

THE RISE OF SUSTAINABLE URBAN DEVELOPMENT ON REUNION ISLAND

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Abstract

The Reunion Island Sustainable Districts program is a case study and a theoretical development for Eco-city policies. It introduces a methodology which emphasises the decision-making process, making this 'key' for the success of each project. Currently, it is being employed in Reunion Island in the building of thousands of houses. This methodology could be generally applicable to other French territories and in most democratic countries.

Reunion Island utilises sustainable urban development as part of its governmental program: *Green Energy Revolution – Reunion island**. A conference defined the RISD concept and the means to its realisation. Local debate highlighted that the complexity of technical analyses could alienate politicians from these urban development projects and hence, strategic decision-making policies. Through financing the project conception, co-ordinating politicians and professionals and their training, the partnership program promotes an integrated realisation of each project. Twenty projects are currently focused on the challenges of sustainable town planning.**

Reunion Island with 800,000 inhabitants shows growth in terms of population, economic, social and cultural development. Limited territory leaves little room for the compensation of urban dysfunctions by the urban spread. Furthermore, increasing petrol and transportation costs mean overseas trade supply is threatening the island economy.

Rapid development calls for an additional 200,000 houses by 2030. To deal with these expectations, spatial planning must optimise land use, housing density and urban efficiency. In promoting local diversity and by combining the needs, the uses and the resources of the island; improving public spaces and networks and creating an animated and integrated development; local, economic and cultural development is ensured. The island's isolation highlights the need for short distance supply and self-sufficiency. The success of the planned development is essential in preventing an impending population growth and resultant expanding shantytowns from destroying an exceptional environment.

Keywords: town planning, urban design, sustainability, tropical island, Reunion Island

1. Introduction

On est tous dans le même bateau. “We are all in the same boat”. This revelation, emphasised during the Bruntland Commission¹, refers to the sense of communal belonging as being crucial for sustainable development and a respectful co-living amongst neighbours. On Reunion island, each individual is bound to a strong sense of community which can be compared to being a crew member on a ship, the island is circular and one feels lost, far away in the ocean, distanced from mainland contact, and without any close-lying neighbours... This may explain why a serious commitment to sustainable urban development is occurring on this island. We will first describe the fruits of that commitment, followed by an explanation of the formation of a new urban policy in accordance with the characteristics of this exceptional territory. The concept behind Reunion island’s Sustainable Districts will be discussed with reference to specific examples. We will question if our experiences in sustainable urban development on Reunion Island are relevant for other territories, specifically similar examples such as the other French tropical islands. Lastly, what can we gain in terms of methods of analysis as well as decision-making regarding spatial planning and urban development?

2. The commitment of Reunion Island to sustainable urban development

Reunion island’s own concept of sustainable districts, in accordance with its needs and characteristics, was defined at the end of 2009. These Sustainable Districts are intended to be attractive and affordable for all inhabitants and visitors alike. Housing, activities and public services are integrated and well connected. In addition, developments are planned to be economical, naturally cooled and cyclone resistant.

The commitment of Reunion Island to sustainable urban development engages more than half of the municipalities and thus a very significant part of the urban development. Currently, around twenty projects for urban development operations apply this concept of Reunion Island Sustainable District (RISD). These projects contribute to the construction of almost ten thousand houses, a sizeable proportion of the average 9000 houses needed a year in Reunion island. The projected areas measure more than 17 square kilometres, and are mostly of urban renewal. These projects deal with the diversity of urban contexts of the territory. The most important projects are focused along the coastline, where the majority of people live and work, however some projects deal with the development of the villages in the highlands. There are projects dealing with city centres and urban sprawl as well as, countryside villages. The perimeters of the projects are predominantly concerned with urban renewal whereas some focus is given to urban extensions. Two projects combine sustainable development and shantytown transformation. Considering the progress of projects; two projects are currently in realisation with funds raised for public building operations, nine projects are in the urban design phase, and eight projects are being theoretically defined.

In terms of mobilization, more than half of the twenty-four municipalities of the island are candidates for one or more projects applying the concept of Reunion Island Sustainable Districts. It involves both professionals and politicians, and more than 150 people went to the events and technical debates organised by the program, including members of the civil society. The program is now supported by the French state, the Regional Government and professional organisations concerned with urban development. The private sector is also engaged, however the French state decided to refuse private sponsorship in an attempt to retain the public independence of the concept.

¹ The Bruntland Commission defined in 1987 the concept of sustainable development on the basis of studies, which demonstrated the limitation of resources on the Earth.

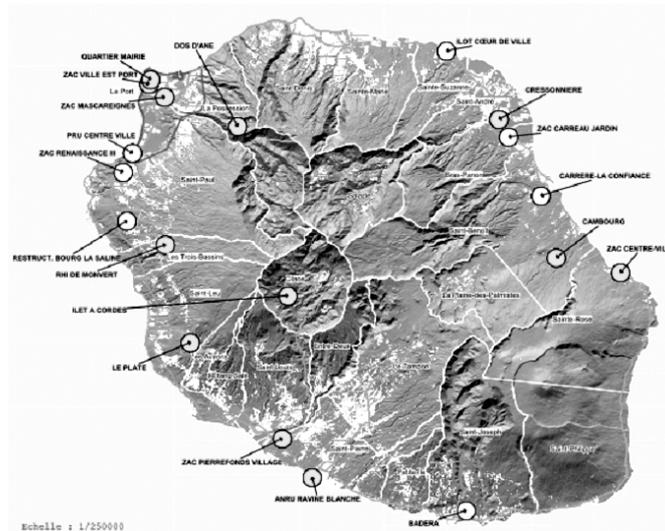


Fig. 1. Reunion Island Sustainable Districts projects

3. Reunion Island in a Nutshell

Reunion Island is a volcanic tortoise-shaped island located in the Indian Ocean adjacent to Mauritius and south-east of Madagascar. It is a developing island with a population of around 800,000. The Island is under French jurisdiction but is no longer considered a French colony, all its inhabitants are French nationals. Reunion Island is referred to as a *Département Outre Mer* (DOM), an overseas territory with its own French *préfecture* (administration). As with all French region, Reunion Island administrative offices consist of its elected representatives of both central councils and several regional councils. This multi-level institutional system governs the island through two assemblies: one for the region and one for the *Département*, four micro-regions as well as 24 communities.

Comprised of approximately 2,510 square kilometers (969 square miles), Reunion Island can be considered a comparatively small French territory. However, with a population of 800,000 and one million expected by 2030, it consists of the fourth highest density in France. Considering that an Upland National Park constitutes 42 percent of the island's physical area, a sanctuary comprising of the entire center of the island with its volcanoes, one could understand that the density factor has become a pertinent issue along the available coastline.

Reunion Island is mostly tropical in vegetation, but is also a region of many contrasts. The West-coast boasts a combination of an attractive climate, lagoons and beaches. Several cities benefit from a well developed infrastructure such as a harbour, airport, universities and highway connections. The Eastern coast is exposed to the *alizés* winds and the all-important rainfall; it is more rural and less developed in terms of infrastructure than the West coast. The Southeast is a desert landscape under the threat of frequent lava flows. The central terrains with a temperate climate are not included in the National Park. These rural highland regions resemble an alpine mountainview. The National Park contains a wide valley with several villages with no road access, it is known as the *Mafat Circus*.

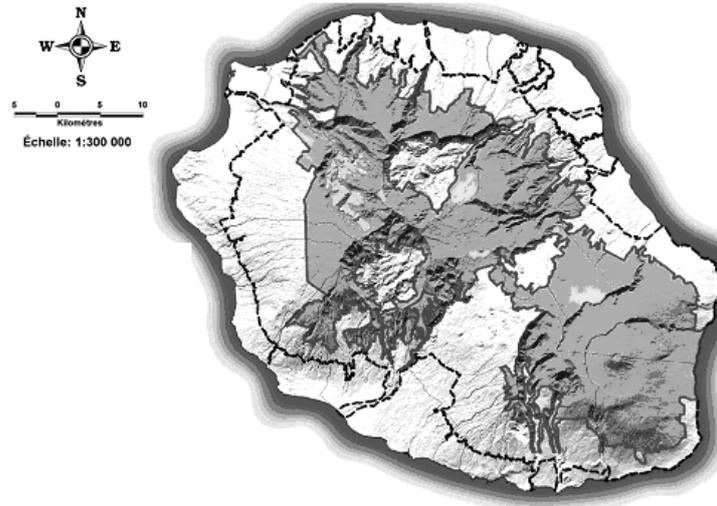


Fig. 2. Reunion Island National Park

In terms of demography, people from all backgrounds have come together to create a unique cultural identity – termed as being Creole in essence. The population is composed of several ethnic groups. The three largest ethnic groups are:

- Blacks, originating from Africa and Madagascar, called *les Cafres*
- Whites, including the bourgeoisie, called *les Gros-Blancs*, and those who live in the mountains
- Indians from Dravidian origins (know as *Malbar*) and Muslim origins (know as *Zarab*).

Delineation between ethnic groups is not evidently clear-cut due to racial mixing and the predominance of a consensual Creole identity [1]. The population is young and is still growing at a significant rate as the demographic transition is in progress. It is expected that by 2030, 200,000 new inhabitants will be living on the Island; the growth rate will be stabilized and conform to that of an industrialized country.

As a colony, the economy of Reunion Island was traditionally based on agriculture, but tertiary activities now dominate. Sugarcane has been the primary crop for more than a century, and in some years accounts for 85% of exported goods. The government has been pushing for the development of a tourist industry to relieve high unemployment statistics, which include up to one-third of the working population. The economic gap in Reunion Island between the affluent and the poor is notable and accounts for persistent social tensions. Some communities are substantially better off than other segments of the population, often approaching European standards, whereas minority groups suffer the poverty and unemployment typical of the poorer nations of the African continent. The economic well-being of Reunion Island still depends heavily on continued financial assistance from France.

The main cities are: Saint-André situated in the East; then Saint-Benoit, Saint-Pierre, Saint-Louis, Tampon in the South; and at last, Saint-Paul and Le Port in the West of the island. Saint-Denis, the capital of the island, has about 120,000 inhabitants. All these towns are situated along the coastline, except Tampon.

In terms of politics, the development of Reunion Island is still the central topic. The concept of *rattrapage* meaning 'reducing the gap with the mainland' has piloted fifty years of developing policies since World War II. In 2010, the modernization of infrastructure and services was exemplified through the construction of the North to South highway.



Fig. 3. Reunion Island cities

Intrinsic investments in terms of sanitation and infrastructure still remain, however the local debate is currently more focused on the quality of development and its sustainability. The development of a new transportation system was the central point of discussion of political debates during the last regional elections in 2010.

Another main political topic includes the economy of the island and its sugarcane resource. This form of agriculture is precarious and dependant on the European agricultural policy. As the sugarcane crop covers all of the coastline, an amplified threat in terms of economy and land use is posed for the spatial planning.

The understanding of land use changes is widely studied by the local agency for urbanization AGORAH and several research projects which map these changes from GIS data [2, 3].

The Regional Plan organises the development of the island and its urbanization. The quality of this development is a permanent debate, with some events and experiences proposed by local institutions and organizations. In 2008, The Young Economical Chamber held a brainstorming event, which resulted in *A Thousand ideas for the sustainable development*. Since 2007, the University of Reunion together with professional organisations have formed an experimental project for a sustainable district using green technologies known as *Beausejour*. In 2006, the local administrations organized a forum- *Urban Pattern for Reunion island*. [4]

In 2007, when the French national debate on the environment and sustainable development occurred in France, Reunion Island was prepared in discussing its objectives. This is where the goal to provide Reunion Island with energetic self-sufficiency by 2030 was initiated.

Even though Reunion Island has been inhabited for less than four centuries, this relatively young as well as economically struggling island is showing growth in terms of population, economic, social and cultural development. However, limited, habitable territory and non-renewable land, leaves little room for the compensation of urban dysfunctions by the urban spread. In addition, due to increasing petrol costs and consequent transportation costs, overseas trade supplying the island with resources and provisions, is threatening the island economy.

It has been estimated that development and population growth calls for an additional 200 000 new or renovated houses by 2030. To deal with these expectations, spatial planning projects must optimise land use together with housing density and urban efficiency. The diversification and development of local activities and supply chains, whilst considering the environmental and ecological impact in protecting cities from natural disasters and disease outbreaks, is essential.

4. The Origins of the Reunion Island Sustainable Districts Program

The *Grenelle de l'Environnement*² occurred in Paris during the Summer of 2007. In accordance with Reunion Island representatives, the French government decided to devise a specific plan for Reunion Island as an experimental territory for sustainable development. This plan designed as the *Green Energy Revolution – Reunion Island* (GERRI) developed several strategic sectors, including Energy Production, Energy Storage, Transportation, Urbanism, Tourism as well as, urban development. The general aim of the plan was to provide Reunion Island with energetic self-sufficiency by 2030. The preliminary studies for the plan were devised locally on Reunion Island. These studies focused on proposals for the generation of sustainable district developments.

The studies were lead by local French administration including the *Direction de l'Environnement de l'Aménagement et du Logement* (DEAL), responsible for Environmental issues, Planning and Housing policies. Laure Nicolas, architect and town planner of the DEAL administration, called on the *CETE Méditerranée* for technical support in defining and deploying actions for the creation of sustainable district developments.

The *Centre d'Etudes Techniques de l'Équipement* (CETE) Méditerranée is an engineering consulting office managing Mediterranean and Southeastern French regions. The CETE is affiliated with the scientific and technical offices network of the French Ministry of Ecology and Sustainable Development. The department managing spatial planning studies, the *Département Aménagement des Territoires* consists of around seventy technicians and specialists trained in specific skills which are needed for sustainable urban development, including the environment, energy, economy, transportation, housing, architecture, sociology, land use and landscape.

What is a *Sustainable District* and what does it mean for Reunion Island? This question was the subject of a first meeting with local representatives in June 2008. Well-known examples were presented at this meeting, these included: Bedzed district, London, Vauban district in Freiburg, Germany and the Mazdar City project in Abu Dhabi. It became evident, at this meeting, that none of these examples could act as suitable forerunners in the case of Reunion Island. Consequently, French state representatives decided to conduct a specific investigation into Reunion Island in order to define a local concept for the sustainable districts.

Investigations consisted of both interviews of local personalities in preparation of a local public debate on the subject, as well as studies into the local knowledge and technical expertise. A study was undertaken by a local engineering office with the support of Léon-Attila Cheyssial (a well-known architect on Reunion island) who produced more than sixty technical manuals.

In preparation of the debate, twenty-four local personalities were interviewed with the aim of defining the issues surrounding Reunion Island settlements. The perceptions of what sustainable districts should encompass, in this territory, was also highlighted. Investigations were concerned not only with the usual stakeholders of urban development such as urbanists and politicians, but also with intellectuals and artists, who could visualise the future of their society.

In ordering and combining all ideas, four scenarios were outlined, each summarised onto a single page [5]. These scenarios became the four prototypes for the proposed Reunion Island districts.

2 The aim of the "Grenelle Environment Round Table" (as it might be called in English), instigated by the President of France, is to define the key points of public policy on ecological and sustainable development issues for the coming five years.

The TEKNO district is abundant with technological features, with solar cells and electric vehicles. The houses are all built sun orientated and vegetation is utilised to control the internal climate through cooling the external walls. Inhabitants can work at home using up-to-date communication technology. The ecological equipment of the houses is supported through green financial aid. Green public services are paid by through ecological taxes.

In SOSSIO district, everyday life is intense and fast moving. Streets, public spaces and facilities are widely shared and people who participate actively in local decision-making. Social networks help and encourage individuals as well as collective enterprises. Activities and events are in continuous creation and spaces are in evolution.

The LONTAN³ district is a revival of the balanced settlements of the ancestors. Housing and agricultural production are combined with the transportation system using horses and animal labour. Simple and economical solutions reappear such as windmills. Traditional values and mutual respect create a peaceful everyday life.

The EKOLOBIO district is a place to live in harmony with Nature. Housing is organized in accordance with ecological and low-tech systems such as natural sanitation, biological agriculture and gardening. Life is economical and peaceful, with an increased presence of bird and animal life, and no disruptive traffic noise.

Each prototype calls for a proper urban coherence and an alternative to dealing with the key points of local issues of urban development. The following table discusses these key points in relation to the above mentioned prototypes.

	<i>Signs of modernity?</i>	<i>Mobility ?</i>	<i>Public spaces ?</i>	<i>Nature?</i>	<i>Solution for urban sprawl problem?</i>	<i>Low cost?</i>	<i>Acceptance ?</i>	<i>Evolving ?</i>
TECHNO	Green tech design for buildings and services	High mobility and green tech mobility	Internet is the public meeting space	Under green tech control. Benefits personal well-being and business sector.	Density and working from home	Expensive investments to economise long-term consumption. Green financial aid and taxes	Respect for technical rules	Evolution limited by systems of control. Computer-controlled.
SOSSIO	Communication, civil society and social networks	Maximise short-distance exchanges and shared systems and networks	Essential. A place of exchanges and social self control	Urban agriculture and subsistence, trees in public spaces	Density, <u>mix of uses</u> , neighbourhood economy	Complex economy, Costs-shared, informal banking	A self-built and self-designed environment	Everyday
LONTAN	Revival of traditional values	Low mobility in a short distance society with <u>horse-drawn carts</u>	Communitarian spaces, under traditional, moral control	Natural order of human society	Mix of generations, <u>overpopulation of household</u> , social order	Low cost Family solidarity ensure social support.	No choice	Land ownership dependant on heritage
EKOLOBIO	Biotechnology, low cost systems	On foot for health reasons, animals	Optional, natural or <u>gardened</u>	The highest principle, symbiosis	High density of settlements, reduction of infrastructure	Low cost. Economic decline, urban agriculture and self-sufficiency.	Revelation and love for Nature. No alternative.	According to the seasons and natural changes

Table 1. Prototypes of Reunion Island sustainable districts

3 *Lontan* means “of the old ages” in local Creole language

These prototypes attempt to illustrate the visionary ideas of 'the city of the future' on Reunion Island. They were intended to provoke discussion and to ensure for a common understanding of debate topics during the forum. For that purpose, they were intentionally caricatured to compel each participant into maintaining a critical viewpoint regarding each of the suggested futures. In actual fact, it was stressed that each of these scenarios presented an unrealistic dream-like vision, which could rapidly turn into a nightmare. Negative perceptions are outlined as follows:

TEKNO district should be delivered with a complete instruction manual and a police guarantee that technical instructions are respected and taxes are paid. Non-complying citizens who are unable to pay for the green high-tech systems should be banished.

SOSSIO district is an economical, social and environmental chaos as it is impossible to decide how to administrate public facilities.

LONTAN district is under social control, but workers live with a life expectancy of up to 45, arranged marriages are an example of minimised options regarding freedom of choice. It is effectively an area with a negative economic growth rate.

EKOLOBIO district suffers from disease and virus outbreaks including malaria and chikungunya. Free-roaming animals enter houses and destroy food reserves. There is little hygienic control.

Nobody wants to create such caricatured districts with such dangerous consequences. Ideally a combination of these prototypes could be beneficial in utilising the advantages and rejecting all the risks. Referring to the table of analyses of these prototypes, it is noted that some features are incompatible. Examples include:

- the computer controlled cooling systems of the buildings in the TEKNO district would have to undergo constant renovation due to the permanent changes in building-use in the SOSSIO district, causing system breakdowns.
- the self-sufficient economy of an EKOLOBIO district could hardly cover the expenses needed for the investment of technological systems of a TEKNO district,
- the economical development of both SOSSIO and TEKNO districts would be limited by the reduction of infrastructure in the EKOLOBIO district.

Political decisions regarding these combined options appear to be necessary in defining coherent concepts for each district. Between the 29th and 30th of October 2009, the French government and Reunion's regional government together with their partners and the logistical support of both the Regional Council and the *Département* Council, organised a forum to discuss the strategic axis for local urban development and defining the technical and cultural conception of urban districts.

The program of the forum included all-encompassing conferences and debates, and four simultaneous workshops. The conferences focused on the Reunion Island settlements diagnostic, on overseas examples of sustainable districts and on the local mobilization of stakeholders. The four workshops were about different topics:

- To complete the local diagnostic and identify the issues of the future districts
- Skills and methods to manage the urban program and urban design
- Opportunities and difficulties for the creation of the districts
- Coherence and ties with other public policies

During the forum and in the meeting which followed concerning the validation of its conclusions, local and national authorities, institutions and professionals decided together what necessary actions to take. They decided to create a *Referential* (reference resource), to define the technical and cultural conception of urban districts; their realization and the means through which stakeholders may become engaged towards ensuring the development of urban districts. Furthermore it was decided to

organize a call for projects into 2010, based on that *Referential*. This resulted in a shared partnership program to co-ordinate tasks as well as, promote and support urban development projects.

The planning strategy considers the geographical positioning of Reunion Island; located thousands of kilometres away from neighbouring states in the Indian Ocean and the European mainland. This island's isolation highlights the need for short distance supply and self-sufficiency. Furthermore, at the risk of seeing expanding shantytowns destroying an exceptional environment, the impending population growth necessitates the success of the planned development. The planning strategy promotes the democratic management of the urban developments. The strategy must guarantee the quality of a integrated urban conception of each project through financing the conception and co-ordinating professionals and their training.

Local debates have highlighted the significance of strategic decision-making in insuring the success of the sustainable city. It was emphasised that many technical studies were not co-ordinated, and that the complexity of technical project analyses could alienate politicians from strategic decision-making with regards to these urban development projects.



Fig. 4. Internet interface of the Program

The documents made for the program, the so-called *Referential*, were published in methodological manuals, technical manuals and announcements for the organization of partnerships. In addition it was published on-line, on a specific reference website which details the methodological and strategic conclusions of the forum [6]. The call for projects was initiated in Summer 2010. Thirteen communities replied and presented various projects concerning RISD.

The commitment of Reunion Island to sustainable urban development is now considered at a national scale. At the beginning of 2011, the French government opened the second national call for Eco-district projects (the first call occurred in 2008). In 2008 there was only one project candidate of an overseas territory, and it was on Reunion Island. This project is now recognised as being ineffectively sustainable. However local debates and methodologies developed on Reunion Island are now recognized as being exceptional. The lessons learned from the compilation of the *Referential* provided part of the bases for the technical definition of that second national call. Due to the local commitment, Reunion Island district projects are now eagerly anticipated.

5. The Production of the Program : Tools, Knowledge and Projects for Districts

5.1. Knowledge and understanding

Local investigations provided architects and urbanists on Reunion Island with useful technical and cultural information. Moreover, not only during the forum but also during the workshops which followed, debates highlighted a particular understanding regarding city growth. During discussions between representatives of the various decision makers and technicians it was evident that room for progress on the methodological field of governance of urban development was badly needed.

On Reunion Island, the quality of current urban development is criticised. That development is viewed as being unsustainable, in terms of renewal as well as urban sprawl. In general, these current urban developments consume land and resources and are plagued with social dysfunctions. Consequently, in spite of the willingness and conviction of the decision-makers in highlighting the need for sustainable development, the result is often disappointing. Reasons include the feeble political backing of the project, as well as the lack of technical studies. Unfortunately, when political decision-makers abandon original solutions for easier and cheaper options even the finest theoretical, design project is reduced to mediocre standards. However, even when politicians are courageous enough to support projects, often the lack of analytical research by urban designers will also cause an unsatisfactory outcome.

At this point, it seems necessary to clarify the progressions of an urban district project. The following schematic was produced and discussed, to indicate the strategic steps of the theoretical progress of a sustainable district project.

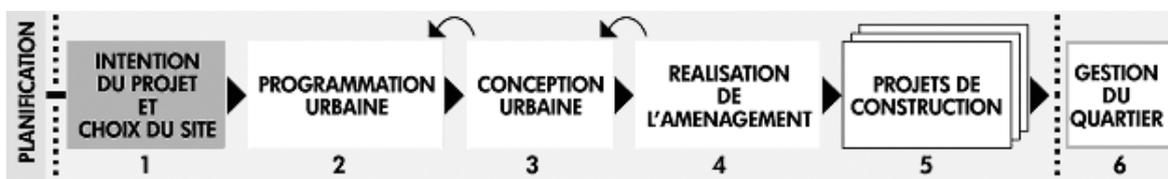


Fig. 5. Progression schematic of an urban district project

- 1- Intention and location: when the idea is ignited to develop something on a certain site
- 2- Program: Analytical research and decisions regarding the content. What is needed and would be benefitting from the development of that site?
- 3- Design: Spatial design in choosing a suitable application of the program at that site
- 4- Realization: Building work for the infrastructures and the transformation of the space
- 5- Building projects: several superstructure building projects complete the district
- 6- Administration: Once the district is inhabited

Analyses and debates surrounding the Reunion Island project identified a few short-circuit mechanisms. Significantly, each short-circuit lessened the interest both for political backing of the project and for the quality of technical studies.

The first short-circuit mechanism. A simple feasibility study replacing the entire project approach. It could occur when the municipality attempts to confirm that the idea of an urban development on a specific site (step 1) is technically possible. Especially evident within small communities, it consists only of a technical study of infrastructure development, a study that costs a

few thousand Euros. Unfortunately, feasibility is then demonstrated by an infrastructure plan. If the municipality then chooses to administer that plan directly (step 4), the studies and decisions regarding the program and a better design are cut off.

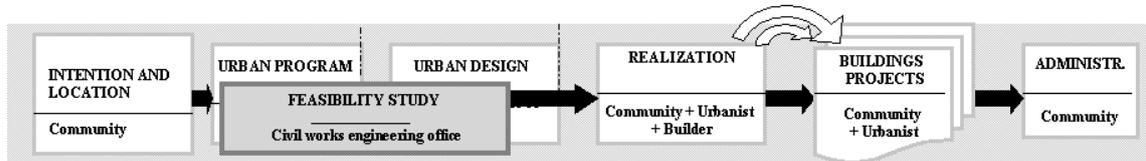


Fig. 6. Feasibility study replacing project approach

The second short-circuit. A premature delegation of the project to a building company. Urban development is impossible without infrastructure building activity (step 4) and public building companies, which are, accustomed to the realisation of these works. For most communities, such works could be technically and financially difficult to support. In the case of a delegation, the stakes for the municipality are to keep the control of the program and the urban design (steps 2 and step 3). On the downside it would be easier for both fractions to sub-delegate these tasks:

On the one hand the municipality trusts the building company, who are considered a professional and competent partner, and furthermore assist the municipality thus taking some responsibility. This may be viewed as positive as the builder attempts to head the project at an early stage in order to guarantee that he/she can easily effectuate it taking into consideration techniques and time-schedule.

However on the other hand, the natural tendency for building companies to lead projects can result in a redefinition of the project goals. This results in a biased outcome which hampers the urban design quality.

The compliance of the builder is the only chance that effective technical analyses be performed so that adapted or new solutions be researched and decided upon. Political support of the project is lessened once the builder is leading the project.

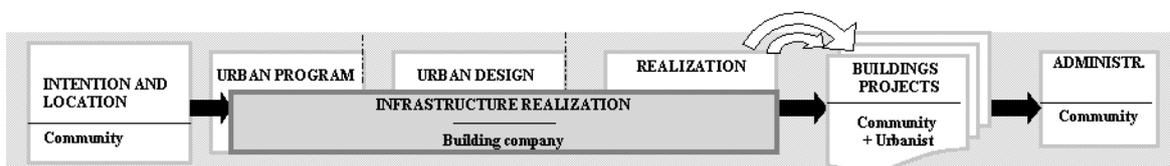


Fig. 7. Premature delegation intended for a building company

The third short-circuit. A program defined by the urban designer. It occurs when the municipality requests the project design (step 3) in spite of the lack of studies or confirmed decisions regarding the aims and project components. Furthermore it could occur when the municipality requests a professional to perform a technical study of the site and to outline the needs (step 2). In this case, the professional is not requested to include an urban design portfolio however this is often included, causing a disregard for the technical study. For both of these cases, the professional dictates spatial design of the project and its program. The functioning relationship between that program and the real needs and choices of the community is then entirely dependent on the willingness and honesty of the urban designer. In order to realize his own urban dreamed design he could easily misrepresent the technical studies to justify his project.

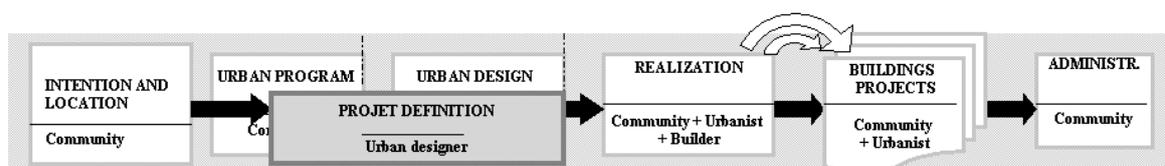


Fig. 8. The program defined by the urban designer

None of these cases introduces an exceptional scenario. The quality of the project and its sustainability often suffer the consequences of these progress dysfunctions of the urban district project. Consequently the *Referential* for the RISD is organised according to the schematic of the theoretical progression of a district project. The step 2 of the schematic progressions is identified key for the sustainability. Specific documents have been written to guarantee that stake.

5.2. Tools : www.quartiersdurables.re

The internet website (www.quartiersdurables.re) provides a succinct portal for all political, technical and administrative information of the program. In addition, advice for the creation of a successful sustainable district project on Reunion Island is provided. The website is essentially a guideline for both the governance of each project and the governance of the program.

5.2.1. A political and cultural description of the concept of Sustainable District

The concept of Reunion Island as a sustainable district arised from local forum debates and was announced and developed in a specific document which also provides a general definition. On renewal as well as extensions, these districts are intended to be attractive and affordable for all inhabitants and visitors alike. Housing, activities and public services are integrated and well connected. In addition, developments are planned to be economical, naturally cooled and cyclone resistant. Utilising local resources, human culture, solar energy and abundant rains, theses districts contribute to reduce Reunion Island's dependance on imports.

Each project should optimise performance according to the following six key points :

To mobilize a renewed governance. The wants of the community must pilot the project. The elected 'responsibles' must research and finance technical studies independantly. They must also decide the program and the district project design. Furthermore they're responsible for the communication of project consequences as wll as the organization of local democratic debates on the project.

To contribute to the coherence of the territory. The sustainable district is not alone on the island. It forms part of the territory and therefore contributes to its general well-being. Most importantly, it responds to local needs in terms of housing, activities, environment and infrastructure. Thus the perimeter of the project has to include parts of the pre-existing districts to succeed as an integrated project. Integrated projects determine that new buildings, streets and inhabitants correspond to the pre-existing town, however, old inhabitants are welcome in the new streets and could be beneficial to the new urban quality.

To be economical and to protect the environment. The sustainable district has to be welcoming for all the inhabitants without destroying the environment. The efficiency of the design together with functionality offers an economical lifestyle on a limited amount of land. Both household and environmental expenses are minimised.

To promote smart growth based on local resources. The sustainable district is not only a place to live but also a place to work, create and develop activities and cultural growth. The district is then considered as a complex infrastructure for that growth – combining services and investment capacity. Human resources are empowered by the living conditions. The district employs local, green energy production.

To set-up a healthy living environment. The sustainable district has to be a place where the living is safe and easy, where the standard of living is high and economical. Housing and transportation are affordable for all the inhabitants of the Island. The district is cyclone resistant and protected from epidemic diseases such as chikungunya.

To facilitate evolvments. The sustainable district is a place of social and economic growth with basic infrastructures. Moreover its spaces and buildings should adapt to that growth and evolvments. Houses should potentially change into offices, offices into shops and shops into houses. This capacity for autonomous development is proof of its sustainability.

5.2.2 A methodological and operational tool to promote the realization

The theoretical scheme of the progress of a district project forms the organisational bases for both the website and the relations between each project and the program. It determines the manner of the project presentation (dependant on its gradual progression) to the partners. It defines the technical and financial aids available which are dependant on the steps of progress (see below). Lastly, it organizes the technical, and qualitative evaluation.

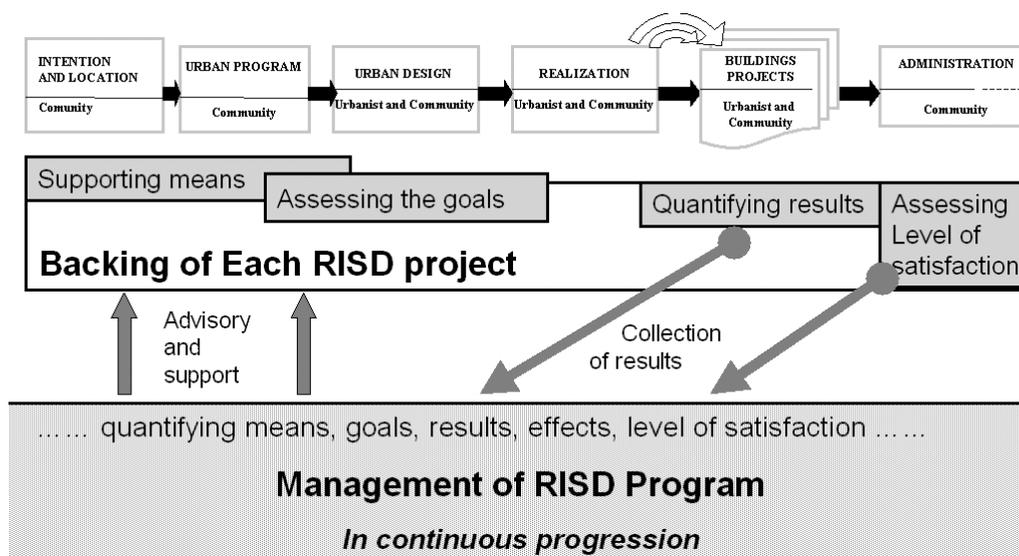


Fig. 101. From the “Bottom-up” and from the “Top-down” of the RISKD Program

Regular presentations at the technical college of the program consisting of direct and multidisciplinary discussions about the specific stakes of each project are key in the evaluation system.

Moreover it is suggested that a few indicators may aid in measuring the quality of the sustainable district project according to its progression. These limited indicators are strategic in nature. A local workshop to be organized in 2011 will define the evaluation system on the basis of the following list of indicators:

- Average of urban renewal
- Number of people who benefit the project: inhabitants, employees, users, ...
- Sense of communal belonging
- Urban density, population density
- Ecological footprint, GES production
- Cost of the standard of living, individual and communitarian costs,
- Average of local economic return
- Average of new employment compared to houses built
- Human development index
- Improvement in terms of Housing satisfaction, reduction of homeless
- Level of services in the neighbourhood
- Car dependency, annual distance ratios per inhabitant
- Cultural creativity, events
- Resilience to cyclone and natural disasters

- Adaptability for residential needs
- Building transformation dynamics, numbers of new settlements for activities
- Investments in the know how for project creation
- Quality of the public debates

A vast amount of data is available regarding spatial planning or building sectors. More or less interesting information is dependant on the relevancy to the scale of the project and the point of view. Consequently, the evaluation system of the RISD program uses caution when considering that information. It also considers that managing a district project is complex enough and evaluation systems mustn't burden the project manager.

The proposed indicators have to be relevant. Moreover they have to fit within the scale of the district project. They will contribute to the management of the program when advanced projects will produce the specific data of the Reunion island's experience of sustainable urban development. An example of that from the 'bottom-up' includes the collected information of land consumption of each project which will help in determining the level of the sustainable growth of the urban land at the scale of the island.

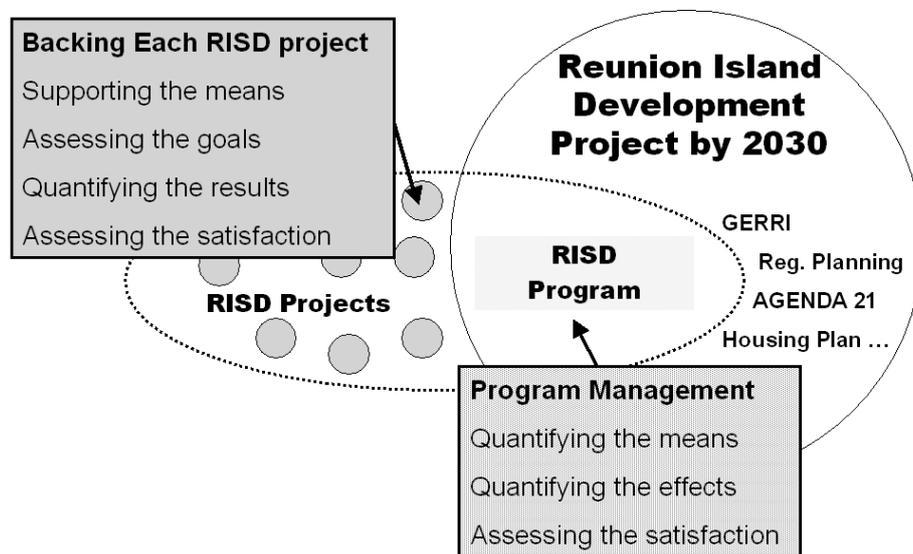


Fig. 102. The RISD Program is included in the Reunion Island Development Project

5.3. Current districts projects

Each sustainable district project is a singular rich and complex experience. In explaining all the interest and the intelligence behind such projects is a daunting task. This information is being collected for the program website which will make it available. The following paragraphs discuss and provide illustrations of four current projects.

La Saline district, Saint-Paul is a project which aims to re-organize a suburban town consisting of around a thousand houses and located in the mountain regions. The project foresees the building of 1200 new houses with a majority destined for social housing. It comprises the development of services, and new activities in accordance with pre-existing ones. The restoration of a waterway reducing the risk of flooding. A new spatial coherence consists of the waterway organized within a public open-space which connects local housing and services.

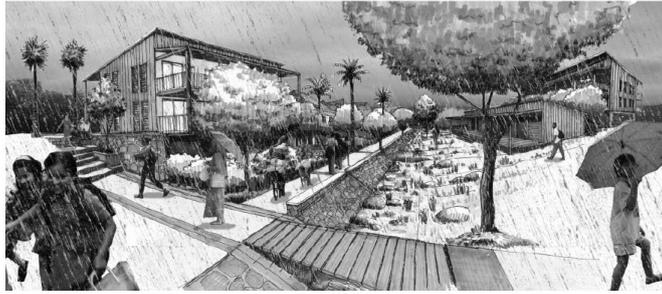


Fig. 202. Pedestrian area displaying the waterway (*La Saline* district)

Ravine Blanche district, Saint-Pierre is a pre-existing project defined since 2007 as a renewed operation for social districts. It is now recognized as a sustainable district project benefiting the quality of its environmental, social and spatial components. The renewal is characterised by a central park spread-out between the buildings which acts as an infiltration system; reducing the presence of polluted water in the lagoon. In addition, local economic development is created thereby empowering the inhabitants. The land-property structure is re-organized to restore small units and public streets adapted for the development of commerce and services.

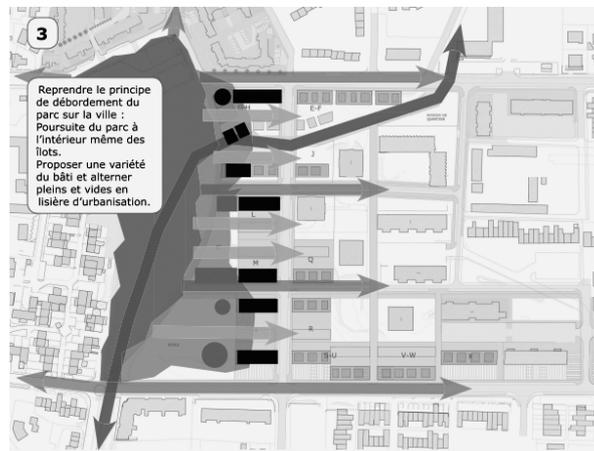


Fig. 201. Green park sprawl between the buildings (*Ravine Blanche* district)

La Creyssonnière district, Saint-André is a project, which aims to contribute to new spatial coherence of a district plagued by a highway, which runs through the city. This project consisting of 1000 houses will aim to connect neighbouring poverty-stricken districts, activity areas and agricultural fields. In response to social conditions and high unemployment, the municipality aims to define and encourage *self-eco-building* of houses in this district.

Ville et Port district, Le Port is a project concerned with building an urban waterfront in the town center. New opportunities are manifold around the former industrial harbour, as a new harbour built outside the city center is currently providing more opportunities. It is one of the last operations to complete the movement which began in 1971 converting shantytowns built up around industrial infrastructures into a liveable city. It illustrates the efficiency of a well-defined master plan with strong political backing. Spatial coherence is more a condition than a purpose. Moreover such a project deploys green technology at a city-wide scale with huge underground infiltration systems to guarantee the water resource and utilisation of compost systems in the fertilisation of soils.

6. Lessons Beyond Reunion Island Case

In a sense, the RISD experience may be a New Urbanism (NU) experience. The NU is founded on the “new theory of urban design” by Christopher Alexander [7]. That theory is much more concerned with the urban pattern and the *genius loci* [8]. The theoretical view of the Reunion Island policy reinforces the process of urban design as being the defining factor for its success. It is accentuated by the strategic phase of the *urban program* which is the political requirement for high quality design. Much concerned by the understanding of the site and the pre-existing pattern, this form of urbanism respects the *genius loci*.

In regenerating ancient urban patterns the Reunion Island urban development experience is greatly enriched. It inspires first the LONTAN district prototype. This prototype would be the Reunion Island’s neo-traditional model, conform to the Traditional Neighborhood Development (TND) prescribed by the NU [9]. However, LONTAN district is just one of the options suggested for the conception of sustainable districts. Further possible options with different and specific patterns are also suggested.

The Reunion Island experience is so removed from the NU theory; when considering that the political and conceptual process is the determining factor and the urban pattern is the result. It inquires as to the responsibilities of the urbanists, politicians and builders rather than searching solutions of urban patterns. In previous works [10], the author demonstrates that each pattern of urban history results from a specific context of influences on planners. On the specific subject of the urban sprawl [11], the urban pattern is intended to result from the defection of urbanists who neglected to take care of peripheral areas. Proposals for regenerated urbanism to succeed in building new urban district and renewing ones are very close to the principles of New Urbanism. But rather than regenerating ancient pattern, the ultimate goal is the New Spatial Coherence as highlighted by the French governmental Center for Strategic Analysis [12].

The experience gained from Reunion Island’s commitment to sustainable urban development, serves as a significant exemplar in terms of sustainable development methodology. We identify and introduce four general lessons concerning our methods for city development. A further lesson serves as a specific reflection of tropical islands.

First lesson. The Reunion Island case clearly illustrates that *sustainable development* firstly means *local development*. Moreover, every architect knows that each building project has to be adapted towards local characteristics. Primary considerations begin with decisions regarding foundation technology, which is dependant on soil characteristics. However, each urban development project is also influenced by climate, geography as well as social and cultural context. The concept of a *Sustainable District* must correspond with a local and current reality.

Second lesson. Sustainable urban development needs clarification rather than conviction. It has become clear that interest is invested in sustainable development and the health of the environment. However, the manner in which the cities are growing is still unsatisfying. The debates concerning Reunion Island highlighted the perverse mechanisms of corruption in urban development progress. Natural inclinations of both the professionals and the politicians tend to deprive the project of responsibility. To clarify and to guarantee these responsibilities is essential for a sustainable urban development. The former mayor of Curitiba, Brasil, Jaime Lerner used to say that the professional and the politician are both co-responsible for the success or the failure of the development project [13]. Professionals heading the technical management of the urban district projects should clarify these responsibilities.

Third lesson. A Sustainable district project first needs economical and efficient intellectual investment. On the one hand funds are drastically limited for pre-operational, generalised studies

regarding an urban development project, whilst on the other hand plenty of data and technical analysis is available. For these reasons, many projects suffer from the confusion created by too many technical studies which don't provide solutions. The *urban program* study, a general and contractual document aims to clarify and guarantee the choices of the municipality with regards to all technical and political reflections. The challenge is to conduct such a study with efficiency, as French municipalities don't have much budget to pay for these studies, this scenario is specifically evident in the case of small cities. Fortunately, but only on overseas territory French state administration could engage specific funds to pay for that pre-operational study.

Fourth lesson. The evaluation of a Sustainable District project needs to include the ordering of the technical data regarding urbanism and spatial planning. In terms of spatial planning, ecological and sustainable development engineering produced plenty of data and tools for evaluation. The French Council of Architects identified and compared yet in 2006 around twenty evaluation tools for sustainable building [14]. To give an example amongst them the Canadian *Green Building Challenge* and the Japanese *CASBEE* demand respectively 229 and 80 information to evaluate a project. Critic and unbearable situation now happened in France by employing such sophisticated tools: when the quality controller has much time to work and is much paid for the evaluation of the project than the urban planner for the conception of the project! To aid efficiency, the management of the urban development project and the management of the spatial planning must choose, share and order data and evaluation tools. The amount interest the data generates is determined, on various levels, corresponding to key, decision-making factors: *the building* with its individual owner, *the district* managed by the municipality and the builder, *the city* administrated by the spatial planning team under the responsibility of the municipality, *the territory* administrated by the spatial planning team and lastly *the world* with its growing, globalised governance. To give an example a district project can successfully organise local access to services but it cannot control the effects of global warming or the strain of an unemployment crisis of a country. Expecting urban development to respond to all the goals of a sustainable development is counterproductive.

Fifth lesson, about the specific case of the French tropical islands. Are other French tropical islands ready for such sustainable urban development? A comparative study with the archipelago of Mayotte in the channel of Mozambique and that of French Polynesia in the Pacific Ocean may provide some clues. All three are developing and insular, and the need to experiment with sustainability is stronger in these territories than in the French mainland. Due to increasing petrol costs and consequent transportation costs, overseas trade supplying the islands with resources and provisions, is threatening islands economy.

However, the following table highlights determining differences between the island contexts. It appears that the Reunion Island experience couldn't be easily replicated. Some doubts remain due to differences in cultural modifications, the aspiration for modernity and the autonomy of economic sectors.

Determinants for sustainable urban development:	Reunion Island - 2,500 sq km - 800,000 inhabitants - 9,200km from mainland - 250km from Mauritius	Tahiti (French Polynesia) - 1,042 sq km - 178,000 inhabitants - 18,000km from mainland - 6,000km from Australia	Mayotte Island - 375 sq km - 200,000 inhabitants - 8,000km from mainland - 300km from Madagascar
Aspiration for modernity , popular meaning of sustainable development references	Mature, as the territory is well equipped by 30 years of investments. Sustainable development contribute to a sense of modernity	Insular accommodation. Modern infrastructure such as the new hospital	A developing territory with infrastructure deficiency. Aspiration for basic modernity (concrete structure for houses)
Environmental concern in the society	Very strong and popular	Environmental protection as a tourism resource	Predominance for the need of infrastructure and building
Autonomy , and optimisation of local resources	Energy self-sufficiency is a political goal by 2030	Experience of local incentive policy for energy saving	A territory still strongly developing, with less will for independency except for the crucial stake of water supply
Professional sector , production of local technical references and skills development	Mature and mobilized with local experiments of sustainable districts (university, builders, architects, urbanists, engineering offices,...)	Lack of examples of green tech buildings	One builder used to produce for the public sector. A few architects more concerned by housing scales
Spatial planning , coordination between spatial planning and operational projects	Mature. Municipalities are accustomed to managing spatial planning	Municipalities are administrated by a master plan (PGA) which is technically administered by the island government	Municipalities master plans (PLU) were introduced in 2010 and are still widely under State control
Public management on local development	Both private sector and public sector invest and contribute to urban development projects	Private sector investments aid development. The public sectors is following more than leading with regards to basic spatial planning	French State head the development and municipalities have less control in managing urban development projects
Political debates and importance of the topic of the Sustainable Development	Sustainable Development is a main topic	The topic is dominated by the institutional instability	Sustainable Development is a secondary topic, behind the emergencies of the housing carrence, the economy and the institutional evolution

Table 2. Three French tropical islands facing the sustainable urban development challenge

The above comparison should be considered as a draft of the determining factors which relay information about each island.

6. Conclusion

A further lesson gained from the Reunion Island sustainable development experience is that the aspect of insulation is a strategic opportunity for governance, in a sense that it could be easier to gather all stakeholders concerned with the development since space is limited and people are more available. A specific dynamism is possible on islands, and the evolvments could be very rapid. For example, Mayotte Island will become a French administrative Region by 2011 and will soon be connected to high speed internet through a new sub-ocean wire. Such institutional and technical changes will create fast-paced possibilities and opportunities. Consequently the professional sector which is currently isolated due to geographic position and basic technology regarding communication will improve rapidly.

For these reasons, although the replication today of the RISD experiment on other islands is considered to be unsuitable, it remains a significant exemplar in terms of experience and methodology. It could alight the potential of the readiness of an island to commit to sustainable urban development and the means needed in the engagement of such a policy.

Moreover the general lessons concerning our methods for city development could be helpful for urban development projects in France and abroad. As much as the spatial coherence is essential for the quality of the urban development, it is essential that firstly the coherence of the technical governance of the project be ensured. This means creating a specific solution rather than applying ready-made, generalised ones (lesson 1), ensuring the transparency of the decision-making process and its funding (lesson 2) on the basis of a unique and strategic thought process (lesson3) rather than creating confusion regarding responsibilities and technical information (lesson 4).

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