of informal land ownership and weak registering institutions, tenure security is not established according to a UN-HABITAT report published shortly after the January 2010 earthquake.

Before the disaster, the Organization of American States had committed $70 million over seven years to develop a digitized land registration system in Haiti. It was deemed a prerequisite for development, but the earthquake has made land title issues much more of a pressing challenge.

Uncertainty over land ownership means that development plans are at a stand-still. This problem of uncertainty of land rights also weighs on local businesses. Many Haitian business leaders struggle to obtain bank loans because they are unable to prove that they own the land occupied by their business. This uncertainty has also shied away potential foreign investors, essential for the development of Haiti. Also, without clear land ownership, it is difficult to create new residential developments, new schools, hospitals, community centers, etc.

Disputes over land ownership, which could take years to be resolved, has hampered reconstruction efforts. The Government of Haiti needs to determine who owns the land - a major challenge after an earthquake that killed some 16,000 civil servants and destroyed countless deeds and land registry files. The disaster has exacerbated land claims. With nearly 300,000 deaths, inheritance and land sales raise many questions. Is the owner alive or dead? If dead, does he/she have inheritors? And if so, do they have proof of inheritance?

Besides the land ownership issues brought forth by the earthquake, Haiti has long had a squatting problem - people, both in urban and rural areas, who appropriate land or property left idle by their proprietors who no longer live in the region or the country.

Another problem is land grabbing. It was already endemic in the slums before the earthquake, and is now widespread due to the lack of clarity in land titles.

The earthquake has only highlighted a long-standing problem, the ill-defined property rights in Haiti, following an inefficient judicial system, years of political instability and a weak government unable to respect and protect owners' land titles. The courts are overloaded, and in Haiti, it takes on average five years to resolve a case*. (Source: Haitilibre.com/ haiti-reconstruction-les-problemes-fonciers-entravent-la-reconstruction*)

Beside necessary and crucial coordination between existing governmental institutions dealing with property titles; i.e. Direction Générale des Impots (tax bureau) & INARA (Institut National de Réforme Agraire), and a few others, the need to create a Bureau of Land Management, responsible for modernizing/digitizing land ownership in Haiti, is also crucial.
Without legal documentation of land ownership, proposed new development will be challenging to say the least.

GIS could be a powerful tool in the creation of a modern web-based real estate database. The Planning Department at Haiti's National Center for Geospatial Information (CNIGS) may provide direction on such a project.

A Land Ownership map of Haiti would show properties owned by the State, (public land which would therefore be available for civic projects), and properties owned by corporations, institutions, as well as individuals. It would also indicate the date of ownership, date of title transfers, taxes paid on the property, etc. A transparent system is key. It could also show land use/zoning districts, data that can be used for development purposes.

GIS mapping would start to reveal areas that should be used for agriculture but presently have houses built on them, areas that could be appropriated by the State via eminent domain for construction or extension of existing roads.

[Create hypothetical map of what a tax map could look like based on the google earth images that show delineations of fields]

[Create lot map based on google earth images of areas of housing]

[Create property block & lot map (made-up to show what a real one would look like]

[Add map of agricultural areas vs urban areas in St Raphael]

Zoning

Zoning is an urban planning process for land use to allocate certain types of structures or open space to certain areas. Zoning regulates the use and bulk of a property, such as regulating distinct residential, manufacturing/industrial, commercial/retail, agricultural zones. Zoning also address health and safety concerns of citizens as it separates different land uses from one another – prohibiting objectionable uses from residential uses.

Zoning also includes further restrictions in different zoning districts, such as height & size of buildings and open space requirements.

It should be noted that in the case of St Raphael, where the urban environment comes in close contact with rural/agricultural areas, there ought to be a balance between urban zoning and rural zoning. Prime agricultural land should not be appropriated arbitrarily and added to the urban fabric without careful analysis just because it borders the city. It takes balance to achieve sustainable growth solutions.

GIS research demonstrates that in St Raphael there are distinct zones for certain urban activities. To reinforce such activities and to encourage their development, we recommend emphasizing certain sectors for the types of activities that are most suited to the area. GIS allows us, by observation, to delineate the different zones and make recommendations for a zoning map and project a possible zoning plan for St Raphael in the year 2030, for instance.

For example, the largely successful new market at the west end of town could also be supported by other types of retail activities encompassing a greater agro-commercial zone. Commercial activity also implies greater vehicular use; a large capacity parking lot to serve both these zones is also worth considering.

Creation of new residential districts as the city grows: We have identified 3 distinct areas (one in the north, another in the west, and another in the south section of town for potential residential growth. These areas have few structures within them and could be prime residential districts as the city grows. The districts could further be zoned for low, medium, or high density use.

Identification of zone for new manufacturing use: Through research, data shows that St Raphael has 53 seamstresses. An obvious manufacturing model would be the installation of clothing factories, since the skill set is already there.

Creation of a commercial strip (zone) along the road leading to the market: This is an obvious zone for commercial activities. The road should be enlarged, if possible, to allow for traffic density.

Creation of more open space: Identify areas for youth recreation (football, basketball and volleyball courts, plus children's playgrounds) and areas for park land. To respond to the lack of public open space in St Raphael, a park can be proposed for the city that could also serve the purpose of ecological education.

[Create a zoning map (made-up to show what one would look like, showing residential, commercial, educational, industrial/manufactural, agricultural zones]

Urban Planning

Land use in St Raphael occurs in half –hazard, unregulated ways. Most of the agricultural land in the vicinity of the town is privately owned. By the year 2050, the population of Haiti is predicted to double; it is likely the population of St Raphael will also grow proportionally. This will severely impact current housing stock and more housing will need to be constructed. If additional land is not available, it will be necessary to build multi-story housing, the apartment-building prototype, which has not been the norm thus far in Haiti. A new thinking vis-à-vis what a home is will have to be accepted, as the detached single-family model will no longer be sustainable as the population increases.

Planning for growth: Housing
St Raphael has grown in population in the past 20 years but has not seen much growth in the number of housing units. Google earth historic maps from 2003 and current data only reveal a few additional buildings, and these have been added within the existing urban fabric. The city is densely packed with houses built wherever they can fit. There is very little open space left for additional buildings. Obviously, any future development would either necessitate demolition of existing buildings to create taller buildings of two or three stories that can accommodate multiple families, or infringe on some of the agricultural land that surrounds the city to incorporate them within a new urban boundary.
We have identified three areas, north, east and west of the city where such growth could occur. In collaboration with city officials and real estate developers/land owners with regards to the housing needs of the city, we would propose creating new housing units of higher density to accommodate population growth, taking into account the importance of open space and new streets to reach these new communities. The infrastructure report has already addressed the locations of waste transfer stations, energy and water needs.

St Raphael is maxed out for residential growth within its current city parameters, unless agricultural land is appropriated to make way for more housing; a proposition that would need careful consideration by all involved (farmers, developers, city officials, citizens). It is clear that with limited residential land and the need for continued growth in agriculture, higher buildings will be the way to go in 2050 after the population has doubled as predicted.

[Create master plan for 2030 & 2050 showing the sutainable evolution of the city]

Building construction

Currently, Haiti has no building codes, and for a country with seismic fault lines and located within the path of hurricanes, it is paramount to construct safer buildings that can withstand hurricane-force winds and earthquakes.

GIS provides data with regard to locations of seismic faults. Armed with this information, better planning can be made to avoid building in vulnerable areas.

India, which faces many of the same problems as Haiti - notably lack of infrastructure and affordable housing - has a Minister of Housing and Urban Poverty Alleviation. One of the ministry's tasks is to find solutions that provide for more affordable housing to be built in order to cope with its rapidly growing urban population. Haiti, even though considerably smaller in scale, faces some of the same problems and would greatly benefit from a Ministry of Housing whose role would be to adopt and enforce a construction code, regulate zoning, construction, issue construction permits and inspect construction-in-progress to ensure buildings are being constructed with the required quality standards. Haiti would not have to necessarily write its own code, as building codes from neighboring Caribbean islands could be adapted to Haiti. A National Construction Code could call for contractors training and certification in various trades such as carpenters, masons, bricklayers, cement finishers, roofers, electricians, welders, plumbers, etc…

Most buildings in Haiti are built without engineers or architects, often have improper foundations, or use improper building practices, and thus, in most of the country there is a proliferation of poorly built homes. Much of the poor quality work can be attributed to the poverty that is pervasive in Haiti, as it is clear that poor countries often have poor construction quality standards. This lack of standards has permitted ad-hoc construction (i.e. shanty towns) to proliferate in the most precarious ways.

A simplified illustrated construction manual, both in French and Creole, should be made available to all builders, in addition to a national building code, which should also be made available free of charge.

Another challenge Haiti faces is the lack of sufficient qualified contractors. This has permitted the business sector, private enterprises and even the government of Haiti to turn to its neighbor, the Dominican Republic, for reconstruction projects. These contractors often bring their entire crew with them, marginalizing local builders - quite an irony when the country needs jobs and would benefit from them stimulating the local economy.

[Add map showing provenance of building materials, both locally and internationally]
[Add graph showing different types of building materials used]

[Add Haiti Building Code front cover image]

Roads

Most roads in Haitian towns and St Raphael are two-way streets, and the primary roads known as national roads are also typically no more than two-lanes). To relieve traffic congestion, a traffic pattern analysis would help determine the feasibility of one-way streets within the city to help with traffic flow. In St Raphael, people travel mostly on foot and motor-bike, and occasionally use donkeys. A privileged few have cars.

GIS and CADD maps can be used to analyze traffic patterns at different times of the day in key areas worth studying to suggest alternative solutions of alleviating traffic jams.
Many streets have no sidewalks, which can result in unsafe conditions for pedestrians. It is not a significant issue now because there are few cars in St Raphael, but as population increases and more cars circulate, there will be a greater need to keep pedestrians and moving cars out of each other's way. Traffic lights, stop signs, sidewalks, and one-way streets are some of the elements to be explored for safety.

GIS and CADD maps can propose sidewalks where commercial activities occur, or where pedestrian traffic is greater.
GIS maps help identify dirt roads that ought to be paved, and can help determine where new roads are necessary due to recent growth in certain areas.

A GIS street map of St Raphael can be used as a tool to analyze foot traffic in neighborhoods that are not accessible by vehicles, and propose well-lit pedestrian path networks that are safe to use day and night. There are many pedestrian paths along subdivided properties and for internal movement within neighborhoods.

Judging from the density of buildings along the primary and secondary roads, it is safe to assume that these houses were built after the roads were constructed. Many of these roads represent an economic lifeline for the residents of these towns. Linear make-shift markets are improvised along the roads. Vendors locate themselves at the entry (or exit) of towns, taking advantage of vehicular traffic for opportunities to sell their produce, prepared food, etc. which emphasizes the importance of speed limits at town entry points. As population grows, branching off of National Road No. 3 to the north, with a new fork at the town's gate going north-east to encourage traffic to flow, may be worth considering.

A series of smaller streets could be proposed within residential enclaves wherever possible (along foot paths if width allows) to permit cars to penetrate those areas, if only in cases of emergencies (for fighting fires or reach disabled persons needing medical help).

As the city grows, there will be a need for thorough analysis of the street grid.
The wider streets could attract retail and commercial uses, leaving the side streets as more private spaces.

[Add road map of St Raphael region]
[Create road map showing proposed primary, secondary and tertiary (foot paths) roads]

Residential Buildings

Many of the residential blocks in St Raphael are located on land that was probably used for agriculture at some point, and as the village expanded into the small city that it is, rural areas became urban. The large lots in St Raphael are now entirely filled with houses. Most are small in scale, with very little yard space in between the houses for proper light, air and ventilation.

Occasionally these large lots are subdivided into smaller lots and new property owners mark their territories by erecting high concrete walls around them as shown below.

Source: St Raphael, haitigps.wordpress

Some of these lots are internal lots that have no access to the street. Many also do not have sufficient light and ventilation or adequate yards. These internal lots are accessible by foot or motorbikes.

Most of these houses are one story high with a sloped hip or gable corrugated metal roof. Occasionally the roof is a concrete slab. Haitians often begin building their own homes with whatever funds they have available. With an 80% unemployment rate, few lenders offer mortgages. Hence, many homes are built in phases. Occupants often begin with a unit on the ground floor and gradually add more rooms or an upper floor when they can afford to continue the construction. When money is not found, many of these projects stall due to the struggling economy, and it is not uncommon to see rebars sticking out of the top of buildings, intended to reinforce additional floors when they would eventually be added.

Most buildings are built without engineers or architects, often without proper foundations, or use improper building practices, and therefore, a proliferation of poorly built homes exists in most of the country. Much of the poor-quality work can be attributed to the poverty pervasive in Haiti. It is clear that poor countries often have poor construction quality standards.

St Raphael fortunately has 24-hour electricity, so it is able to meet its domestic energy needs. Solar panels would be a welcomed technology, but the price is still prohibitive for most households.


Google earth


N
Image © 2013 DigitalGlobe
Google earth
2004
Imagery Date: 10/30/2009 19°26'13.35" N 72°11'41.07" W elev 1215 ft eye alt 1951 ft

Haitian residential tradition has long been detached single family homes. With the current housing crisis, this model is not sustainable, and it is time to explore multi-family apartment complexes. This would necessitate a certain cultural adjustment. Haitians like to have their own homes, however small they may be, with access to a yard as all domestic activities (cooking, ironing, washing, cleaning) are done outdoors. Judging, however, from the capacity of Haitians in the diaspora to adapt to other ways when they leave Haiti to settle in the United States, Canada, Latin America, Europe, etc. this may not be unsurmountable.

GIS has helped us identify three areas for potential residential development. They are located in the north, east, and west sections of town. These areas are currently undeveloped and would be good locations for future planned growth.

Through GIS, we can identify agricultural lands, and potentially even identify the type of crops grown. With this information, we can minimally disrupt fertile areas (GIS can reveal soil information, and types of soils can often determine land fertility with regards to potential viability of an agricultural zone).

[Add map of residential buildings showing, 1, 2 or 3 story structures]

[Create master plan showing new residential clusters that take into account proper size of lots with front and back yard, open space, easy access to dwellings, etc]

Public buildings

All buildings used by the public, i.e. assembly spaces such as churches, cinemas, schools, factories, as well as hospitals, clinics, markets, supermarkets, stores, and government buildings, etc., should be constructed to the highest standards that address health, safety, welfare, and the protection of life in the event of natural or man-made catastrophes, such as hurricanes, earthquakes and fires. Government should set an example with regard to the construction quality of its civic buildings.

[Add map showing all public buildings in the city]

Schools

Most of the educational institutions are located in town, south of the cathedral. In fact, they seem to all be clustered in the same area, effectively creating an education district. We would like to propose a safe zone and pedestrian-friendly area, creating an educational campus which regroups all these institutions. Even though these facilities are all centralized and offer the benefit of easy intercommunication between institutions and students, we also see great value in creating new rural schools in the areas where the children live. 75% of pupils in these schools live in rural areas and it makes sense that the schools be located closer to them. It is not unusual to see children walking an hour or two each way in rugged mountainous terrain, to reach school, not to mention having to wake up at dawn to be at school on time. New rural schools would also alleviate the overcrowding currently found in the St Raphael schools.

GIS can assist with locating all schools in the commune and determine, based on population of the different villages, where new schools could be located to alleviate the overcrowding in the city schools.

[Add map of all educational institutions]

Health facilities

Haiti has a very high mortality rate because health facilities (clinics, hospitals) are lacking. There is no hospital in St Raphael. The average age of death in St Raphael is 41 years (men) and 45 years (women) with the main causes of death being hypertension, diabetes, epidemics and malnutrition.

Clinics offering preventive medicine services would be greatly beneficial to increasing the overall health of the population. More clinics are needed to serve local populations in need.

The close proximity of housing and the density on these city lots does not create sufficient light and ventilation. People living in close proximity to one another are more at risk during epidemics.

GIS can assist in locating all the medical clinics in St Raphael and identifying areas where the population is underserved and propose health centers.

[Add map of all health facilities in St Raphael city and region]

Churches

The religious sector is very vibrant. There are many churches of various denominations in St Raphael.
GIS can assist in locating all the churches in St Raphael and identify their denomination.
The churches in St Raphael could be teamed up with churches of the same denomination in the U.S. and Canada to encourage support.

[Add map of all churches in St Raphael city and region]

Tourist Sites

For too many years, political instability, years of embargo, bad propaganda from the international press and Hollywood, lack of infrastructure, and a multitude of political and socio-economic crises have served to tarnish Haiti's image, and that in turn has deterred tourism. Yet, the country is a goldmine for tourism as its historical, cultural and natural attractions are immense. It would take a partnership between the government of Haiti and the economic elite of the country to take action to stimulate economic growth. Labadie, an initiative led by Haitian businessmen in partnership with foreign investors (cruise ships), is an example of a successful tourist destination.
As of 2001, there is a Ministry of Tourism in Haiti and many efforts are being made to make Haiti a new tourist destination in the Caribbean.

GIS can help identify the numerous archeological and historic sites, located near St Raphael, such as the renowned St Raphael caves, and its best beaches, which can then help identify areas for future resort development and hotels.

GIS can help locate hotels and inns, which in turn can identify areas where those facilities are lacking, and identify, based on further analysis, whether those areas have the basic infrastructure facilities to accommodate tourists.

[Add map of all tourist sites and hotels in St Raphael city and region]

Parks

Deforestation has led the country to the brink of economic and environmental abyss. It is the main cause of soil erosion and low water retention. The deterioration of the environment has a profound effect on the economy of the country. Haiti does not produce enough to feed its people. There is a very close link between the economy, the environment and agriculture. The recovery of the environment and its protection will have lasting economic effect and will contribute to the creation of jobs in the industrial, commercial and service enterprises (recycling, composting, collection and treatment of waste, reforestation, water treatment, etc.). The environment can be a very dynamic sector in creating jobs.

Creating protected green space (reserves) to begin restoring the environment is vital. They can either be botanic gardens, replication of vanished pre-Columbus forest cover, or simple city parks with an aggressive tree planting program and a citizen brigade to protect them.

[Add map showing open space]

[Create map showing possible areas for nature reserve, parks and city squares]

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Antoine Lunot, Mayor of St Raphael