

REPORT P2

DECENTRALIZE WHAT HAS BEEN CENTRALIZED

Recover the Bogotá River water structure and basin by restructuring the territory around through a new model of governance

Angela María Moncaleano Novoa
#4420500

Department of Urbanism
Faculty of Architecture
TU Delft

Mentors:

Lidewij Tummers (first mentor)

Nico Tillie (second mentor)



Table of Contents

Section 1:

- a. Actual Situation
 - How?
 - Where?
 - Why?
 - Problem Statement
 - Reality
- b. What can be done?
 - Methodology

Section 2:

- a. Hypothesis
- b. Problem Field
 - Geography
 - Water Structure
 - Administrative National Division = Departments
 - Department - Cundinamarca
 - Incomes / production / qualities in the Bogotá River Basin
 - Bogotá River Basin
 - Population

Section 3:

- a. Dynamic
- b. Research Question
- c. Specific Research Questions
- d. Strategy

Section 4:

- a. Flows
 - Philosophy
 - Food
 - Waste
 - Energy
 - Key elements
 - Interventions
 - Referents
- b. Examples
- c. Vision

Section 5:

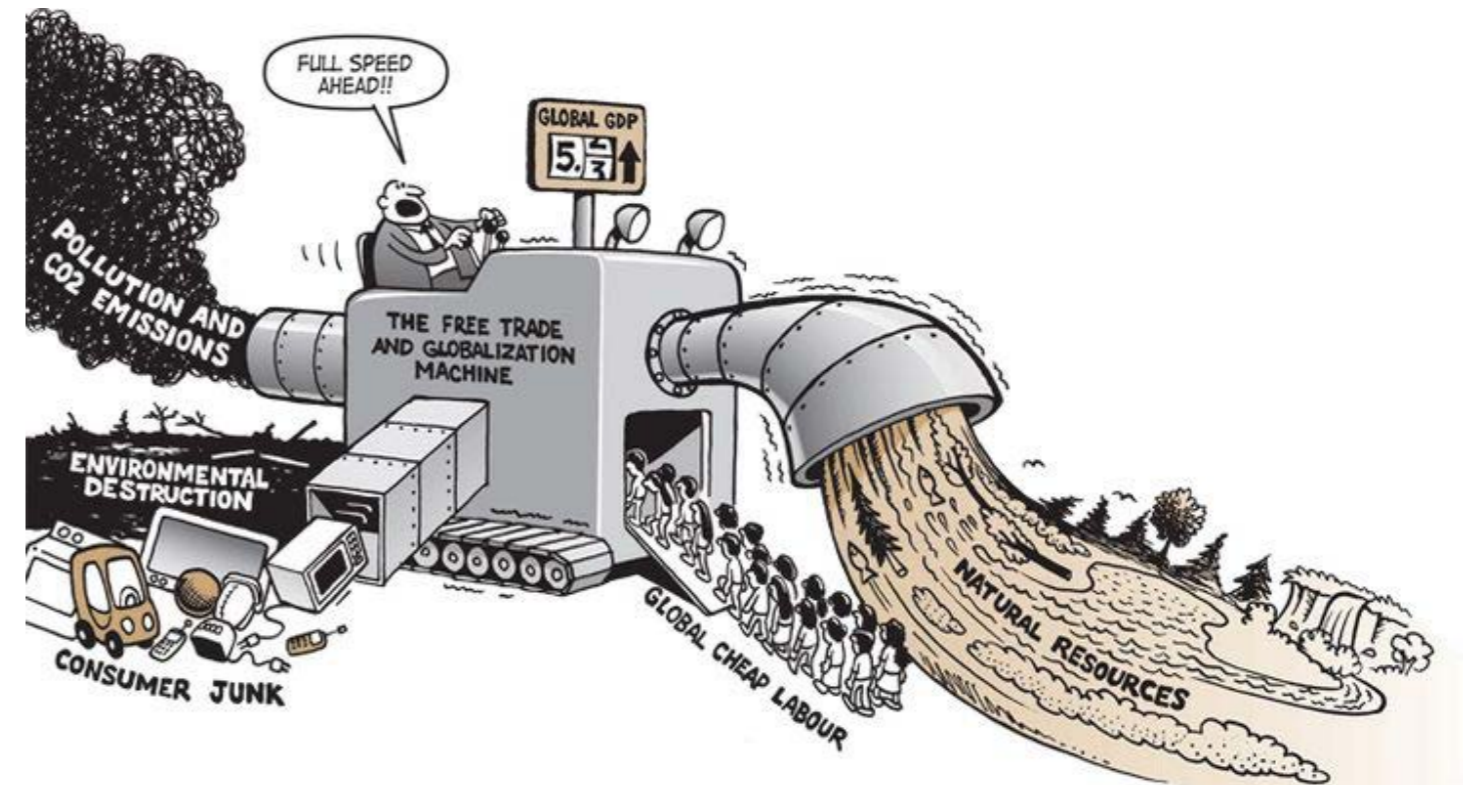
- a. Social and scientific relevance - Motivation
- b. Ethical Paragraph
- c. Research Approach - Theory paper

Section 6:

- a. Time - working Schedule
- b. Literature
- c. References

Section 1

There is a problem ...



<https://www.pinterest.com/ateamb/globalisation-and-the-environment/>

The Bogotá River in Cundinamarca, Colombia, has had for some a forgotten and for others an unknown story through the years. In the 20th century the wood was extracted from the forests for energy input and in the 21st century the water is the protagonist of the hydroelectric power plants. The food is produced and the drinking water comes from the longest fertile and varied river basin in the region. The natural structure became relevant in the past centuries given to the constant use of the resources that are provided for human activities. Although, it was only matter of time, to realize that the renewable resources are any longer renewable. And that the consequences arisen over the water and the soil bring dramatic impacts for the population and the environment.

The picture above illustrates the irony in which human activities need more raw materials and consume the natural resources to produce additional outcomes that should supply the demands over the population growth. It is the perfect case in point in my personal opinion that exemplify in one image the enormous problem that Colombia is struggling with, not only in the Bogotá River basin but in many other river basins along the country.

How is it happening? Well the crisis present in the deterioration of the natural system structure occurs together with three significant and rising issues: contamination, sewages and waste amounts. These three matters bring vast concern in the future and durable life and stability of the natural resources.

The contamination is generated by several productive activities that bring economic inputs to the region. The sewages come principally from housing and industrial areas; and finally the waste amounts are a giangantic situation that is overhanging health and ecological presence in the river basin.

It is a fact, that the highest productive areas in the country host the highest amount of population; and these fertile areas have substantial environmental threats. Which is why is really important to create more sustainable environments.

What I want to tackle in the project and I will talk about along the process is the necessity of an improved model of governance that can accomplish the requirements for future developments but in balance and in a sustainable

How? It is divided in ...



Contamination



<http://images.etiempo.digital/contenido/bogota/IMAGEN/IMAGEN-14057275-2.jpg>

Sewage



<http://sostenibilidad.semana.com/medio-ambiente/articulo/rio-bogota-contaminacion-tregua/32929>

Waste amounts



<http://paularomeroe.blogspot.es/tags/rio-bogota/>

system structure with the environment contained in the area. For this reason, the main goal of the project is to generate a sustainable (liveable and renewable) system between water + soil + human activities along the Bogotá River and basin.

Where?



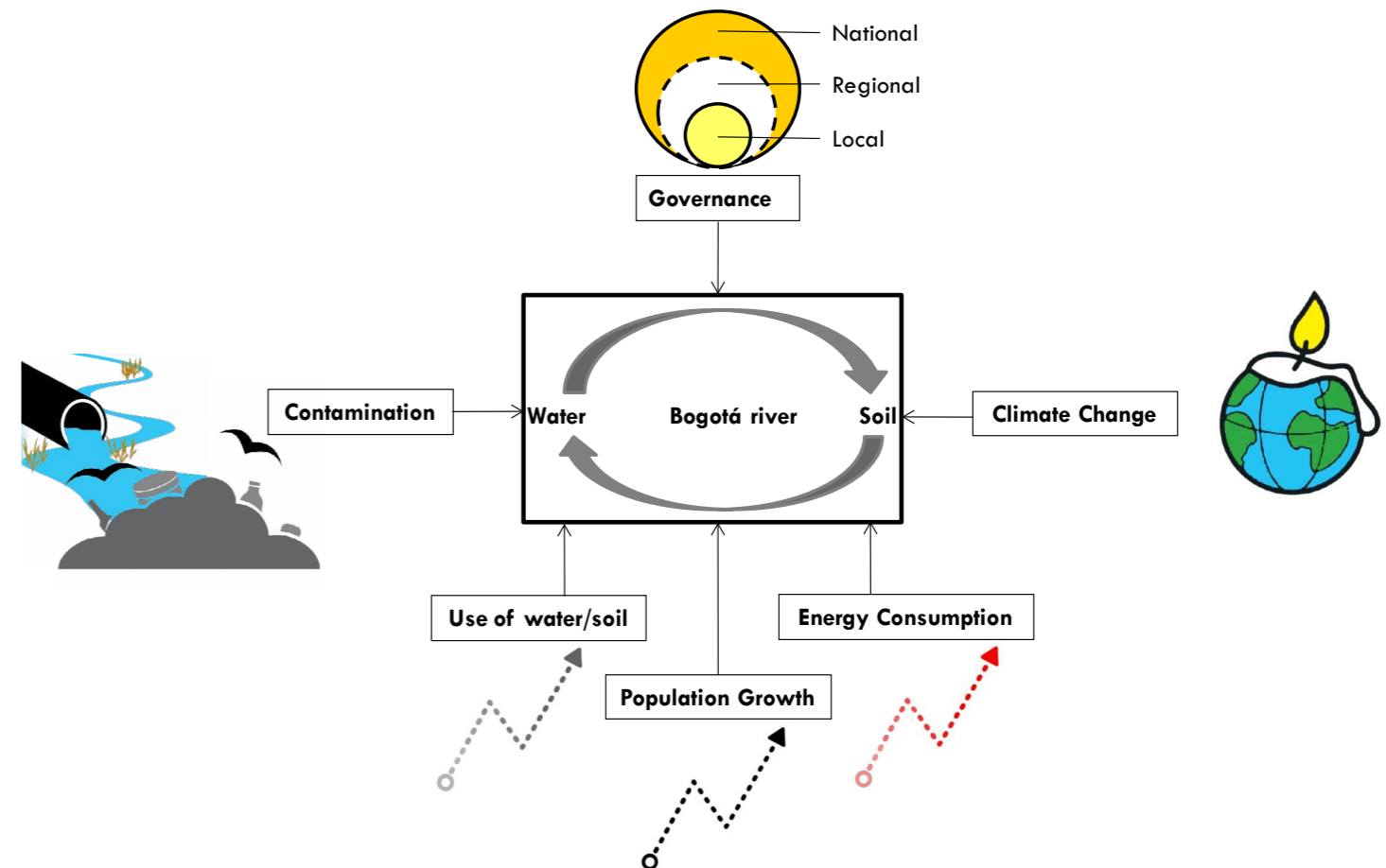
Cundinamarca
Bogotá



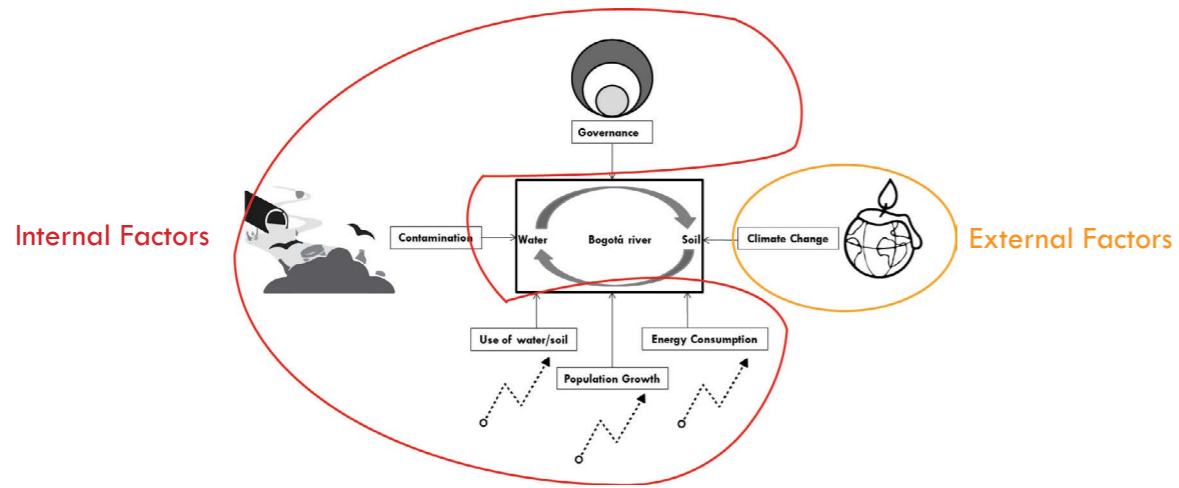
In the research, the Bogotá River and basin will be the principal area analyzed in the project. It is located in Colombia in the department (called region as well) of Cundinamarca where the capital city Bogotá is located too.

Why the Bogotá River basin is been pushed to an environmental weak threat? The answer is provided in six differ-

Why?



What can be done?



ent factors that include external and internal factors. The cause that influence the damage of the river basin is the external factor climate change; where we can't do anything about it. On the other hand, the problem produced by the behaviour of the population and the model of governance in the region are the other internal factors which involve contamination and use of the resources.

Problem Statement

The resulting product of the difficulties mention before, bring the following conclusion:

The Bogotá river length has an extension of about 380km; its basin surface has around 6.000km² and passes through **different administrative boundaries**: 45 municipalities and the city of Bogotá. It is used as an **articulator between urban and rural areas**; and is the **main water source** of the Sabana de Bogotá.

However, there are **three principal factors that threaten the environmental system** of the river and its basin: contamination, urban development, which causes urbanization as well, and rural activities such as agriculture and cattle.

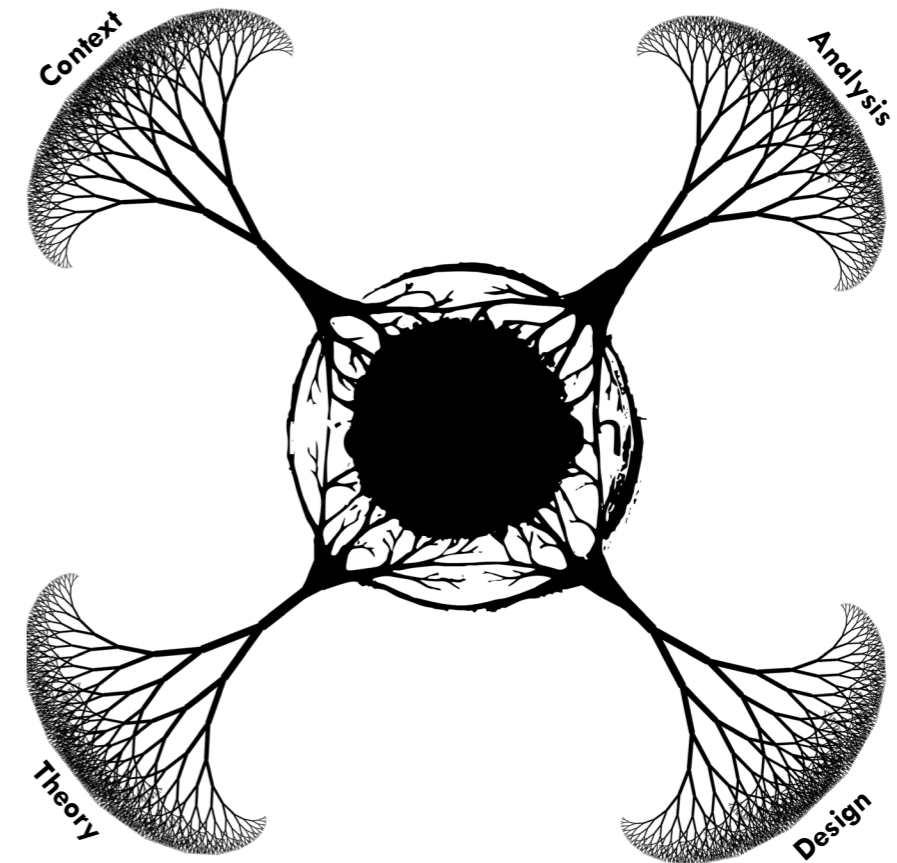
The **absence of a regional law**, the **constant lose of ecological biodiversity** given to the consequences over the water and the soil, and finally the **permanent pollution** received through discharges of tanneries, sewages and industry has provoked environment **degradation** over the river and the basin.

Reality

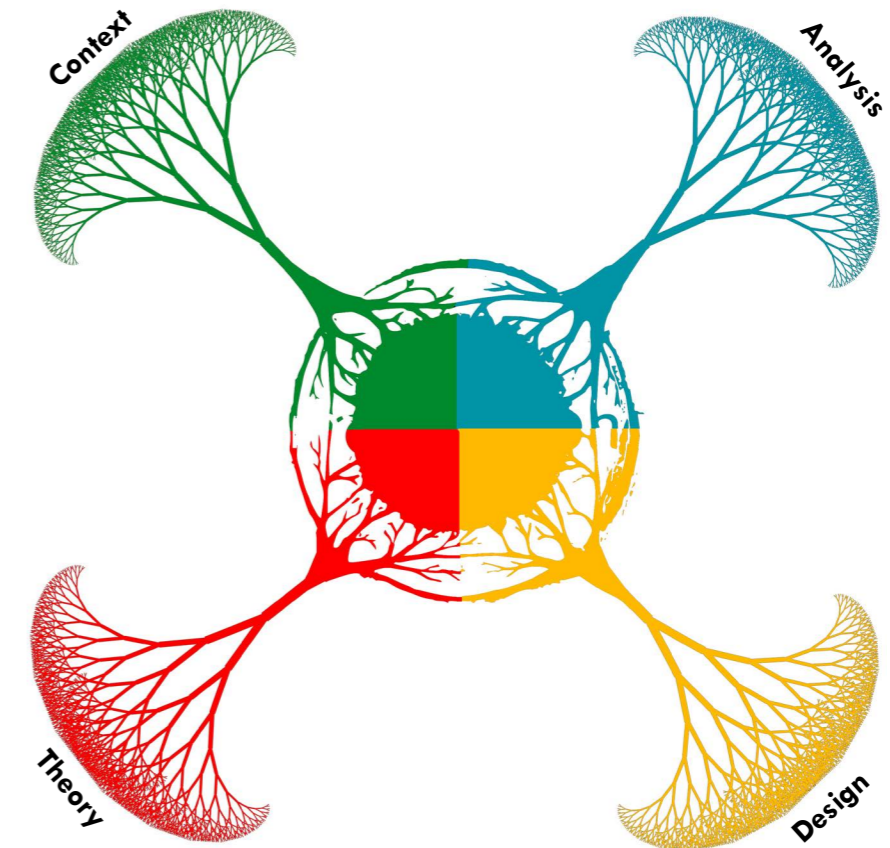
This is:

- Damaging the river
- Destabilizing the environment
- Weakening the structure of the region

If we don't stop this is going to be the consequence



The **methodology** of the project is divided in four branches: theory, context, analysis and design. These branches are going to work together along each other to develop a balanced proposal in the middle, in which it not only involves the Colombian context but also it takes into account the applied concepts and theories in other referents analyzed before which could be relevant for the intervention. The four branches are identified with different colors to highlight every theme included in each one. They are explained below:



Theory: Decentralization Rural and urban boundaries

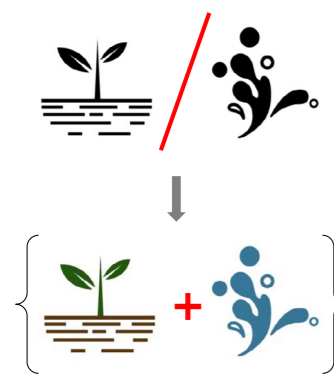
"Many have argued that a **key ingredient** in **improving the quality of urban governance** is decentralization and this has clearly been a major ingredient in many development strategies since the 1980s."

(Gilbert, 2015; Campbell, 2003; Tandler, 1997; UN-Habitat, 2009; World Bank, 1992).

Decentralization may lead to more **creative, innovative and responsive programs** by allowing local "experimentation." It can also increase **political stability and national unity** by allowing citizens to better control public programs at the local level.

(World Bank; 2001). <http://www1.worldbank.org/publicsector/decentralization/what.htm>

Context: Location Problem Statement Hypothesis
Relevance Research Question



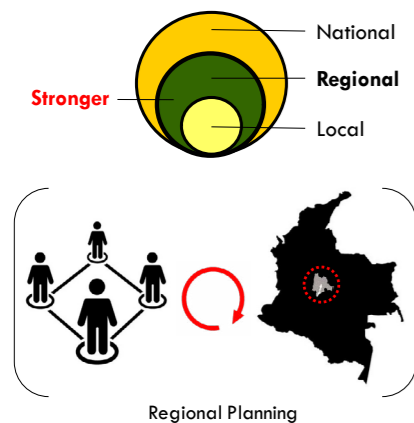
The **context** will not only involve knowledge about the location but also about the natural system structure (hydrological cycle). This is going to reinforce and highlight the importance of the elements such as water and soil contained in the ecology of the place and the future use of these resources. The **analysis** has the goal and objectives defined to achieve

Analysis: Mapping SWOT Scenarios
Vision Strategy Conclusion

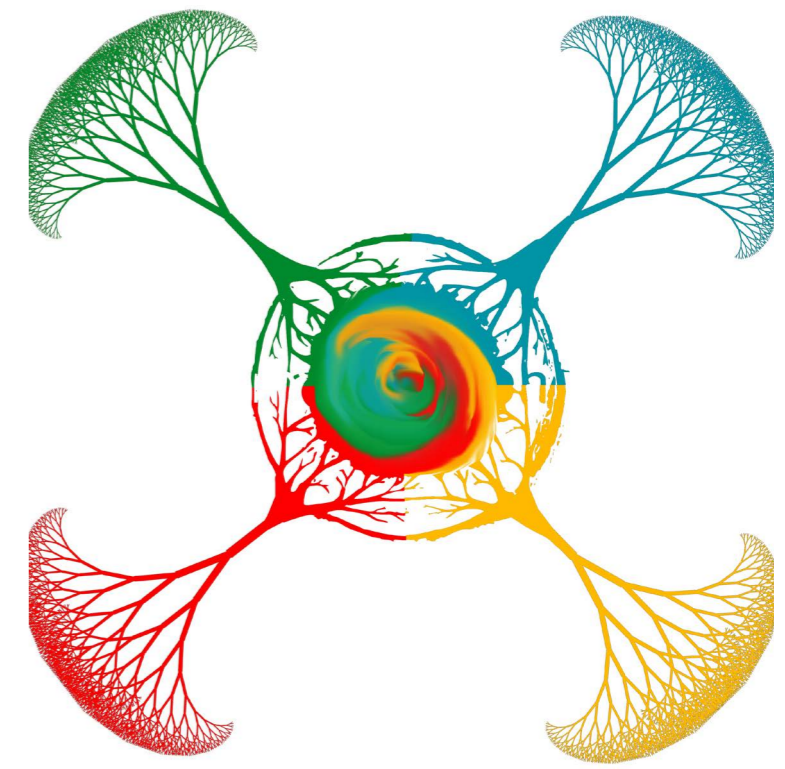
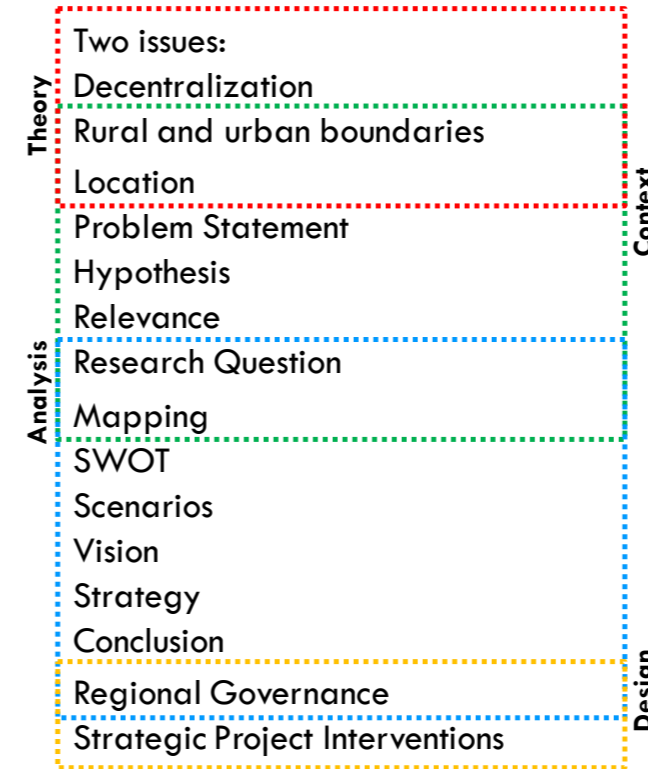
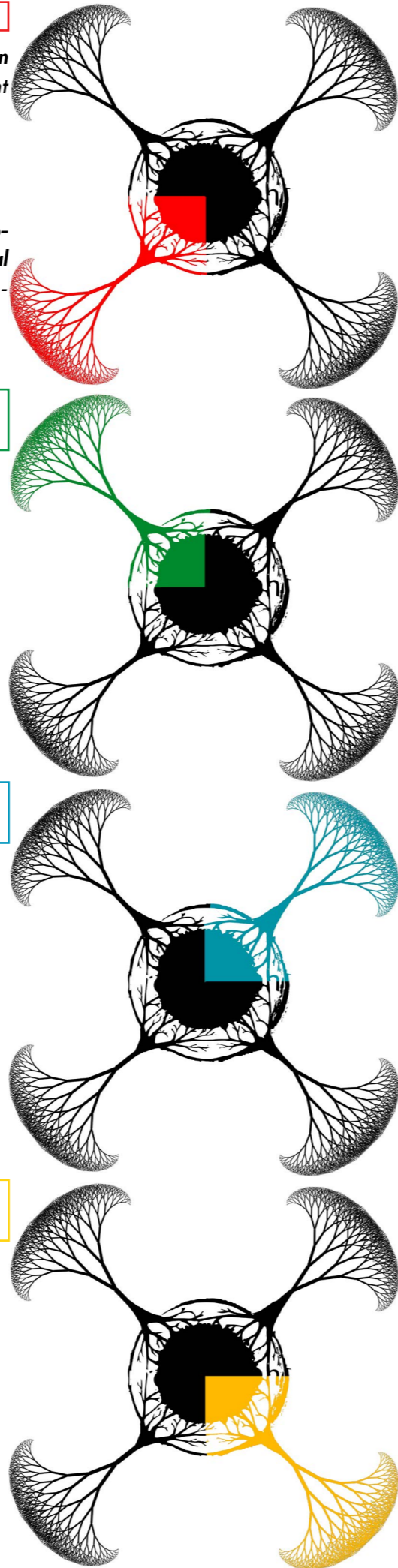
Goal:
1. Recover the environmental structure of the river.

- Objectives:**
1. Higher quality of water and soil for food production and generation of electricity.
 2. Have sufficient land for agriculture and cattle to supply food demands.
 3. Have sufficient land for urban development without damaging the river system.
 4. Adequate areas for waste management.

Design: Regional Governance model
Strategic Project Interventions



in the further development of the project. Finally, the **design** is going to produce through a new model of governance and the implementation of **decentralization** strategies along the river basin for the improvement and protection of the natural system structure. A innovative way of governance that is going to attract a variety of stakeholders that would want to get involved.



The overlapping of these four branches consequently, makes it possible to go from one theme to another taking into account its connections and backgrounds with one another. The result in the end will create the fusion of the four bases established into an innovative model of governance applied through different strategic interventions that share the same concept: decentralization. This is going to upgrade some economic activities in the region in balance with the natural system structure for a sustainable system between water, soil and human activities.

Section 2

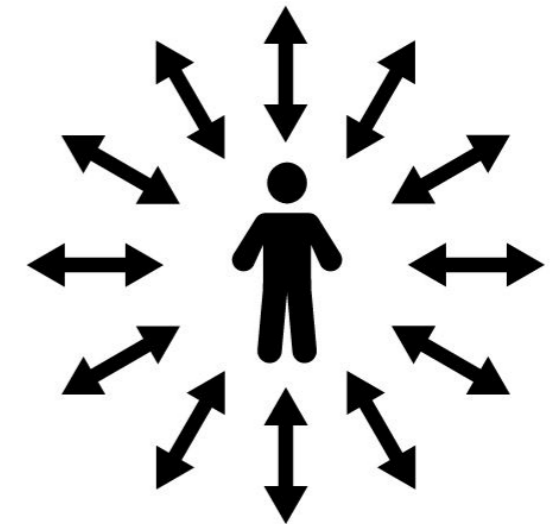
Hypothesis

The interest in the river which involves as principal elements water and soil with the human activities and their interactions caught my attention given that in my personal opinion the physical factors in this specific case have urgent priority and are of higher relevance for the population over the economic factors. They have more influence on the daily life needs rather than the economic structure.

There are two ways or options for human activities to interact inside the natural system structure:

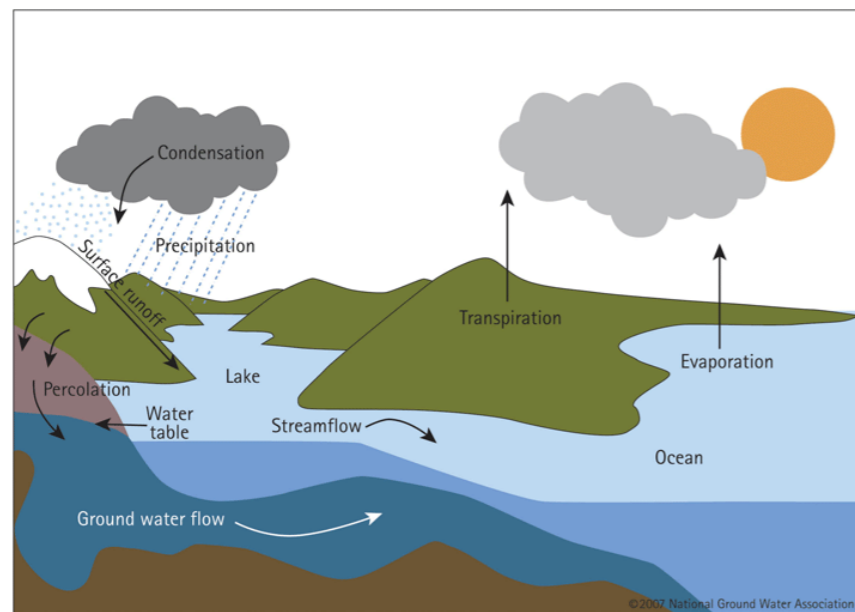


Irresponsible Consumption



Responsible Consumption Sustainable system

The actual situation is the one represented in the model of the left, although the ideal model is to have the one in the right. For this reason, the research started with the analysis of the natural system structure where the Hydrological Cycle takes place and is relevant for the analysis and research. Although the interactions in the natural system are not rigid, in the sense that when it comes to the Hydrological Cycle the interactions create different associations and incorporates a variety of exchange processes. It is shown how it actually occurs in the following scheme:

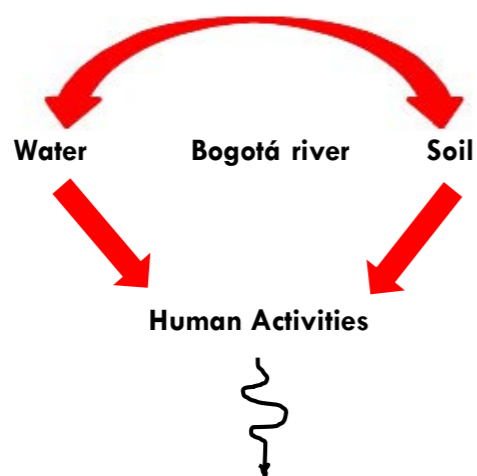


http://www.ngwa.org/fundamentals/use/pages/groundwater-facts.aspx

By means of the illustrations given before the natural system has the following system structure with the principal two elements mention along the project water and soil:



The constant interaction between them. Although a conflict exists when human activities become part of the system. Where they use natural resources without renovation, reuse or recycle of them. This interacting cycle is not helping because is not a sustainable system structure.



This is how the model has been working generating different kinds of problematic issues. Principally it has been influenced by human developments which include contamination, climate change, governance, food demands and energy generation.

Then the hypothesis and ideal model for the future condition of the river is shown in the next image:



This is the system in which it should work and is useful for the present and future conditions. It is a model in which water, soil and human activities interact with each other but also work together in a sustainable way: social, economic and environmental sustainability. It would be a self regenerating system that fulfils needs of the future increasing population in the region.

Problem Field

The context of the territory in which the study area is located is shown below. The Colombian territory covers **1.7%** of the global surface, which hosts **14%** of the global biological heritage. It also has more than three hundred ecosystems in its characteristic geography.



By the other hand, the water structure of the country is large and bio diverse which is one of the most important qualities. It shelters the variety of ecosystems around the territory. It is important to understand the natural structure of the country because few has been done to coexist with it in a sustainable manner.



Caño Cristales River

3



Amazon River

4



Magdalena River

5



River born

6



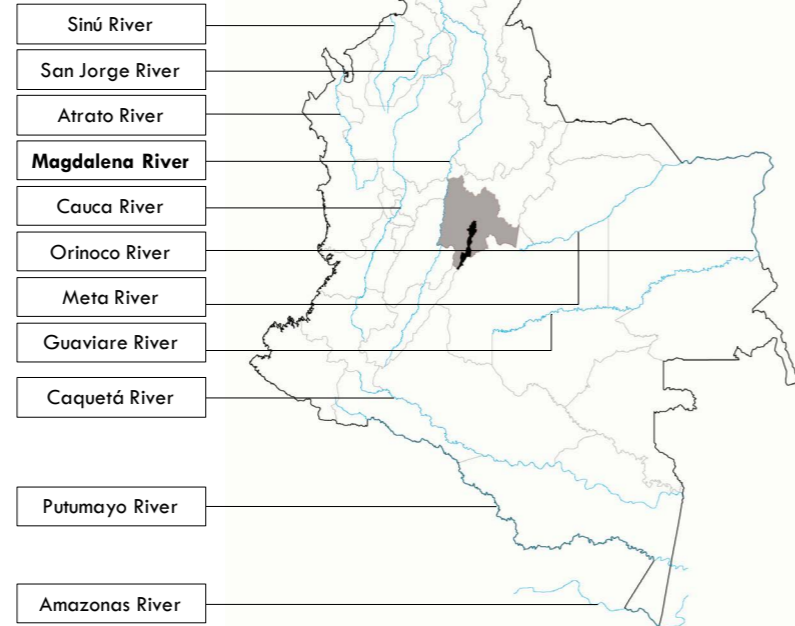
River basin

7



Change of topography

8

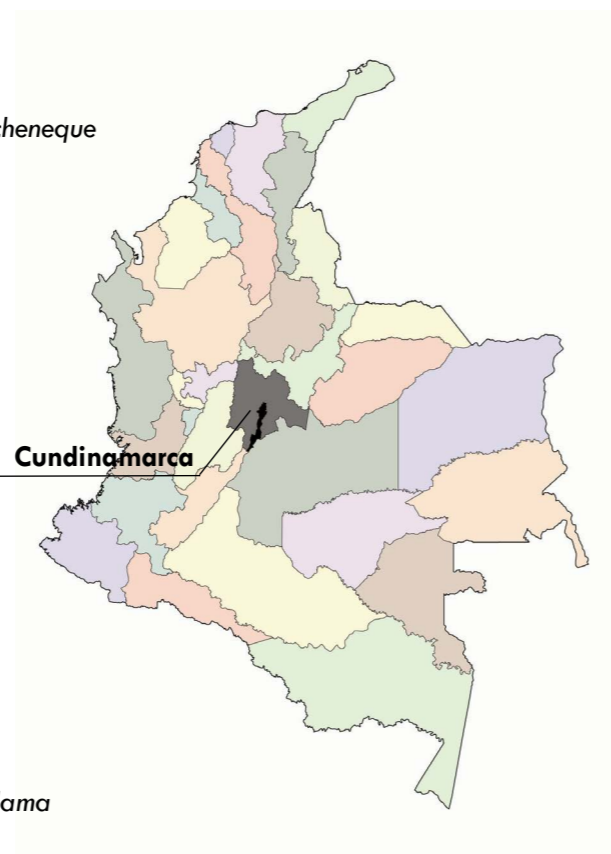


Páramo de Guacheneque

Landscape

Crops

Salto del Tequendama

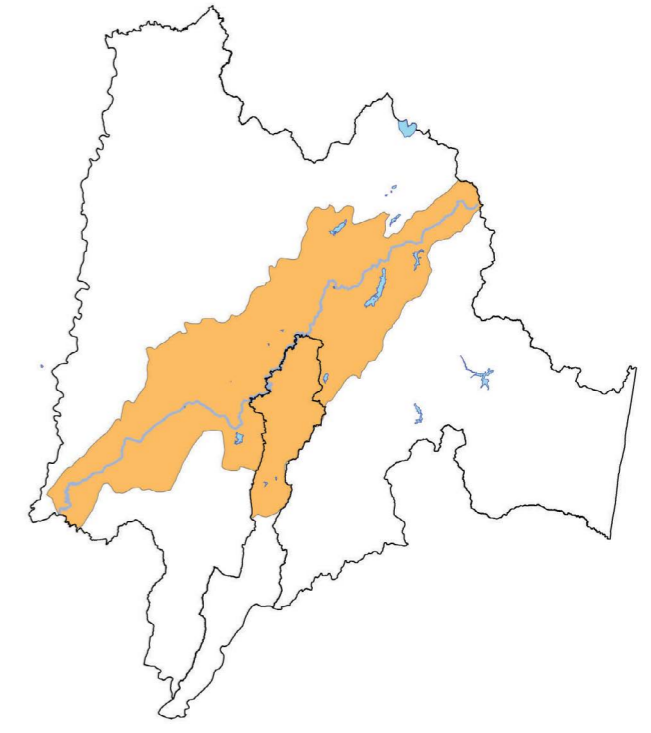
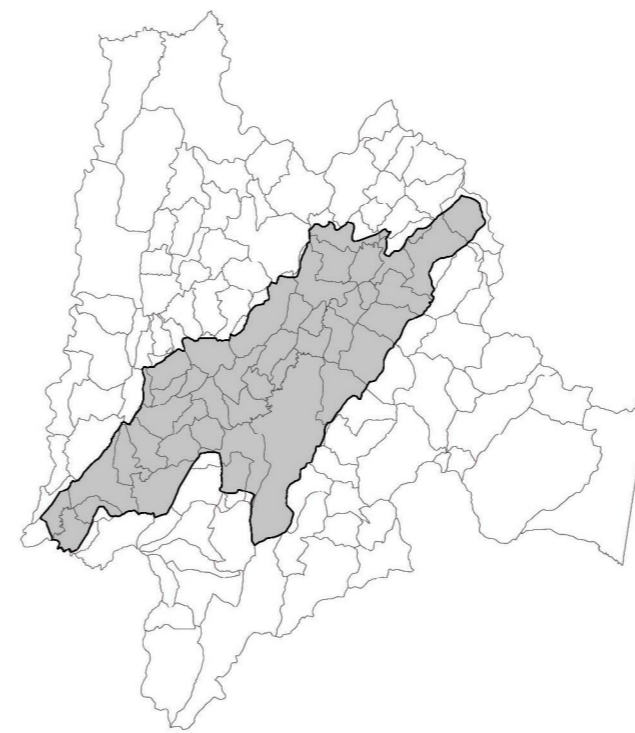
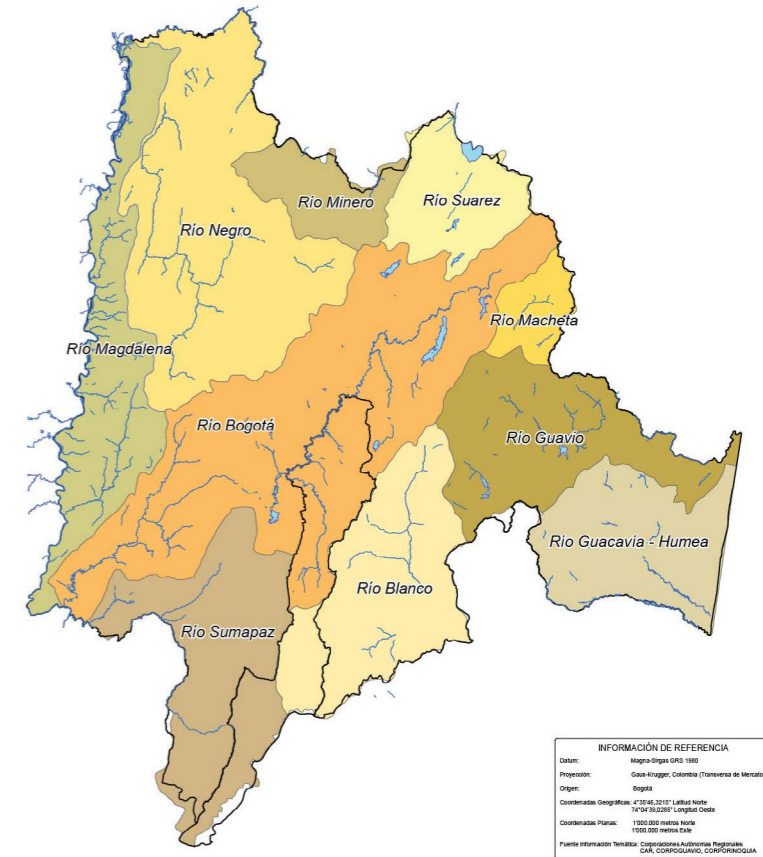


Cundinamarca

The images aside show the water and soil landscape structures in the country. The department, called region as well, Cundinamarca is located in the most populated and economically productive region in the country called Andina region; it has **116 municipalities**.

The Bogotá River provides considerable input to the productivity and economy of the region and the country. In the west border of Cundinamarca, the Magdalena River becomes part of the Andina Region sharing the ecosystems involved in it. In this context, the Magdalena River is relevant given that the Bogotá River in the end of its riverbed flows into and contaminates it.

This is the River Basins Administrative Division:



Given by administrative boundaries of the different municipalities in the department and also topographic and geographic features.

The Bogotá River basin is the orange area. It has **46 municipalities** which correspond to **1/3 of the department**.

The Basin has an area approximately of around 590,000 Ha. Which is **33% of territory**.



Flower fields



Livestock



Natural Resources



Agriculture



13

Some of the principal qualities of the region are shown in the next pictures. Flower fields, livestock and agriculture are the activities with the main incomes in the GDP. Then the rich natural resources that are present show the majestic landscape of the surroundings.

All these values together shape the prosperous and abundant river basin that the country has.

The largest areas in the river basin are covered with nature; passing from lakes to mountains and forests. Then agriculture and livestock, fulfill most of the river basin as well followed by the flower fields.

In terms of numbers, the structure of the population has the following dimension:

Population Department: **10.600.000 people** approx.

Bogotá: **7.800.000 people** approx.

115 municipalities: **2.800.000 people** approx.

Then, in the river basin the proportions are the following:

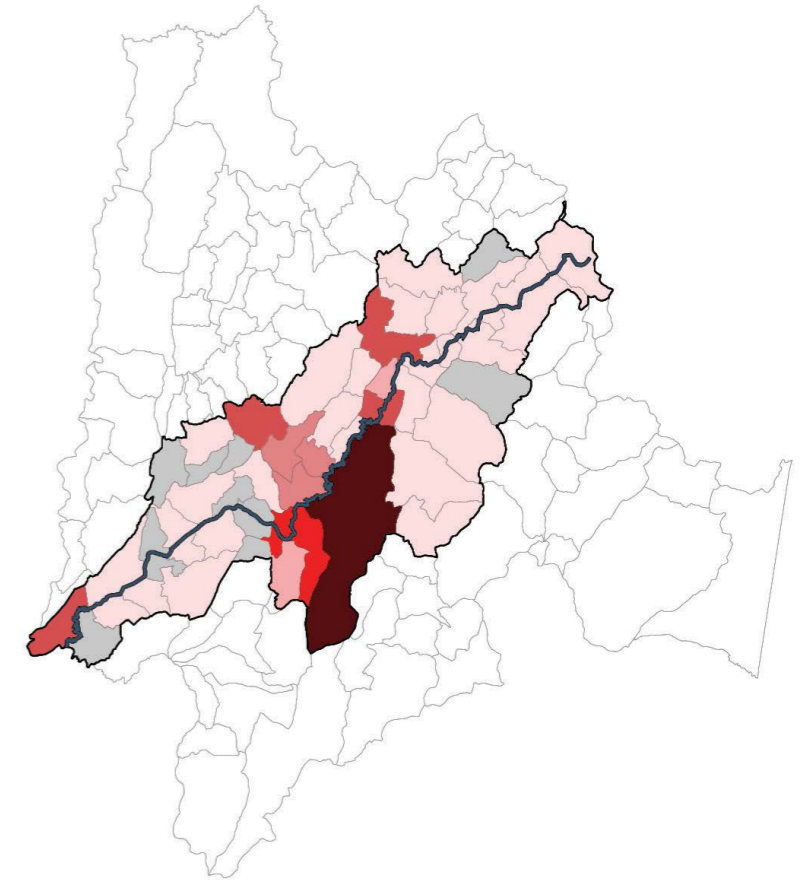
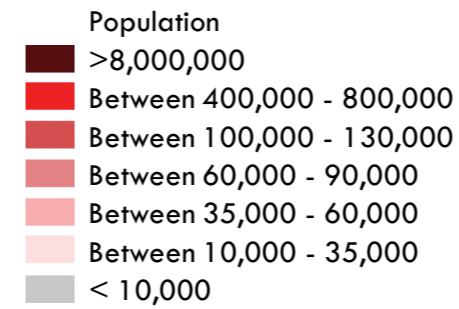
Population Bogotá River Basin:
9.650.000 people = 92% of the department

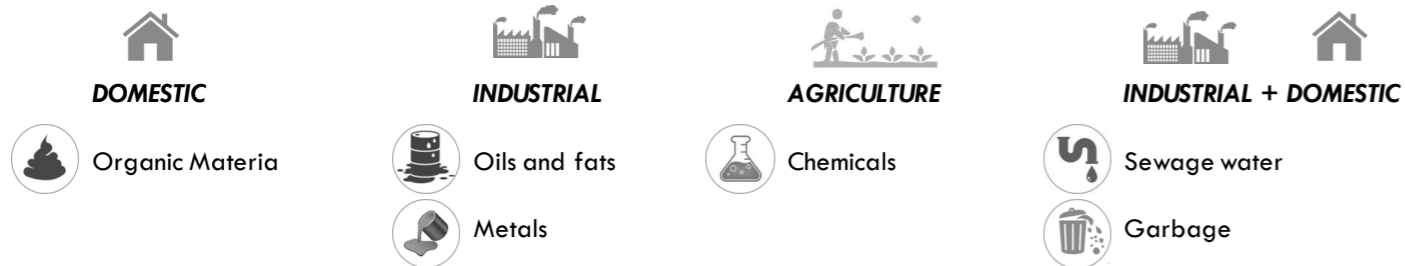
Bogotá: **7.800.000 people** approx.

45 municipalities: **1.850.000 people** approx.

The majority of the cases, the most populated and developed urban areas settled closer to the water structure are the ones that contaminate the river the most. In other words, the amount of people mention before that live in the river basin are not the only ones that contaminate the area. The river receives waste from about 9,410,000 inhabitants. This includes Bogotá (capital city) and the surrounding municipalities of the Bogotá River basin.

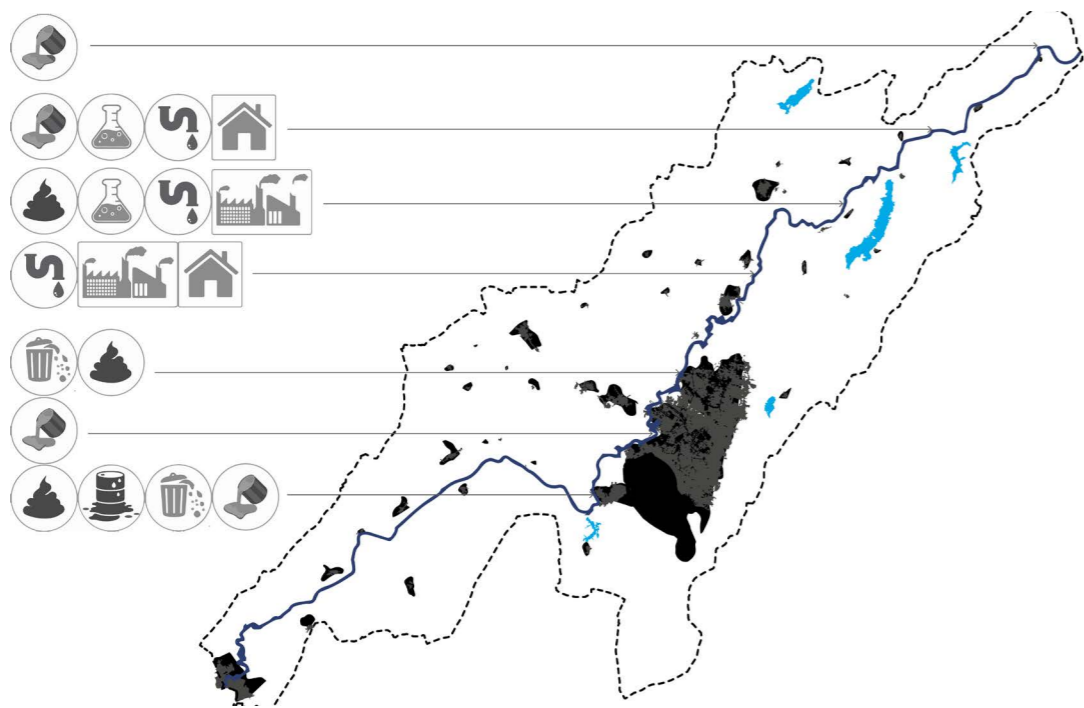
In the map shown in the right, the larger amount of people that live in the river basin are located in the middle part of the Bogotá River. It include municipalities such as Zipaquirá, Chía, Cajicá, Soacha, Girardot, Madrid, Mosquera, Funza and the capital city Bogotá.





Though, the natural structure quality and economic activities are wealthy it has brought important damage over the water and soil structure of the Bogotá River basin.

For a more illustrative example of the problem studied in the river basin area, the next maps show the interpretation on the data table studies from the Bogotá watershed, made by the public entity CAR (Regional Autonomous Corporation) about the contamination in the water structure overlapped with the urban growth of the municipalities along the basin territory. It compares the urban development, understood as human activity, with the quality and the water status. This concludes that: by one hand, the river presents high amounts of contamination along the whole natural structure; and by the other hand, the urban development's keep growing near the water structure.



The contamination is given by four principal sources: domestic, industrial, agriculture and the mixture between industrial and domestic. All of them have threaten the purity and employment of the water structure. All of them are located near the territory that surrounds the river. And is really important to highlight the organization of this issue because it is going to be explain further in one of the strategies that involve waste management.

As a conclusion, there are seven areas delimited with different kinds of contamination. The most harmful areas are the ones near the capital city that are defined as domestic, domestic + industry + agriculture and domestic. With huge amounts of garbage, metals, oils and organic materials.

Incertidumbre por río Bogotá

Atraso en obras y recursos ponen en duda la recuperación.

Redacción Bogotá

Una fuerte incertidumbre sobre el futuro y la real recuperación del río Bogotá se generó luego de que el representante a la Cámara Carlos Eduardo Guevara presentó los atrasos que tiene esta obra, a pesar de lo ordenado por el Consejo de Estado.

El principal afluente de los bogotanos tiene un grave problema de contaminación generado desde hace varias décadas y a pesar de las promesas de diferentes administraciones y los esfuerzos conjuntos de organismos gubernamentales, no gubernamentales y multilaterales, la contaminación de este río es una de las más grandes del mundo.

Y es que de los principales afluentes bogotanos, el canal Toreca y los ríos Salitre, Fucha y Tunjuelo llevan una gran cantidad de elementos contaminantes al Bogotá con bajos niveles de oxígeno que en algunos



Contaminación del río Bogotá, una de las más graves del mundo.

Los datos

- Punto crítico**
Contaminación se vuelve crítica cuando el afluente entra en contacto con el río Fucha y el Tunjuelo.
- Otra duda**
Falta claridad en las competencias que tiene cada una de las entidades y su trabajo articulado.

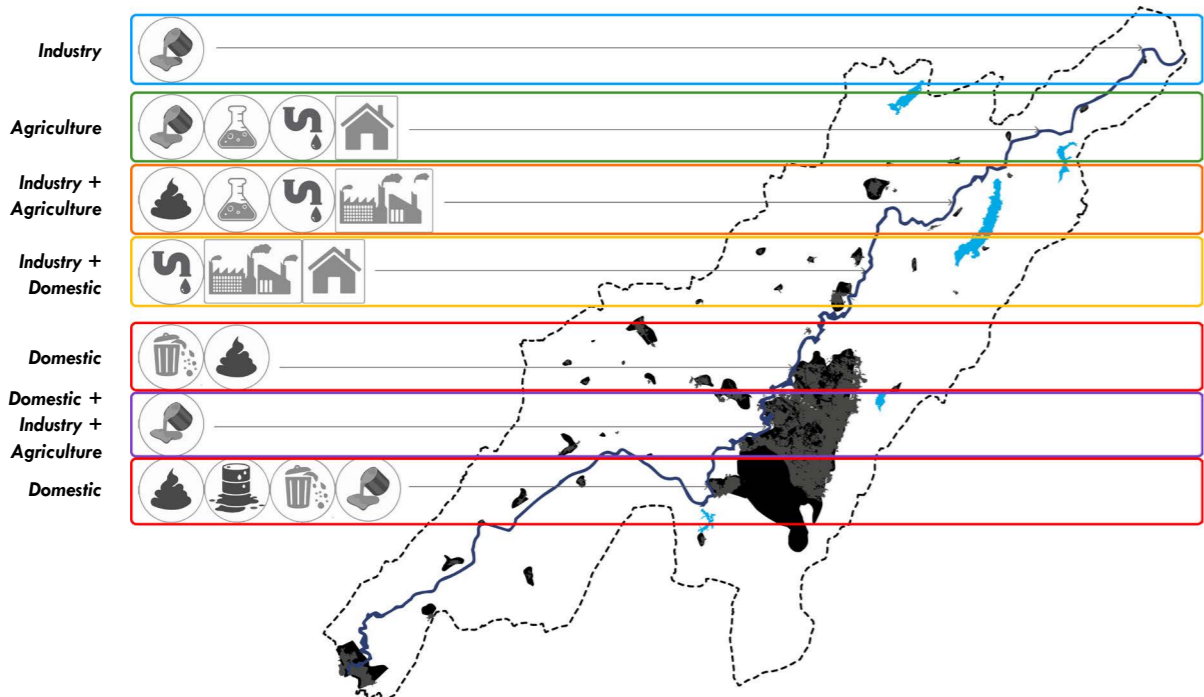
casos llegan a cero miligramos por cada litro (mg/l) que mueven.

Lo que más preocupa son los contenidos pues se encuentran altos niveles de cromo, cobre, plomo, níquel, manganeso y zinc, producto de los vertimientos que se hacen en estos afluentes del río Bogotá.

Fue por ello que se ordenó a la CAR, a la Gobernación de Cundinamarca, a la Administración Distrital y a las diferentes administraciones municipales que, de manera conjunta, idearan estrategias para la recuperación de las aguas del río. Sin embargo, estas acciones aún están bastante atrasadas.

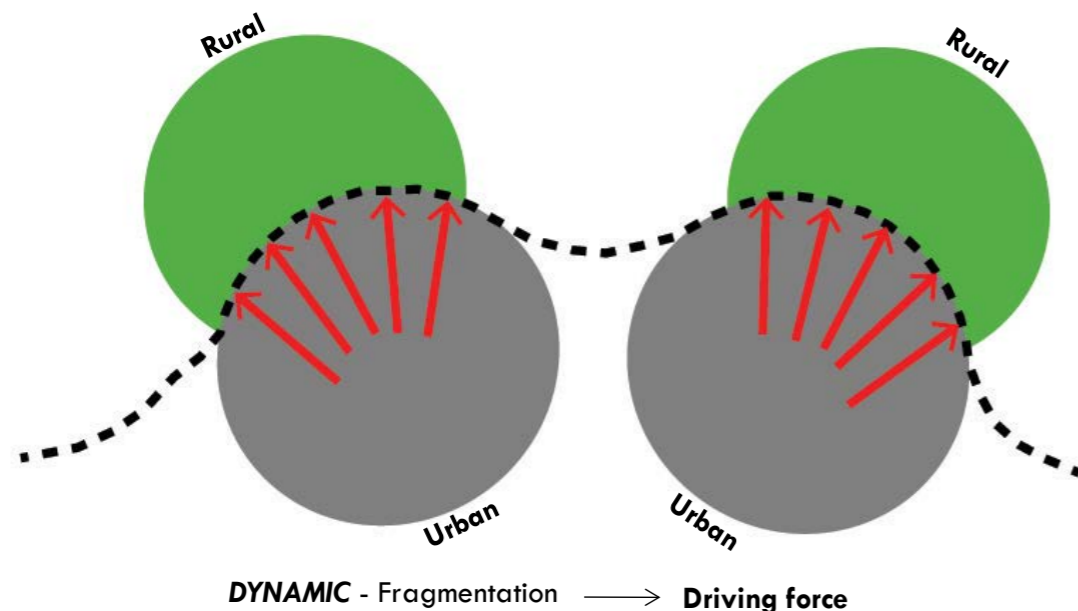
Entre los aspectos más preocupantes está la financiación de las obras, para lo cual se requieren 2 billones de pesos; la construcción del interceptor Tunjuelo Canoas, que sigue rezagada y las máquinas tuneladoras que se encuentran bajo tierra no han podido ser extraídas para continuar trabajos.

de cruzar el Distrito Capital, el Río Bogotá pasa por los municipios de San Antonio del Tequendama, Tena, La Mesa, El Valle de la Virgen, Tocaima, Agua de Dios, Ricaurte y Girardot. Luego de bajar 380 kilómetros su recorrido finaliza en el río Tunjuelo, el río Fucha y el río Muzo.



Dynamic

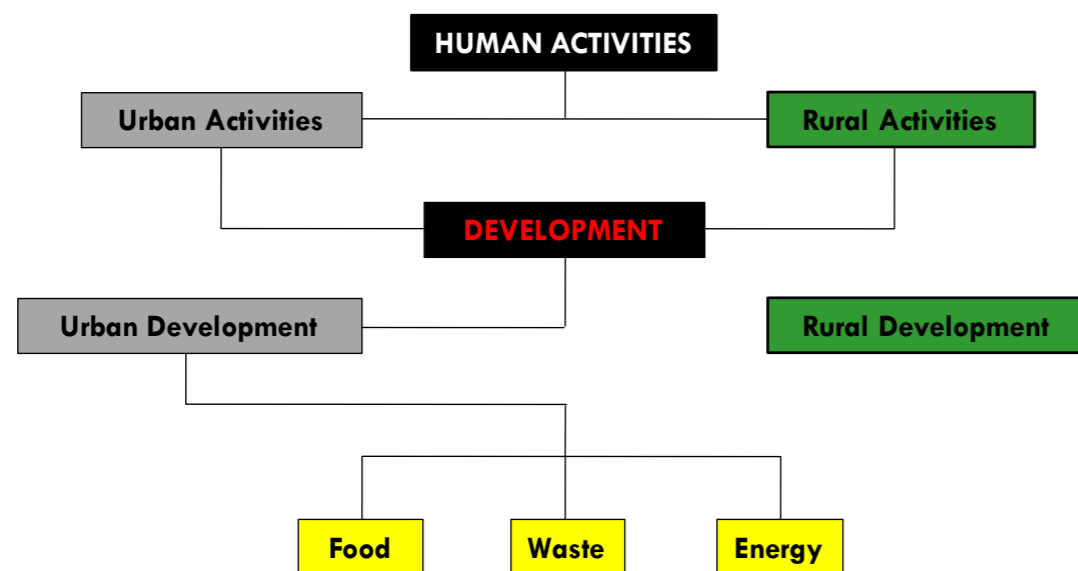
The actual dynamic in the region is given by the scheme below. The urban development has absorbed the rural areas along time and lately has been more often. The existing boundaries between rural and urban areas have changed dramatically during the last 20 years. Without any territorial planning rural areas become urban areas given to population growth. Any improvement in infrastructure or services has been done producing impressive



- Urban development/urbanization
- Agriculture
- Division between urban and rural
- Pressure population growth

expansion of urbanized areas. This dynamic generates fragmentation which is a driving force that is enlarging along the department. The result is an unbalanced and unsustainable dynamic between the human activities in rural and urban areas. There is a failure in the structure of the system and is really necessary to intervene. The scheme below points out the themes that are going to become part of the research, analysis and finally the strategy and design of the regional plan. Development is the main theme because is the main substance involved with the planning and governance of the region. The other three (food, energy and waste) are complementary themes that are going to become part of the possible strategic projects.

Dynamic = unbalanced = non sustainable



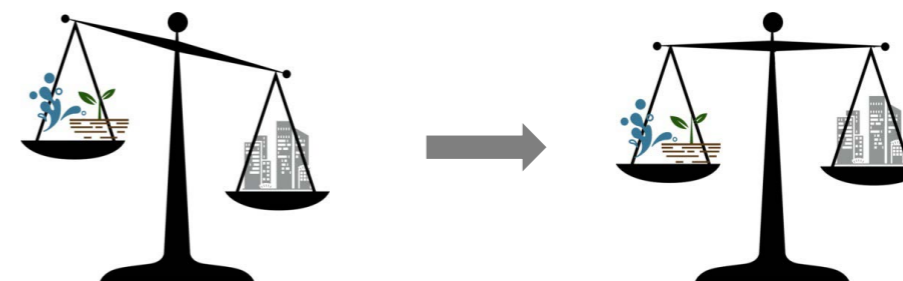
Research Question / Specific Research Questions

Then the research questions were defined based on the consequences given over the natural system structure: water, soil and on the description of the problem statement. The principal factors provoking a change are human activities divided in rural and urban activities. These activities I'm going to name them development which is rural development and urban development. Development generates certain flows that are applicable and significant to highlight in determined areas along the river basin. These three flows are: food, energy and waste.

Therefore the general research question covers these themes previously mentioned and specifically emphasizes on the creation of a sustainable system structure in the region.

GENERAL

How to generate an **integrated system** between **urban development, food production and waste management** given by the increasingly urban pressure of urbanization **without damaging the environment** contained in the Bogotá River and its basin?



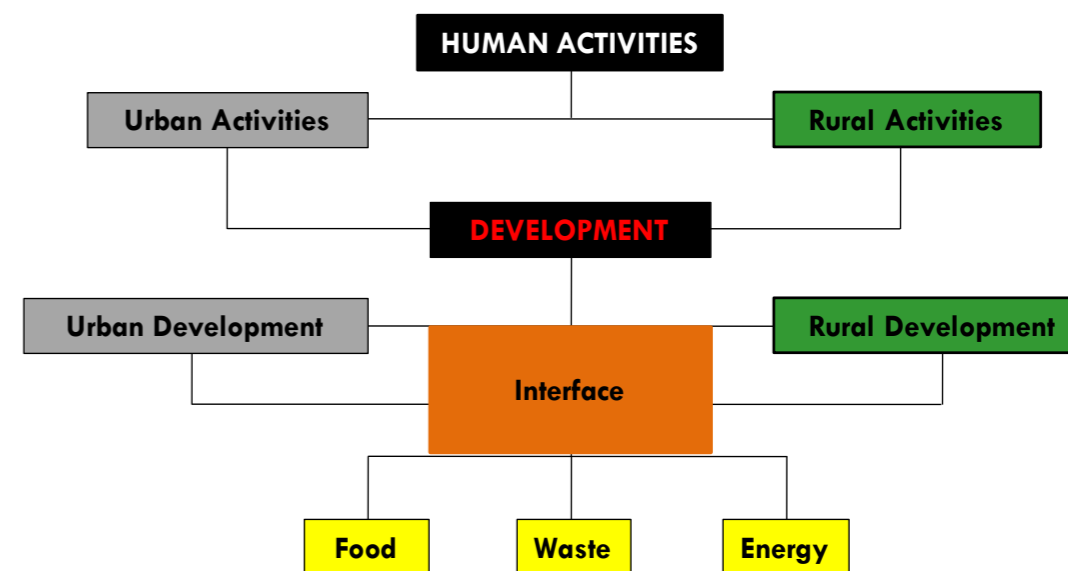
Then the specific research questions will work with the central human activities and its three respective flows:

SPECIFIC

1. **DEVELOPMENT** - How to generate land for urban development without harming the river system?
2. **FOOD** - How to create a balance between the natural structure and food production in cattle and agriculture activities?
3. **ENERGY** - How to improve water and soil for energy generation?
4. **WASTE** - How to adequate areas for waste management and treatment along the Bogotá river and basin?

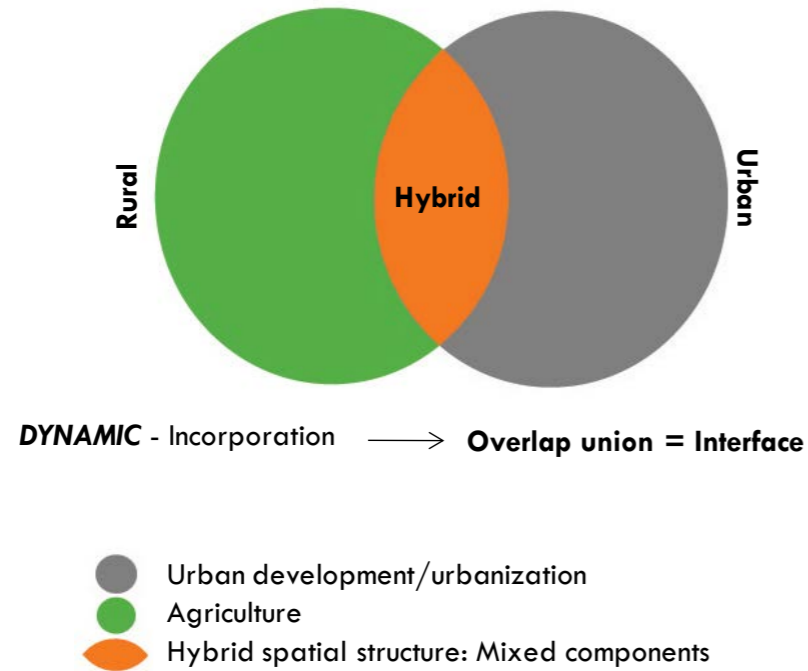
As it was shown in the scheme before, there is a breakdown in the system. So the idea is to generate an interface as a solution in the strategy based on decentralization to improve the structure of the regional system.

Dynamic = balanced = sustainable

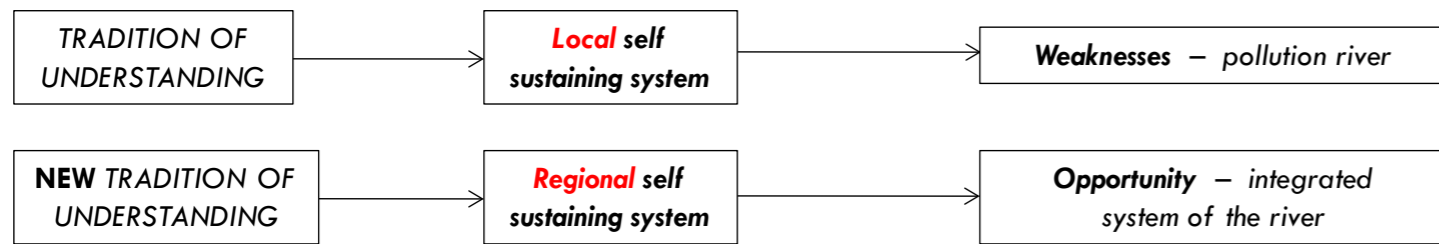


Strategy

SCENARIO - 2025 - 2035: 10 to 20 years



The challenge of the country and the regions is: Colombia's 75% of the population live in urban areas. It has been projected that in 2050 its population will increase to 85% in urban areas. Cities around the world consume around 67% of the energy produced and are responsible of almost 80% of the greenhouse gases. The increasingly demographic growth in urban areas and specifically in Colombia has put more demand and pressure over the natural resources.

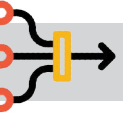


The strategy will start with the decentralization of the different flows along the river basin. The solution is going to be given by the generation of an interface (a mixed shared area) that I denominated "hybrid". The objectives mention before about the different flows, food, waste and energy and the development could be seen as strategic projects involucrated and developed in this hybrid areas.

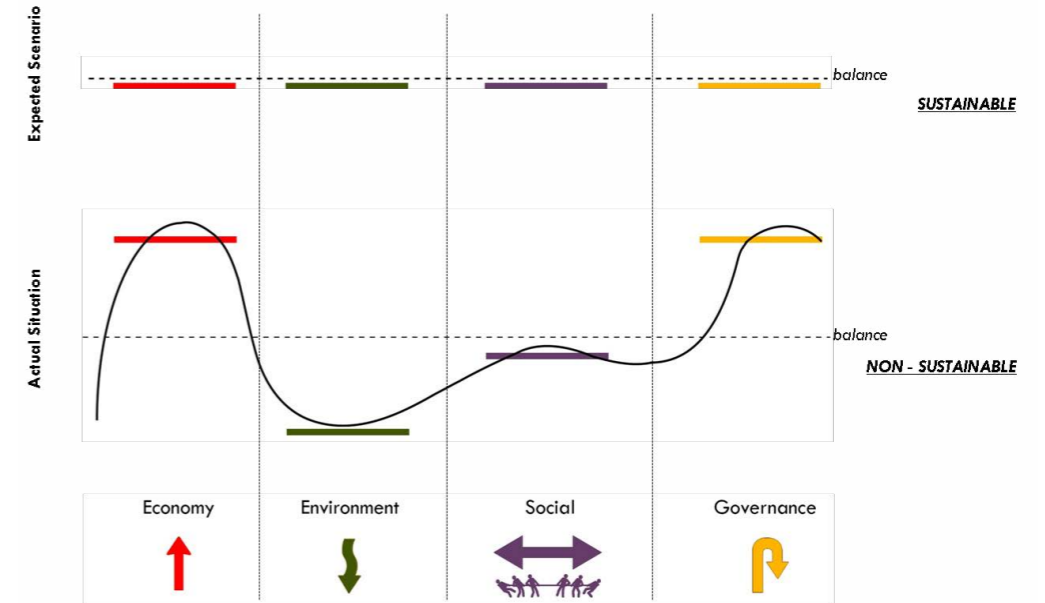
The recent tradition of understanding and behaviour has been done in a local scale. This has brought pollution to the river and is seen as a constant weakness. But, if the tradition of understanding is upgraded to a regional scale for the generation of a self sustaining system it would bring an opportunity to create an integrated system of the water structure and the territory.

Section 4

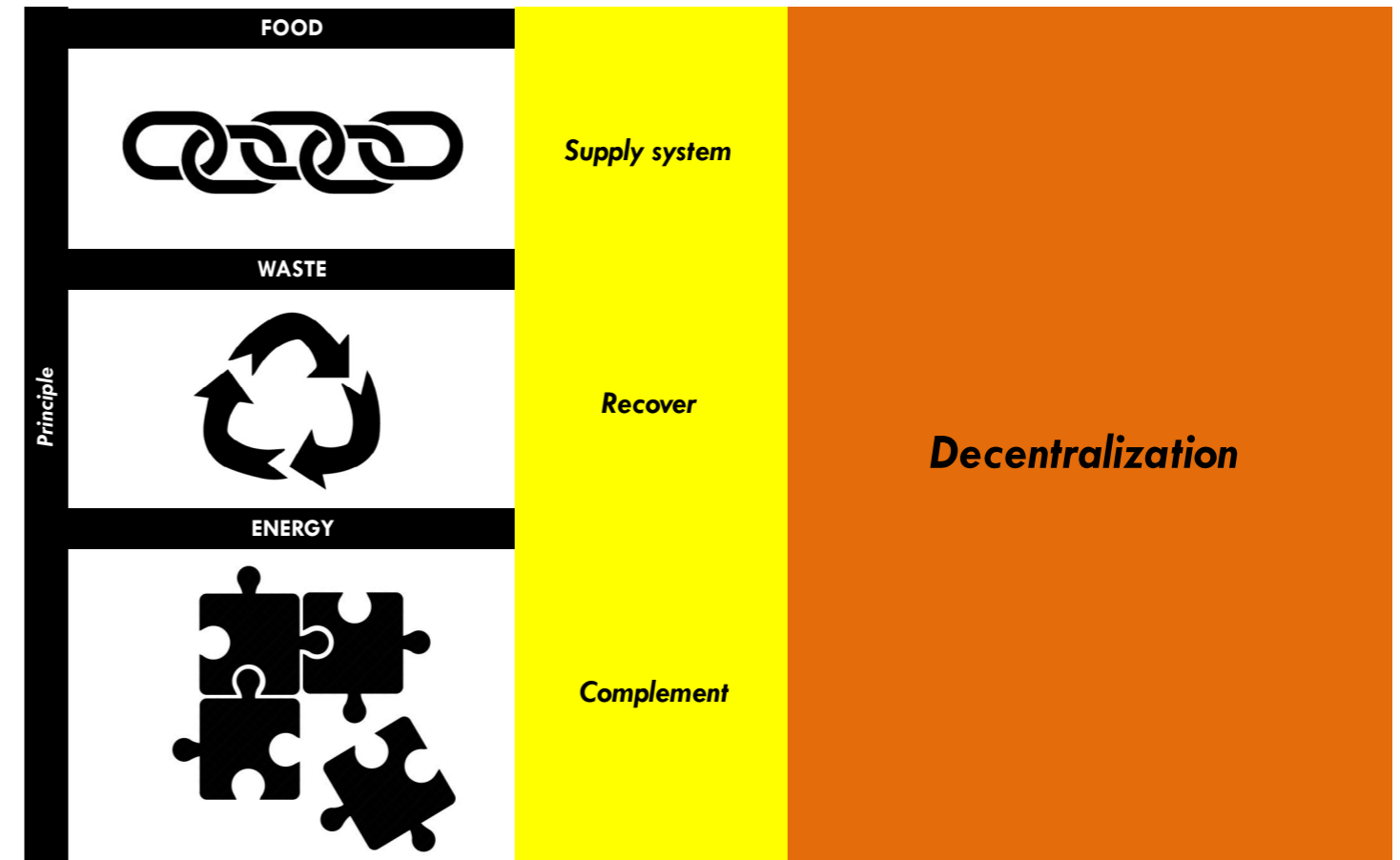
Flows



It has been said that human activities deal wrongly with the region. The effects on the declined of the environment caused by climate change and influenced by the problematic behaviour of the population have carried general consequences that can be solved through the decentralization strategy. Re-establish the network connections involving the environment in a sustainable way is the approach to restore the links lost in the department.



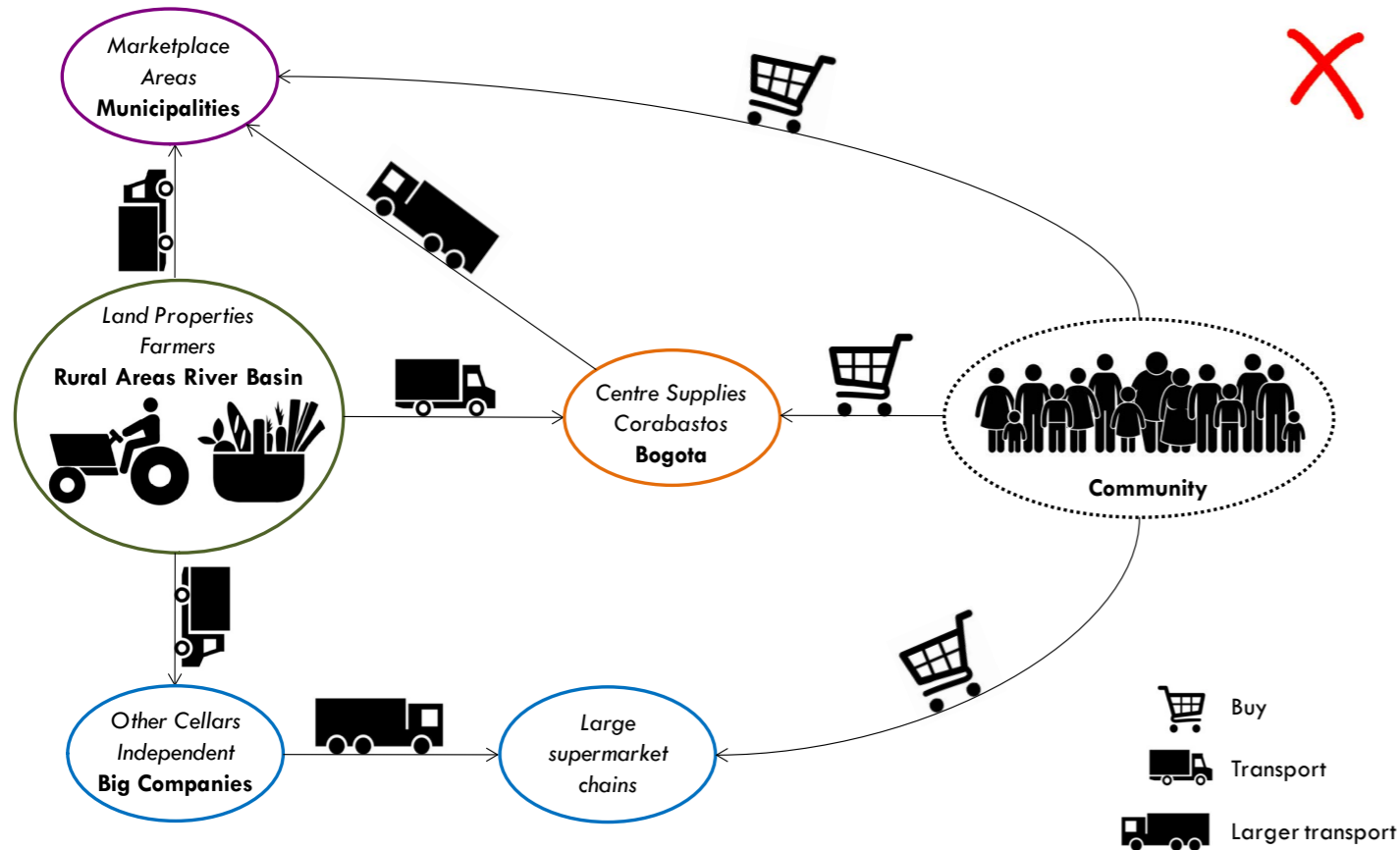
For this reason, I propose to implement some principles that are illustrated below. Through the analysis of the three flows it is concluded that each theme has a course. For food the philosophy is a supply system; for waste is recovery; and finally for energy is complement source. For all of them the strategy is going to be based on the decentralization concept. This is the way I'm going to find the solution for each flow. Given that they need an improvement to generate a new model of governance. The development of this criteria is going to allow me design



solutions consistent with the area. Then it is going to let me check against the criteria base if the solutions are accurate and applicable for the specific interventions; and finally the results are going to give me the options in which the solution could work or not. To begin I will show the detailed study of one specific flow: food. The process done in this field is going to be applied in the other two flows waste and energy. The intention is to point out how the analysis and further design of the flows contained in the strategy is going to be accomplished.

Food

These are the actual flows in the network:

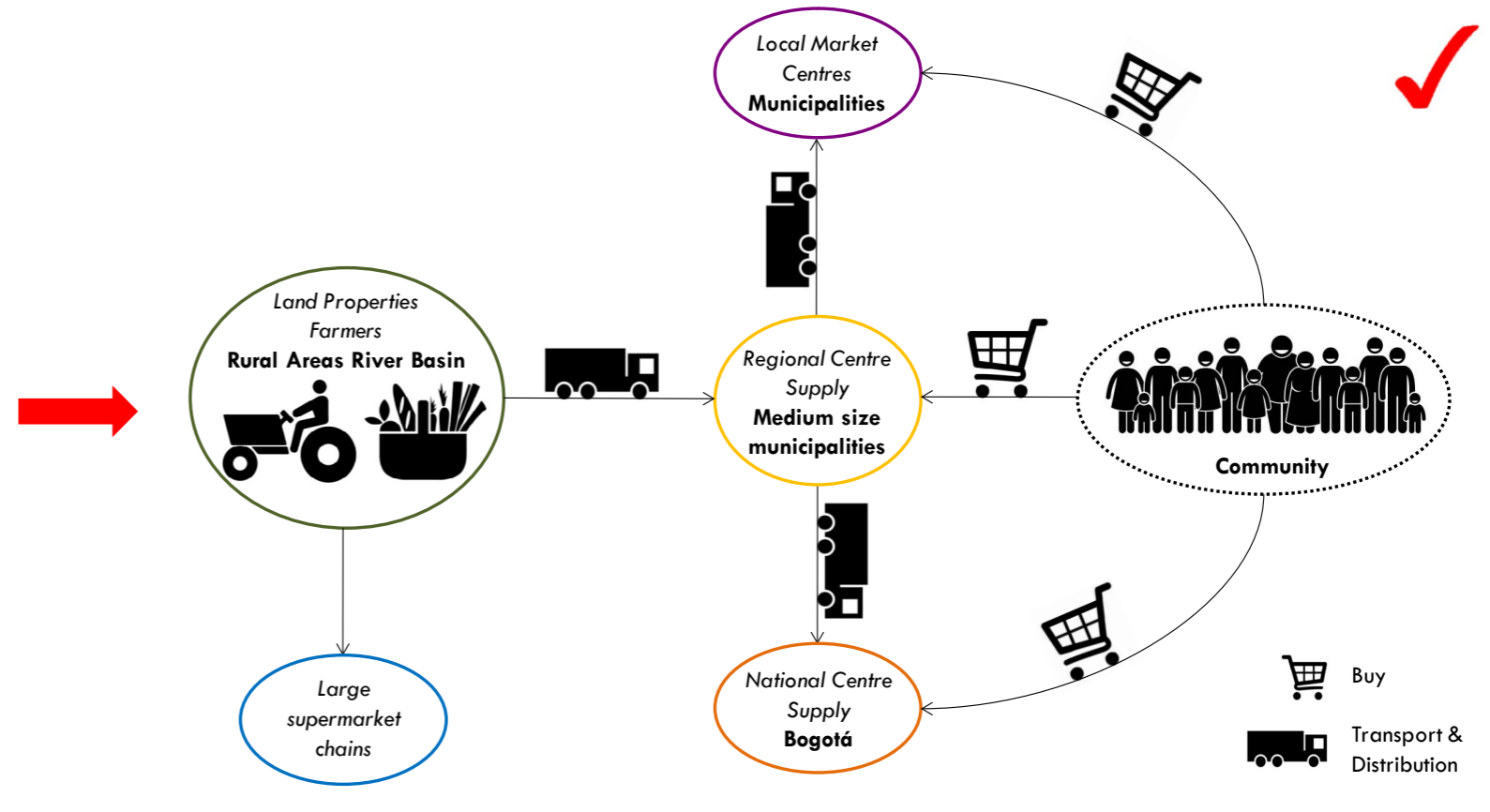


The connections structure is centralized, creating re-processes in transport and distribution. This generates traffic congestion, air contamination and deterioration of road infrastructure. **How could it be improved?**

A proposal arises in the next scheme; it presents how the flows should be employed. To prove the applicability and positive improvement of this flow in the strategy, some key elements are going to be analyzed: transport + distribution and production. After the results, the conclusions will indicate if it could work or not in the region.

There is already an approximation in identifying the areas where these strategic interventions could take place for the improvement of the flow. Once they are shown in the scenarios the vision of the whole area is going to be set. Then it is going to be possible to continue with the design of these points and the further proposition of the solutions over the Bogotá River basin.

The flows in the network should work like:



The proposed scheme shows the re-structuring of the connections that apply the decentralization concept. The intermodal points are distributed among the region and are located in the most populated municipalities which have the enormous flows of goods in food (**Regional Scale**).

So the regional centre supply is going to be the pivot for local and national supply centres. This will decongest the road infrastructure and optimize the processes in transport and distribution.

On the other hand, the production will go in line with a sustainable system taking care of the water and soil without harming the environment in the surroundings.

How is it possible to achieve and prove this theory of model in the food flow?



Marketplace Areas Municipalities



18



19



Centre Supply Corabastos



20



21



Large supermarket chains



22



23

Key Elements

NEED - Feed 55% more population with the same amount of land

FLOWS - Transport and Distribution
SCENARIO - 2050: 35 years

DATA

2015 - 10.600.000 people

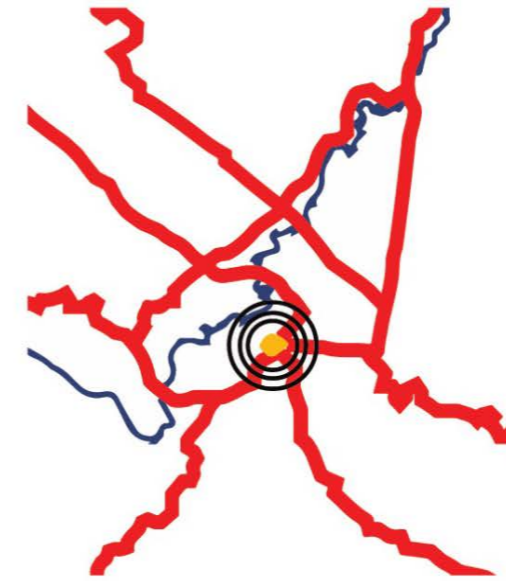
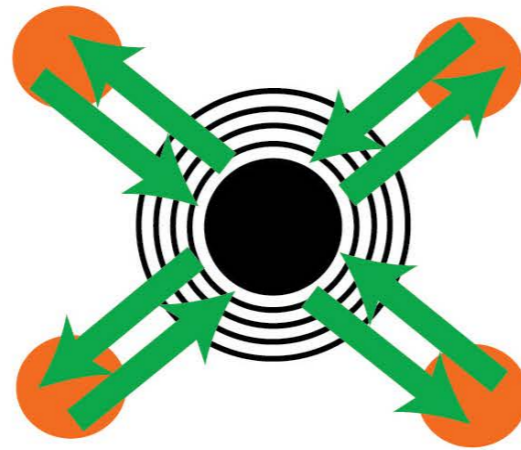
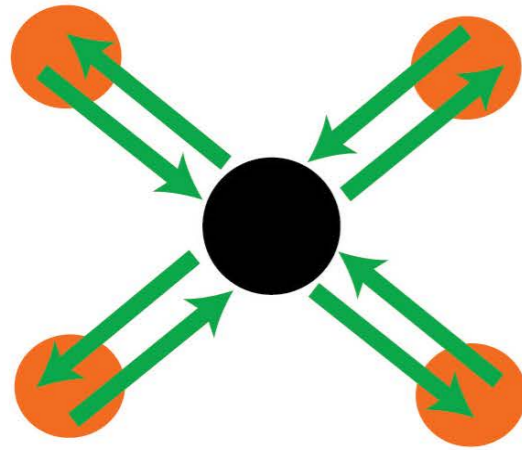
2050 - 16.200.000 people

PROBLEM

PROBLEM

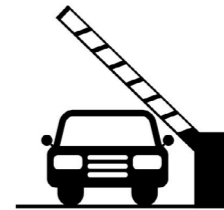
LOCATION

Threat



Population Growth

Weakness



Tolls in roads - \$\$

PARAMETERS

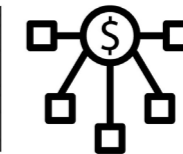
- PROBLEM - Centralization
- Centre Supply
- Transport/distribution of food
- Production areas

- PROBLEM - Centralization
- Centre Supply
- Transport/distribution of food
- Production areas

CENTRALIZED

— Saturated road Infrastructure

● Centre Supply – Bogotá



Topography - \$\$

What is **causing a shortcut** in the food flow? There is a threat given to the **need of feeding 55% more population** (growing population) **with the same amount of land**. What could possibly be done?

The sketch above draws attention to the road infrastructure; all connecting the centre supply in the capital city and how they are saturated given to the issues mention before. Part of the weaknesses include:

In the food flow two key elements were highlighted for further analysis and research. First, transport and distribution; it is made by trucks and the existing road infrastructure is starting to have sudden collapses during some periods of the year. The conceptual scheme shown above illustrates how the food is sent to the centre supply in the capital city to then go back to many of the points where it came out. As it was said before, this generates traffic congestion, air contamination and deterioration of road infrastructure. The images below show part of the effects that are happening in the region.

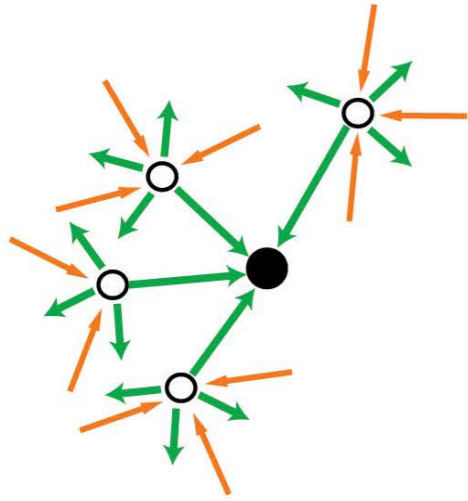
- Topography (expensive infrastructure)
- Increase of transport to mobilize more food (traffic, not enough accurate road infrastructure)
- Toll in roads (take longer routes: Provoke damage and maintenance of roads)

They enlarge the difficulties presented and complicates the achievement of a solution.



Intervention

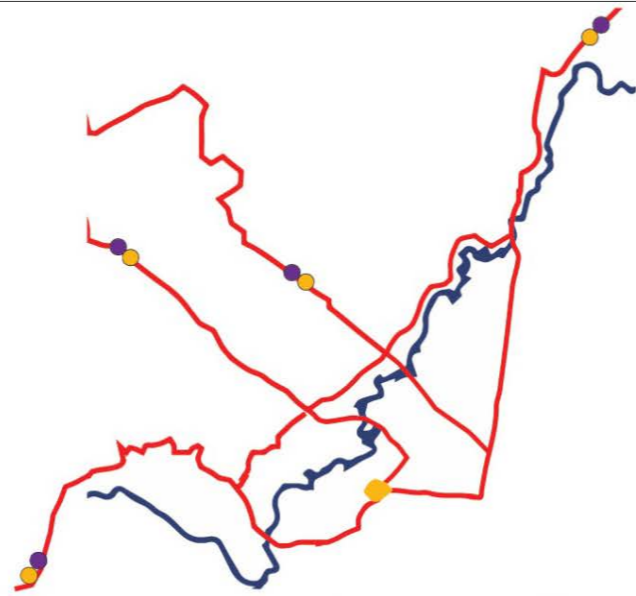
STRATEGY



STRATEGY - Decentralization

- National Centre Supply
- Transport/distribution of food
- Regional Pivot: Centre distribution
- Production food

DIMENSION



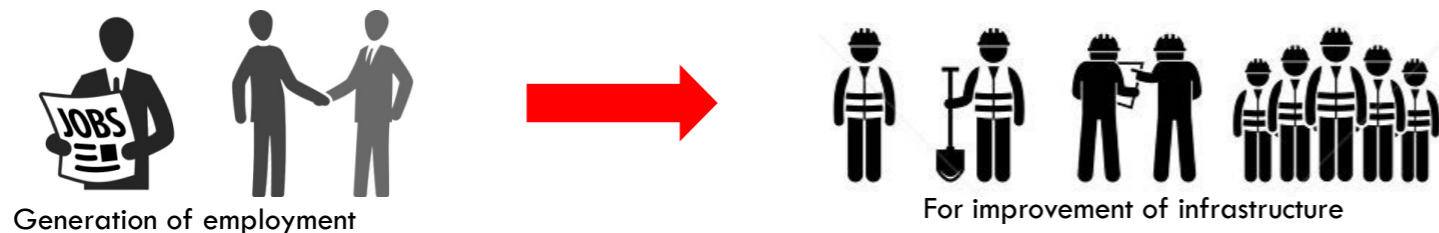
DECENTRALIZED

- Uncongested road infrastructure
- **National** Centre Supply – Bogotá
- **Regional** Centre Supply
- **Local** Centre Supply

The strategy applied will be based on the concept of decentralization. There are going to be located regional pivots which will be centres of distribution in the most populated municipalities in the river basin. This with the purpose of decongest the road infrastructure and optimize processes along the transport and distribution of food. **The philosophy and principle is applied as the interconnected supply system.** In the same infrastructure development every regional centre supply will have a local centre supply that is going to help the distribution in a more local scale.

As a result the intervention is not only going to improve the transport and distribution of the goods but it can generate employment opportunities in infrastructure and the future intermodal pivots in the region.

Opportunity



Referent: Rungis Market Paris - 232 hectares



29



30



31



32

The market has a strategic position, 7km south of Paris.

It lies in the centre of an exceptional network of transport links, located in a major business area (Orly-Rungis), which facilitates relations with the various food industry sectors: local, national or international.

• Road network

• Airports

- Orly
- Roissy Charles de Gaulle

• Waterways

The Bonneuil-Sur-Marne port: combined river-rail-road platform
Handles 1.1 million tons by river, and 300,000 tons by rail per year.

• Rail network

The rail terminal at Rungis handles approx. 200,000 tons of fruit and vegetable per year.

• Public transport

24/7 access by tramway and bus, with connections to the overground and underground services.

The market has the following characteristics:

- National network - 19 platforms
- Urban logistics actor: catering trade, mass distribution, organize transport and food supply
- Food industry centres, logistic parks and multimodal hubs
- Regional economic development centres

Criteria - strategically located near towns and rapid communication:

- A site with vast, empty tracts, easily constructible.
- Central in relation to major road, rail and air routes.
- Easy access for Parisian and provincial vendors and buyers.
- Practical for incoming goods.

The referent demonstrates the facilities given through an organized and accessible infrastructure. Also the decentralized structure of the system makes it possible to cover and supply the country and even to the continent.

It is a perfect example to take into account for further study in the design and planning of the local, regional and national centre supplies in the Bogotá River basin.

Key Elements

NEED - Feed 55% more population with the same amount of land

Flows - Production
Scenario - 2020 - 2025: 5 to 10 years

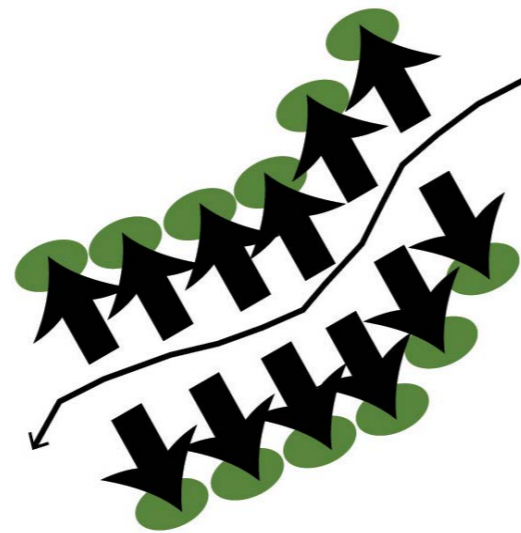
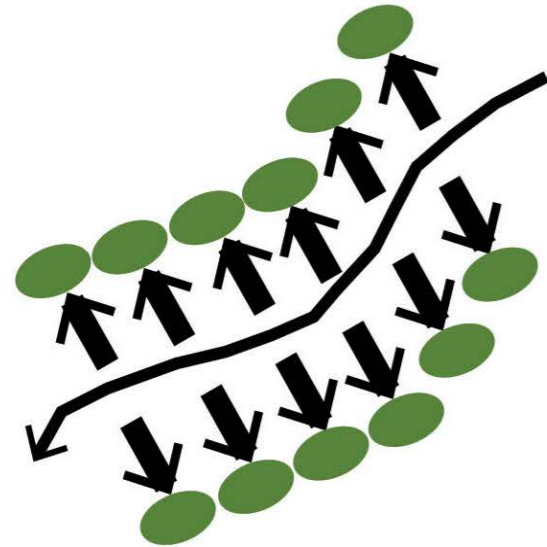
DATA

2015 - 10.600.000 people

2050 - 16.200.000 people

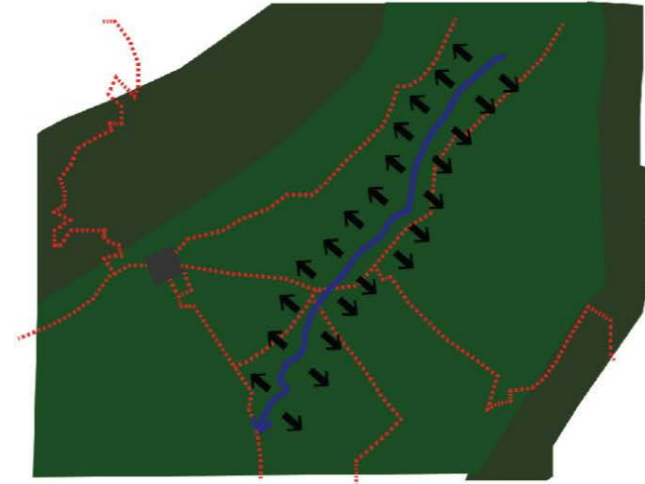
PROBLEM

PROBLEM



PARAMETERS

LOCATION



Municipality: Tenjo

- Mountains
- Agriculture
- Road infrastructure
- Chicú River
- Water supply

Individual gain and shared cost

Threat

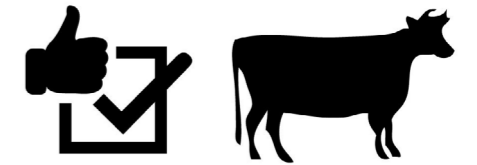


Climate change

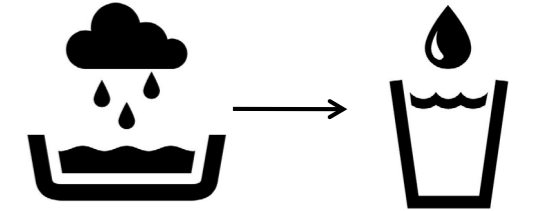
Weakness



Contamination - water and soil



Hygiene and health of slaughterhouse



Water demand: reduced availability

- PROBLEM** - Individualism (water supply) + contamination Bogotá River
- Water supply
- Agriculture - crop fields

What is causing another shortcut in the food flow? Another threat is **climate change** and is affecting the soil and the water which are the elements in charge of the hydrological cycle. There is still the **need of feeding 55% more population** with the affectations present on the natural system. What could possibly be done?

The second key element analyzed and researched of the food flow is the production. Farmers, original producers of all the products that are transported and distributed in the region, are in charge of getting water for the irrigation and growth of their crops. They are really creative in finding different methods to achieve quantities of this valuable resource. Although, there is something called "the tragedy of the commons"; this concept talks about the shared community resources that don't have owner but everyone is able to use them. The conceptual scheme above illustrates the actual situation: different farmers take water from the river for personal benefit for individual profit. The increasing problematic of the individual behaviour is bringing effects over the water structure. As time passes

by less water is available and the quality of the environment in the river is declining. As it is shown in the pictures below the Bogotá River is been contaminated and nobody cares and protects the priceless and helpful water and soil that human activities use in their daily activities. The sketch above draws attention to the water structure in blue. And how farmers take the resource in an immeasurable manner. Then the consequence is individual gain and shared cost over the natural system structure. Part of the weaknesses include:

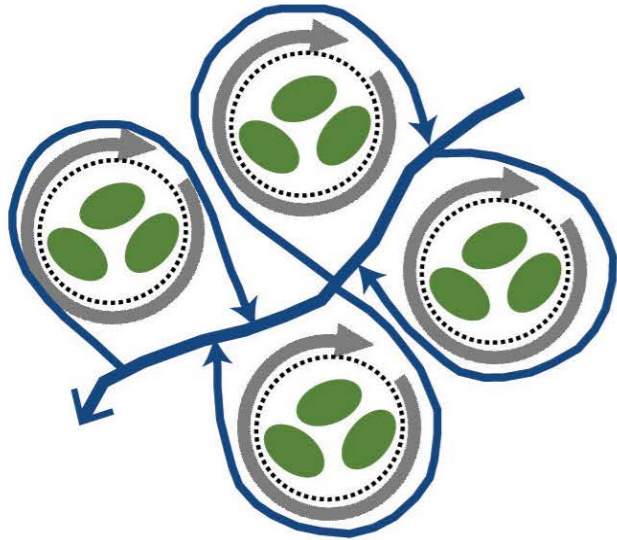
- Contamination - water and soil
- Hygiene and health of slaughterhouse
- Water demand: reduced availability, quantity and quality – less accessible for irrigate.

They enlarge the difficulties presented and complicates the achievement of a solution.

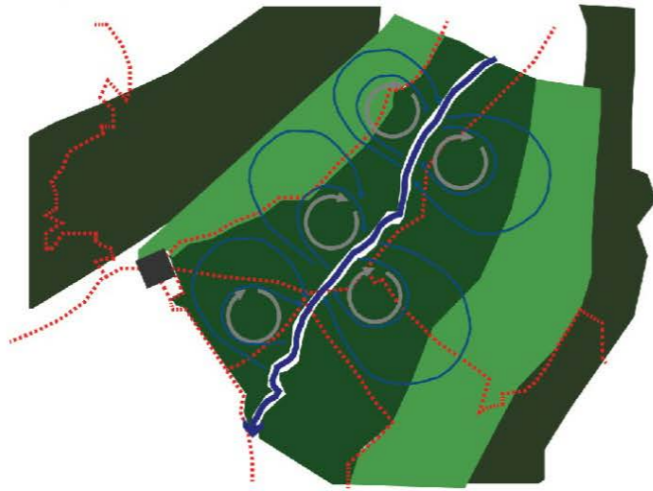


Intervention

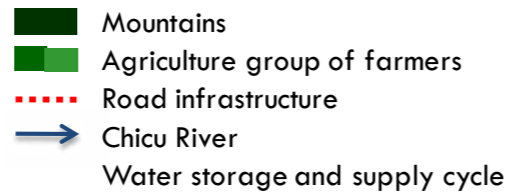
STRATEGY



DIMENSION



Municipality: Tenjo



Combine benefits and contribution

The strategy applied will be based on team work; **combine benefits and contribution** in the agriculture areas in the region. Develop an organized group structure in the different crop fields to take part of and be able to use the resource but also to participate in the protection and health of the water structure. As they need the water for their own incomes this operation is going to be done by the same farmers. They administrate, check and look after their interests. **The philosophy and principle is applied as the interconnected supply system.** With team groups it is going to make it possible to restore and recover the quality of the water structure.

As a result the intervention is not only going to improve the production in the agricultural field but it can create the opportunity of developing an integrated system between food, water and human activities. As the soil has the quality of water holding capacity and the region is a really fertile land, this will be a plus to really make the system work.

Opportunity



Soil: water holding capacity
 Basin + paramos

Opportunity



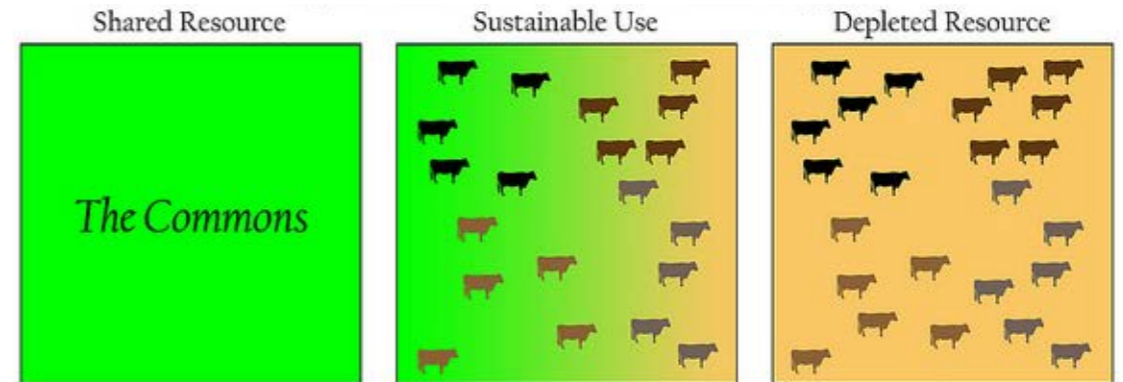
Connection link: food, water, human activities = integrated planning

Strength



Referent - Shared community resources - Elinor Ostrom

"Imagine an open pasture shared by multiple cattle owners. Each owner increases their herd to maximize their benefit. With an unregulated resource this is "logical" since the benefit is enjoyed by the individual and the impacts are shared by all. This leads to the ultimate overgrazing of the pasture."



Usually shared areas in the environment are deteriorated because of a terrible management and extreme use of the resources.

The Victory of the Commons: Nobel Prize-winning economist Elinor Ostrom proved that people can and do work together to manage commonly-held resources without degrading them.

"When local users have a long-term perspective, they are more likely to monitor each other's use of the land, developing rules for behavior". This theory structure is operated by the same farmers. They have eight principles for managing the commons:

- Limits
- Benefits
- Collective choice
- Monitoring
- Sanctions
- Conflicts resolution
- Recognition
- Nested enterprises

"What we have ignored is what citizens can do and the importance of real involvement." What Ostrom has demonstrated is the existence of social control mechanisms that regulate the use of the commons without having to resort to property rights."

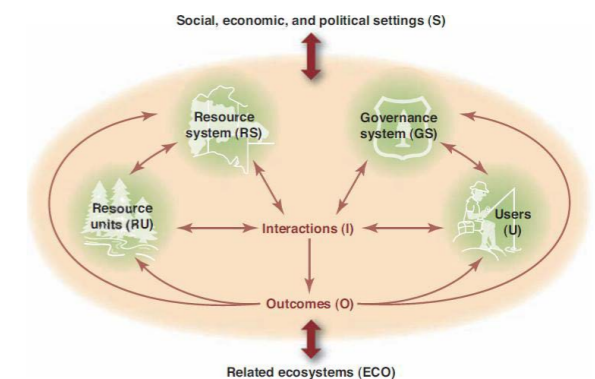
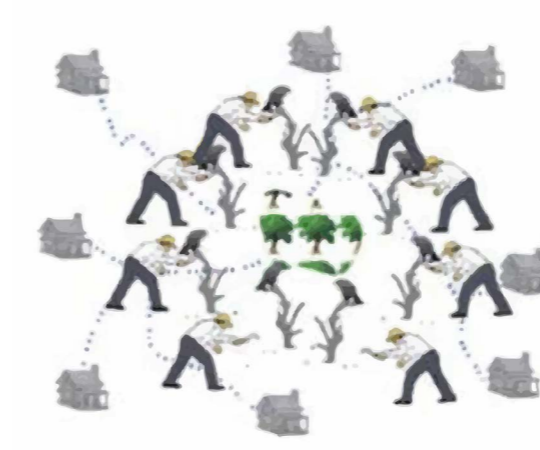
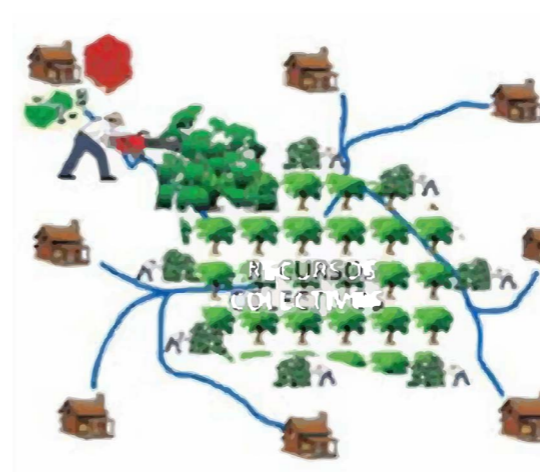
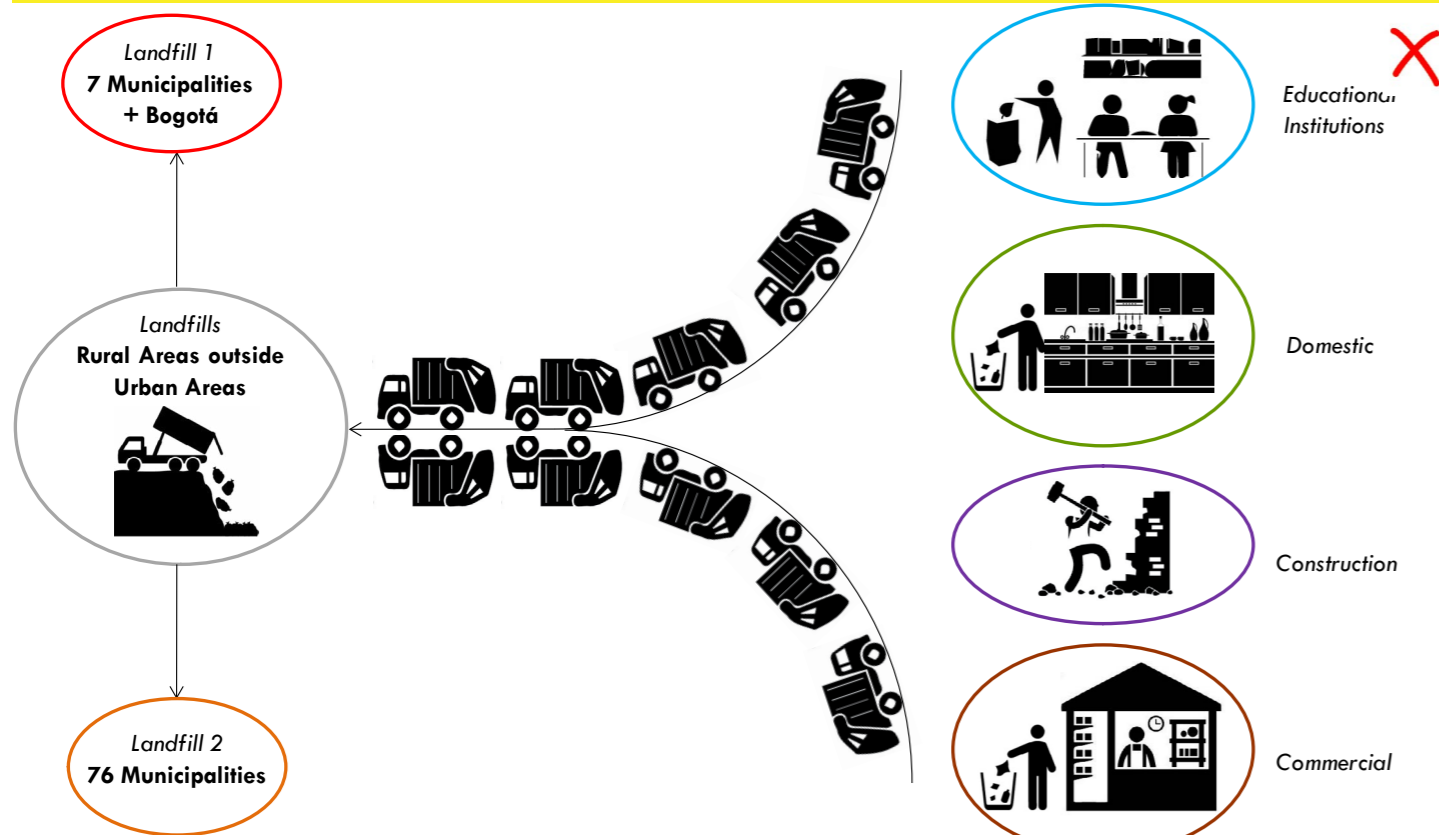


Fig. 1. The core subsystems in a framework for analyzing social-ecological systems.

The study based on two key elements in the food flow, were highlighted for further research to find a strategy for future implementation, which will bring potential interventions for upcoming solutions in the region. As it for waste and energy flows, the structure used before in the food flow for analyzing and researching is going to be applied in them as well later on.

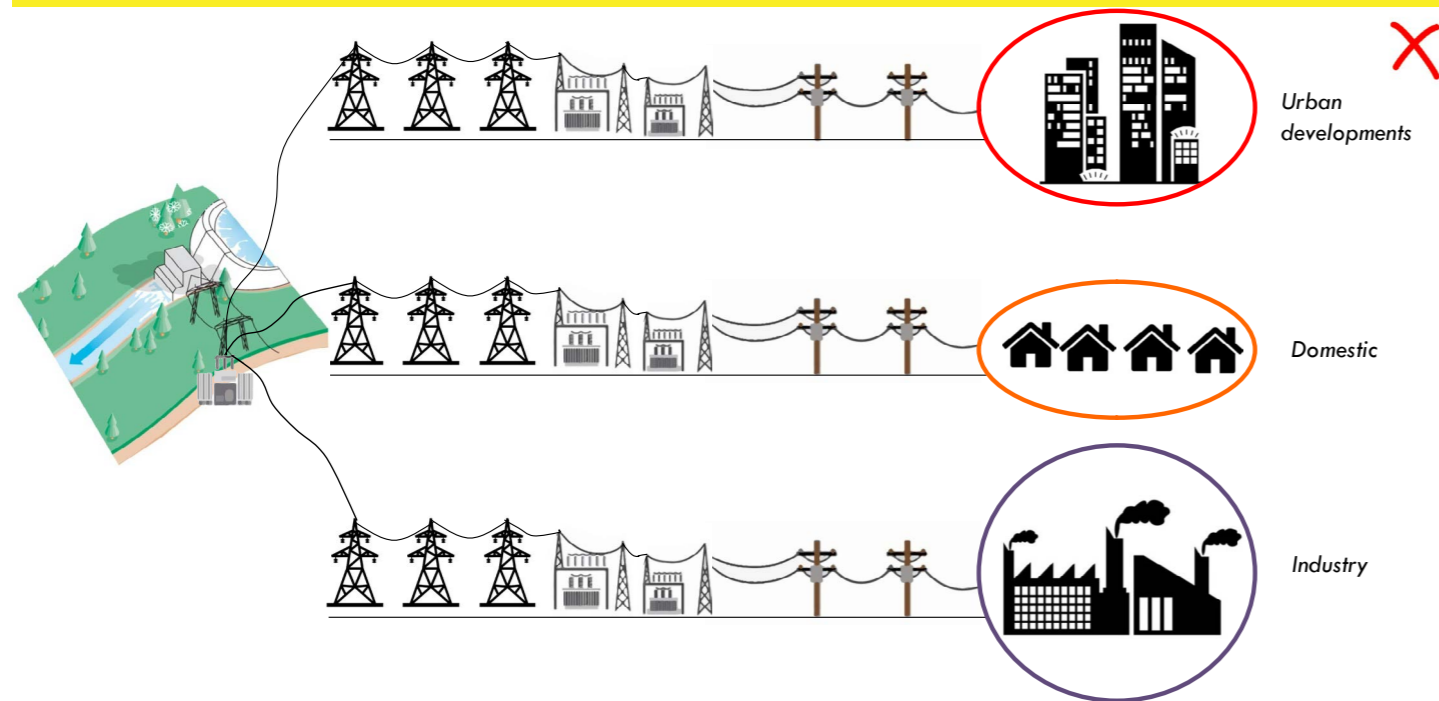
Waste



How could it be improved?

How to achieve and prove the positive implementation found of the theory in the waste flow? → ✓

Energy



How could it be improved?

How to achieve and prove the positive implementation found of the theory in the energy flow? → ✓

The previous methods used including the referents are going to give as a conclusion if the theories taken into account could work or not in every flow in the Bogotá River basin.

Coming up next, I will give you an idea through some examples, how the interventions in food, waste and energy flows in the region combined with the development could improve the model of governance I am looking to upgrade the most productive region in the country into a more sustainable self sufficient system as well.

Examples

Curitiba, Brazil

Implementation of several innovative systems to create jobs, improve public transportation accessibility, promote housing development, and improve waste management. The city has integrated a “radial linear-branching pattern” to protect density by diverting traffic from the city center and protect green areas by encouraging industrial development along radial axes.

- Benefits of the system:
- Reduced transportation time
- Creation of about 50,000 direct jobs and 150,000 indirect jobs
- Curitiba's fuel usage is 3% lower than in Brazil's other major cities
- Improved air quality and health benefits
- 70% of the city's residents are actively recycling and 13% of solid waste is recycled
- Reduced flood mitigation expenditures by promotion of park development in flood-prone areas

<https://sustainabledevelopment.un.org/index.php?page=view&type=99&nr=57&menu=1449>



Photo: Michel Willian/SMCS.

<http://sustainability.formas.se/en/Issues/Issue-4-December-2013/Content/Focus-Sprouting-Cities/Successful-initiatives-by-the-worlds-leading-cities-in-new-UN-book/>

<http://goingurban.tumblr.com/post/72275446346/curitiba-brazil-green-exchange-program-a-city>

Curitiba = “Brazil's green capital” prime example of a green economy in a developing country.

Green Exchange Programme

encourages slum dwellers to clean up their surroundings and improve public health by offering fresh fruit and vegetables in exchange for garbage and waste brought to neighborhood centers. The city has 96 exchange sites.

Each month: 6,500 people exchange 255,416 kg of collected garbage for 92,352 kg of fruits and vegetables.

New Orleans, United States

When Hurricane Katrina passed through New Orleans in 2005, the severity of the effects was a direct result of human engineering projects that dried up the natural wetlands.

The ecosystems' natural buffer capacity became severely compromised, and the city was devastated by the disastrous flooding.

A positive outcomes of the tragedy was the growing realization that restoration of green infrastructure was necessary to counter future storms.

The New Orleans Urban Water Plan vision for the Monticello canal, includes the extension of the channel, and incorporating of dikes in a redesigned agricultural and recreational open space that makes room for storm water and reduces unwanted flooding.

Source: Greater New Orleans Water Plan.

These two projects in Brazil and the US illustrate on one hand the integrated example of different fields that involve the flows such as food and waste with the balance structure of the natural system; and on the other hand the importance of building and growing together with the environment.



www.architecturalrecord.com



Existing



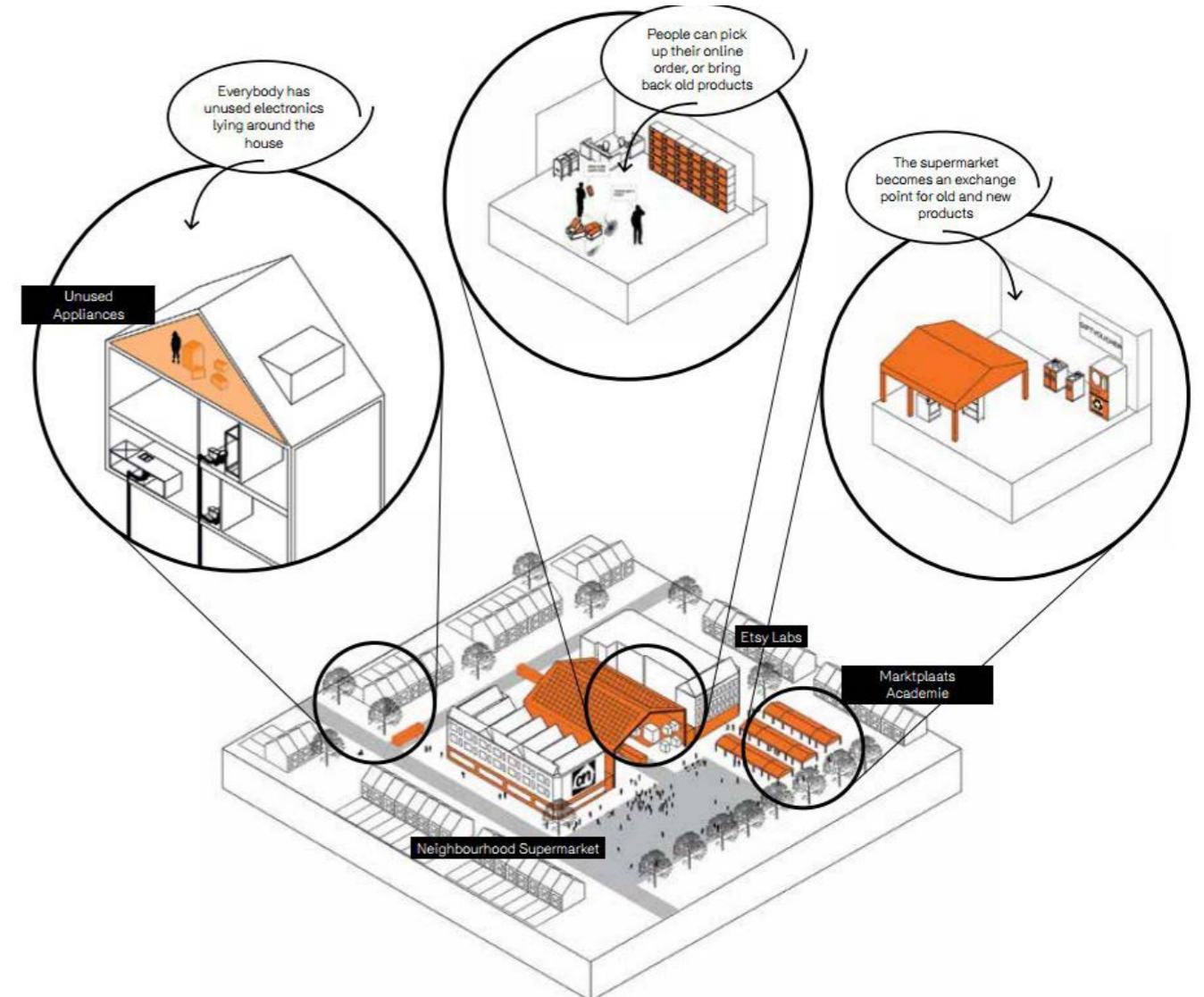
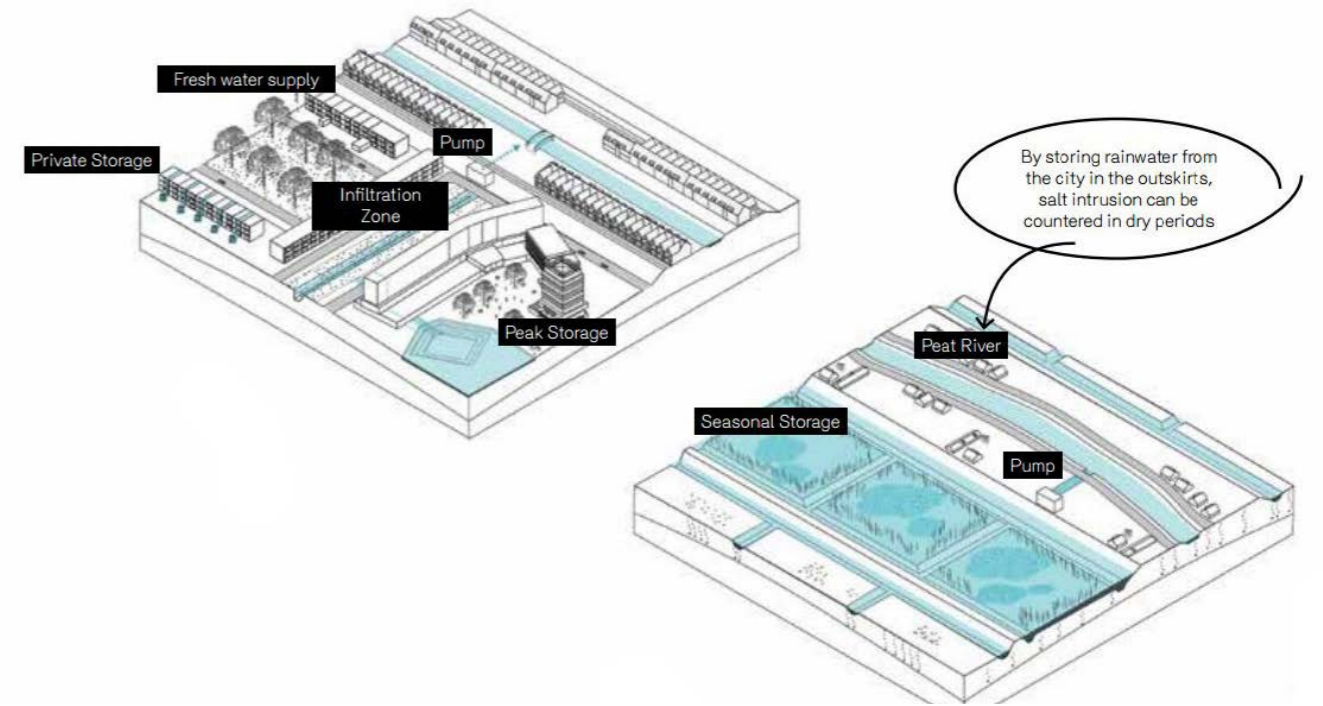
https://paesaggisensibili.wordpress.



Proposed

http://www.spur.org/publications/article/2015-07-28/learning-live-water

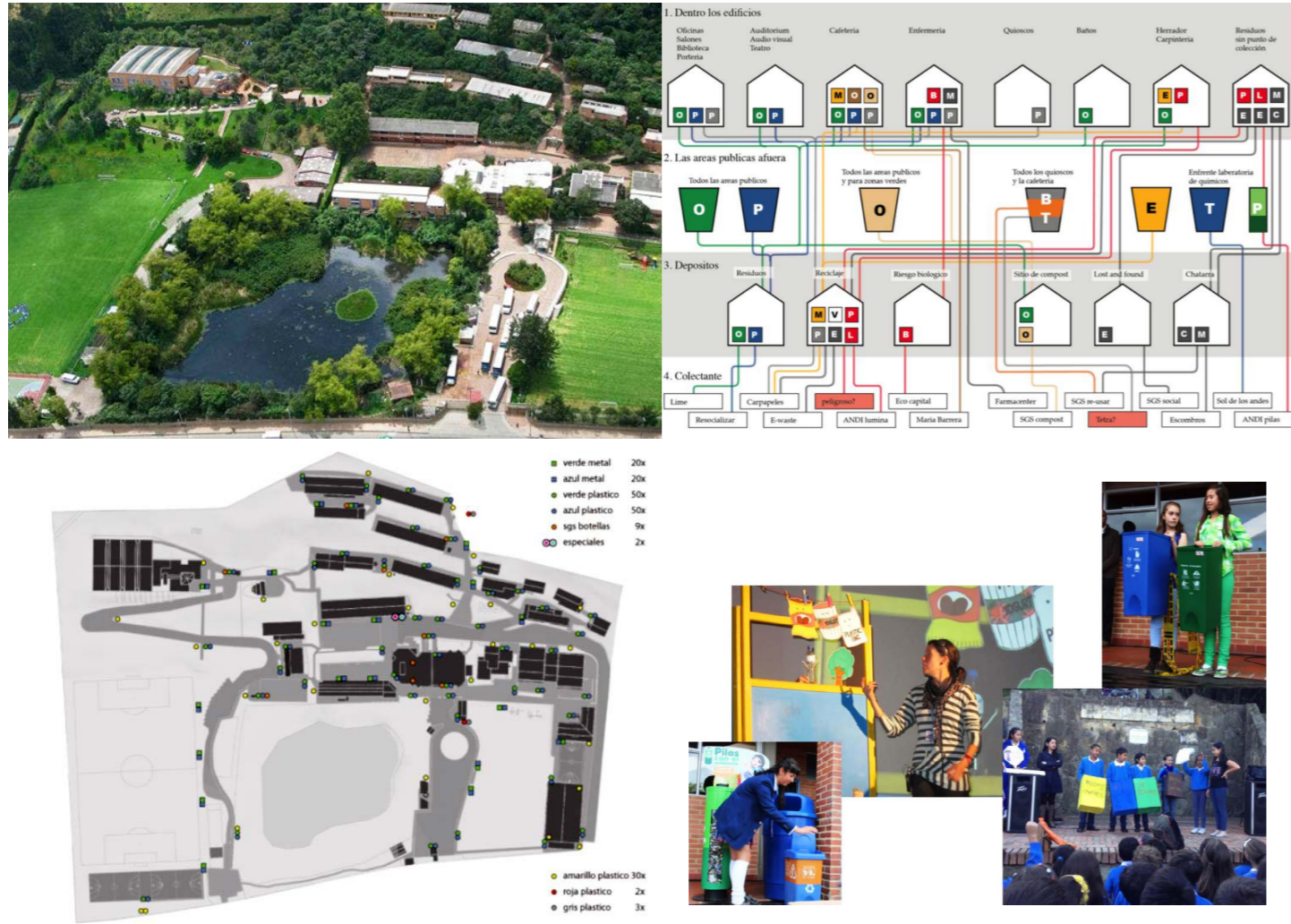
Urban Metabolism, Rotterdam, The Netherlands



http://iabr.nl/media/document/original/urban_metabolism_rotterdam.pdf

The water storage and recycling example in neighborhood scale could be considerably useful given to the increasingly housing areas and agriculture fields in the region. This example shows the applicability of the two methods mention before that could be relevant for the future improvements in the Bogotá River basin.

Private School, Bogotá, Colombia



In this educational institution waste management is primordial for the human coexistence with the environment. They have a plan of recolection and recycling that could be implemented not only in this school but in all the private and public schools in the region (furthermore the country). With the permanent education about this field in waste amounts the future generations are going to be more conscios about that matter and in the end more sustainable with the natural system structure.

Brooklyn, United States



<http://antigmofoods.blogspot.nl/2013/05/the-lush-life-bromley-caldari-helps.html>

Rooftop gardens to reduce demands on supply food are really useful. Given to the enormous amount of rooftops in small, middle and big cities is the perfect opportunity to contribute and make useful places with such a necessary investment. In Brooklyn many roofs have started to implement this strategy and generate new incomes and knowledge about the theme.

Then some other examples are shown of how the strategies could be applied over the Bogotá River basin regional structure.

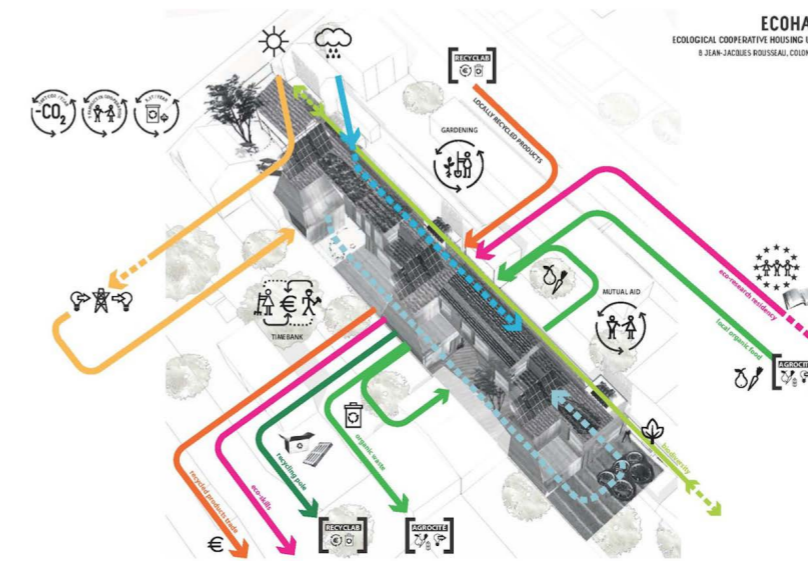
Other examples



<http://www.quo.es/naturaleza/islas-basurero-para-adornar-nueva-york>



http://www.ryerson.ca/carrotcity/board_pages/community/56_rue-st-blaise.html

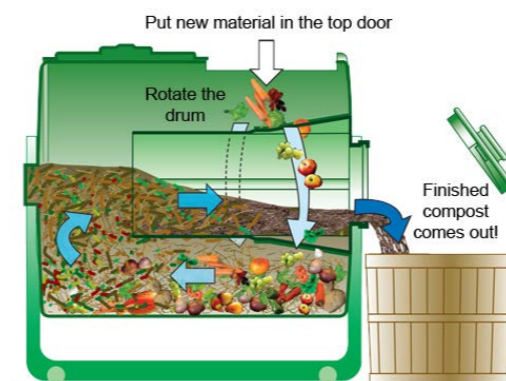


http://adbr001cdn.archdaily.net/wp-content/uploads/2012/07/1342720381_urban-par-is-atelier-d-architecture-autog_r_e_aaa-constantin-petcou-doina-petrescu_courtesy_of_zumbobel_group1341625424_8_ecohab.jpg



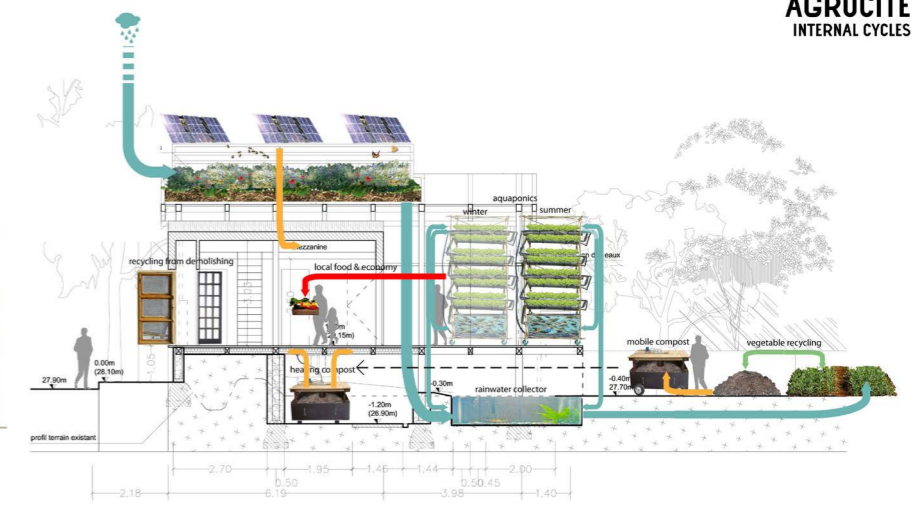
http://es.123rf.com/photo_39597185_categorias-de-basura-composicion-infografia-con-contenedores-de-reciclaje-residuos-que-consiste-en-p.html

How it Works:



(Please note, it takes on average 6 weeks for new materials to be completely composted.)

http://www.homeproductsmore.com/Compost_Tumbler_200_p/sun-mar_200.htm



<http://architektur.mapolismagazin.com/node/1355>

AGROCITÉ
INTERNAL CYCLES

Vision

The images illustrated before are examples of what I am going to do and work further in the project.

I will show in P3 how is going to be done and implemented in the area. This is going to be elaborated in the three different flows involved in the plan.

The examples previously shown on the whole implemented in its specific flow and strategy will create the new vision I have for the Bogotá River basin in the region.

The image in the right expresses a first idea and represents the visualization of what I am looking forward with the research, analysis and further design.

The proposed dynamic in the develop area (hybrid) between rural and urban areas could integrate in a spatial and territorial planning the Bogotá River basin.

The wishful and now more visible balance between the elements worked are going to bring a more concrete possible scenario over the area.



Section 5

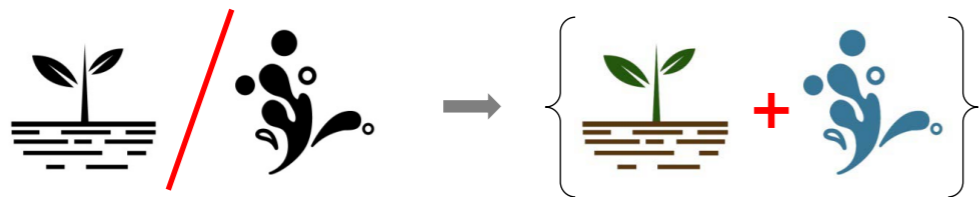
Social and scientific relevance - Motivation

The principal motivation of this project in a **social perspective** is to stand out the importance of the Bogotá River and its basin for the people in the region. The magnitude of the explosion and contamination of the natural resources doesn't compensate the protection and balance in the recovery of the area. Contribute to the generation of a sustainable system structure for a healthier quality of life and improve habits for upcoming generations of people with the immediate context.

Prioritize and create interest in the generation of a sustainable system structure. **How?**



By the other hand, for a **scientific relevance**, it is known that the Bogotá River has had a considerable number of studies and programs written for the protection and recovery of its structure, although none of them have been implemented. The quantity of those papers, essays or plans are not directly proportional to the efforts done in the defence of this environmental structure and its natural resources. These documents have principally emphasized on the study of the water resource or the soil quality, but not in the joined natural system structure that includes both and other physical elements in this specific case. Overall they constitute the cycle by which human activities are benefit from.



Also, the lack of a regional law that covers the entire area gives as a consequence the actual situation: a national law that is not valuable and a local law that is accomplished by some of the municipalities around the river.



NATIONAL; LAW 2811 – 1974: Article no. 1

“El ambiente es patrimonio común. El Estado y los particulares deben participar en su preservación y manejo, que son de utilidad pública e interés social.”

“The environment is common heritage. The State and individuals must be involved in its preservation and management, which are of public utility and social interest.”

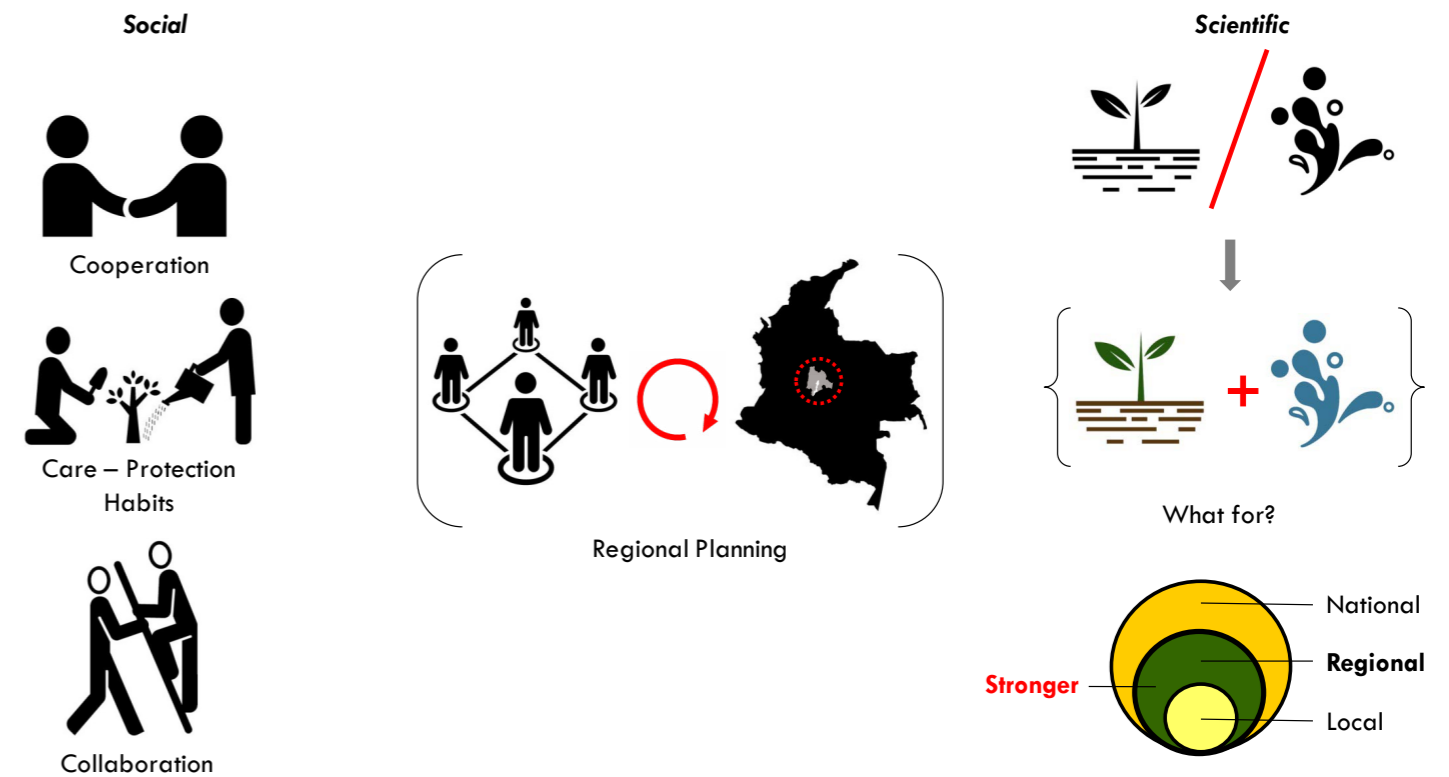
“La preservación y manejo de los recursos naturales renovables también son de utilidad pública e interés social.”

“The preservation and management of renewable natural resources are also of public utility and social interest.”

For this reason, it would be significant for the project to contribute to this body of knowledge in a more integral and sustainable way. In the research group - Complex Cities - it could give an approach of how thinking from the environmental field as starting point, could give another perspective in governance and strategic planning to apply different choices for the improvement of the Bogotá River. The environmental field would be essential given that focuses on the needs of the population and damages over the natural structure; instead of focusing only on economic problematics or urban growth.

Moreover, a more concrete connection with the research group - Complex Cities - could contribute with its planning methods in the regional strategy that I would like to approach.

What for? Well this will allow the generation of alternatives more in line with the planning of the territory. As a result, this is going to integrate the region with the Bogotá River and basin.



Ethical Paragraph

The importance of focusing on the necessities, desires and rights of the population in a region such as the Bogotá River basin in Cundinamarca Colombia is vital. Given that there exists huge inequalities between social groups. The planning and structure of the model of governance is unsustainable with the environment and the same population living there. Disadvantaged people suffer neediness in many parts of the region produced by lack in infrastructure and lack of opportunities in rural areas. The proposal apart of generating a sustainable system with the natural structure, proposes alternatives for jobs, better quality of urbanized areas and healthy lifes with the restoration, recuperation and protection of the Bogotá River and basin.

On the other hand, the information involved in this project was taken from public available websites from Colombia's data base in public organizations, educational institutions:

- DANE: Departamento Administrativo Nacional de Estadística (National Administrative Statistics Department) - <http://www.dane.gov.co/>
- Pontificia Universidad Javeriana: Biblioteca General (Javeriana University General Library) - <https://bases.javeriana.edu.co/my.policy>

These information includes statistics, studies about the Bogotá River and the analysis of the Department of Cundinamarca between others. The aim of the graduation project is to design a new planning system for the region to re-evaluate the actual system which is principally distorted.

The originality of going back to the origin

Faculty of Architecture, Delft University of Technology

Angela María Moncaleano Novoa

4420500

A.M.MoncaleanoNovoa@student.tudelft.nl

January 2016

Urbanism

Abstract – The Bogotá River in Colombia has the biggest economically productive basin in the country. However, for the last two decades, human activity in the region has transformed the ecosystem contained along the basin. Nowadays, the river basin has been pressured by a model of factors that pull out the majority of resources; and as it wasn't good enough, the increasing demands over food production and waste generation caused by demographic growth damages the natural system. The hydrological cycle is been modified and disturbed by factors such as: contamination, climate change, excessive use of the water and the soil and as it is known that is implicit but necessary to mention, Governance. The lack of commitment in the protection of the environmental structure and the lack of responsibility over the territory have produced massive threats: the fragmentation of the region, the river and its basin, given by the extensive extraction and abuse of natural resources for economic purposes.

The Bogotá River is considered one of the most polluted rivers around the world. This paper tackles the requirement of an improved model of development for the river basin and its surrounding built and natural environment. Water and soil are not the only elements involved in the natural system anymore. It shows how human activities are included in the present and future model of the system and that it is necessary to restructure or redefine it to improve by one hand the environment and by the other hand the social life of the region.

Key words – environment, ecology, model of governance, sustainability, urbanization, urban development, hydrological cycle, biodiversity, urban, rural

1 Introduction

In the following section I introduce the problem present in the Bogotá River and the natural resources in Colombia. "Currently the rivers of the big cities have been channelled and turned into sewers. Wetlands were drained and filled to build housing areas. The marshes are property of landowners who established livestock and agriculture." As a consequence, floods, forest fires and droughts are been caused result to this command and dominant authority over the natural structure. Colombia has a National Law to ensure and protect the ecological biodiversity of the country and its renewable resources which include ecosystems within their natural resources and water structures. This act number 2811 written in a piece of paper since 1974 says in its article #1: "The environment is common heritage. The State and individuals must be involved in its preservation and management, which are of public utility and social interest. The preservation and management of renewable natural resources are also of public utility and social interest."

Unfortunately, there has been a failure in the model of governance and development when it needs to deal with the natural system structure, in this specific case with rivers and their basins. This law is not valuable when it comes to productive areas, where it is present but is not implemented or accomplished given to economic benefits. The so called era of globalization; it brings high amounts of development in different fields, although the consequences over the environment are clearly catastrophic. "An era of 'globalization', as economic and social

activities as well as governance structures link cities together through spatially extensive flows of various kinds and intense networks of communication." The improvements are seen spatially along the productive areas, unfortunately the healthy and sustainable relationship with the natural structure is not mention, and it is in this case almost lost.

This paper addresses in explaining how a river basin, the Bogotá river basin, requires an improved model of governance and development for the sustainability and persistence in long term for future generations.

2 Going back to the origins

In the following section I explore how the natural system structure and the natural resources have been working and used in the past. In ancient times, artists of different civilizations have reflected in art and literature their fascination for a really important element: water. They believe that it enhance the beauty of landscapes and cities. Cultures consider water in their rituals and myths. "The falling water accommodates according to the relief of the terrain, it can drain or infiltrate, accumulate in the mountains as snow or in depressions as lakes. Over the years it has not only generated the orography but also the political divisions: rivers and lakes provide natural boundaries between regions and countries." Water is not only considered from the point of view of an important natural element but also contains a social dimension. "The referents of our origins as a nation and as multiethnic and multicultural society are related to the water and mountains."

Ecosystems are the raw materials for the provision of food, energy, recreation, between others, essential for the development of societies. People who have lived in these fertile and productive areas possess technical knowledge about changing climates over their crops and options on how to mitigate pests. It is a cycle that has coexisted for centuries, although things have changed throughout time.

"Colombia is recognized worldwide for its vast natural resources in forests, deserts, water and biodiversity. This heritage is one of its greatest strategic possessions, which has not been considered in all its dimensions as the large added value for economic, social and environmental sustainability of the country." Also, the environmental problems experienced today, are closely related to poverty, hunger, migration and basic sanitation deficiency. The ideal model in which the cycle should work is based on a measured transformation of the resources; this will generate employment that will result in economic development for the region and in a good quality of life for the people living there. Instead, the model revolves around the increasingly exploitation of the resources; this entails to the plunder and degradation of the environment which also conducts directly to poverty. This is the reality model that the river basin is facing. The scarcity of investments in infrastructure, as one example, the protection and regulatory governance over the natural system, despite all the economic growth achieved in the region, leads to a non sustainable relation and structure between the economic, social and environmental parts involved.

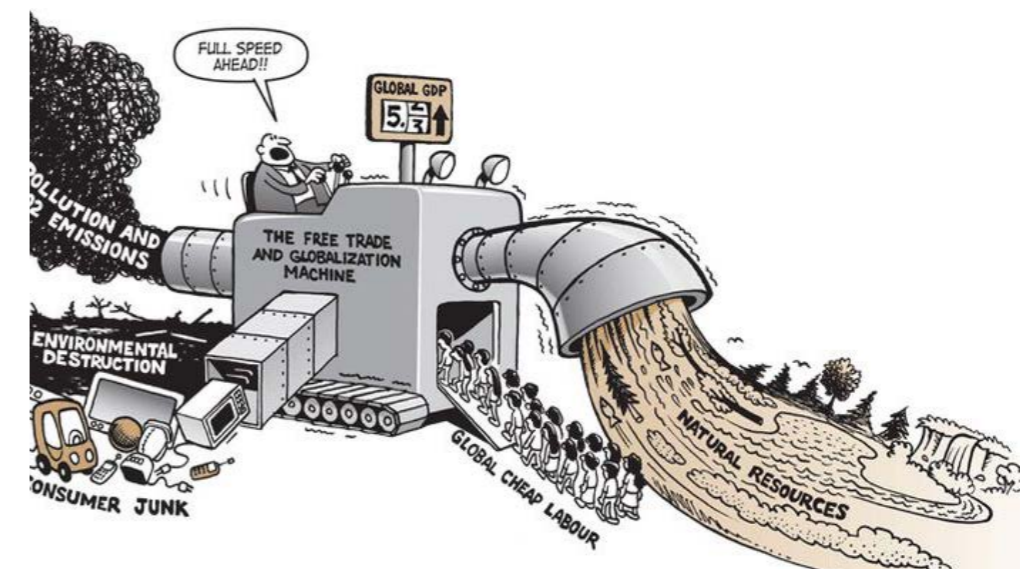


Figure 1: General view the era of "globalization" process. The picture shows the general concept of the degradation of the natural resources and the contamination progression.

Source: <https://www.pinterest.com/ateamb/globalisation-and-the-environment/>

Since the beginnings of urban developments in Colombia, after the conquest, the environment has always struggled with human activities. In the 19th century, wood was used as energy input; as a consequence, forests started to present serious reduction over this activity. In the 20th century, wood consumption was reduced and replaced by coal which was the innovation in energy inputs by then. To compensate for the wood reduction, the territory was planted with pines and eucalyptus that transform the configuration of the landscape. (Avellana-da Cusara, 2012: 250) Moreover, emissions of contamination started to be present in the environment. Still it wasn't important enough to do something about it and it has continued to extend not only over forests but also water structures: rivers, ravines and canals. In the 21st century, the contemporary energy input is given by hydroelectric plants which have brought environmental impacts as well and also given to the large urban development of the capital city: Bogota. As a result, the surrounding municipalities have exploited in an immense urbanization without planning, which has dragged not only problems over the environment but also over the social dimension in every populated area in the Sabana de Bogota. Nowadays, the impacts are so disastrous in the Bogota River basin that human activities are defined as "the destructive hand" and rivers are determined as "open sewers" (Guerrero Legarreta, 2010: 121, 123) given to all the pollution contained along the natural system structure. The outcome of this part of the research illustrated the history of the water structures and in general the natural resources along time.

3 Water structure: ally or enemy?

In the following section I describe how the current problem is going forward. The Bogota River was catalogued as an ecological catastrophe in the year 2004. The damage caused by urban and industrial development deteriorated dramatically the water structure. "Urbanization has changed the face of the Earth and, incidentally, the biodiversity that is over it." As it was mentioned before, the failure in the model of governance has collapsed given to a centralized control. This type of management or guidance has been losing its direction for the past twenty years, driving the resources and its population to a non sustainable and balance life. Therefore, the importance of proposing an innovative model of governance is imperial for the territory.

Transforming an economically productive area that bounces into their natural resources destroying the ecosystem by which it is surrounded, into a sustainable model which demonstrates a structured and self-sufficient region, has become the innovative method of protecting the biodiversity contained around the world. In history, earliest developments such as Mesopotamia, Egypt, India or China were called river civilizations given to their closeness to their water structures. Consequently, Tigris together with Euphrates, the Nile, Indus and Yellow Rivers, locations where these civilizations took place. The riversides had great fertile land which was convenient to irrigate. As a consequence, it caused important developments in agriculture and the economic growth brought great changes, starting with population growth which converted small villages into large cities. On the other hand, contemporary cities with massive urbanized areas, like London or Paris, have grown rapidly alongside a water structure; or Rotterdam where the river is the principal transport road for the productiveness of the city highlights the value of this water structures which happen to be the heart and backbone of each city. Although, in cases such as Colombia the situation is not similar if the intention is to illustrate the properties and qualities of the natural water structure along with urban development.

For this reason, it is urgent to emphasize that the model of development focused on a centralized structure has converted the region and its configuration in a disastrous government. Instead, the applicability and implementation of a decentralized structure could bring the region out of the black hole and transformed it into the first productive area in the country that has enormous economic growth in a sustainable and self sufficient manner with the environment that leads to a healthy and happier population. "Many have argued that a key ingredient in improving the quality of urban governance is decentralization and this has clearly been a major ingredient in many development strategies since the 1980s." (Gilbert, 2015; Campbell, 2003; Tendler, 1997; UN-Habitat, 2009; World Bank, 1992). The product of this study helped me realize the dimension of the problematic and the different scales that are involved. If something is to be done is to take the water system as an ally of planning and development not as an enemy that is disturbing the territory because is part of it.

4 The region that lost the memory about the force of the river and the influence of nature

In the following section I explain the variety of concepts involved in the research and definition; as well as the

identification of several key elements that are relevant to point out. The principal pressure over the region and the natural system structure is urban growth. Because of the rapid and extensive population growth in the Bogota River basin other flows such as food production, waste generation and energy consumption have exploited, creating a vicious circle in which the environment receives anything but negative results and consequences. That is to say, that every day more water is needed to consume, to use for agriculture and generate energy; more land is needed to produce and cultivate food, more land is employed for landfills and storage of waste in an unsustainable way. And the environment doesn't receive anything back. Human activities only provide extraction, damages and destruction without reparation. The system is been working in a dysfunctional structure which carries more and more pressure over the natural system structure.

Now, talking about urban growth; urban development and urbanization in the specific context of the Bogota River basin, are important to highlight because they outline some differences. Why are they included and underlined? Well in the research done under this theme about the water structure in an economically productive area I realized that these terms are primordial for the understanding of the matter but also because these terms are usually misinterpreted. To begin; based on a study made of Bogota's progress along the last 20 years; urban development in my opinion has to deal with the development and improvement of its urban areas. One of many objectives is to reduce poverty, expand the access to basic services and make the cities economically more productive and environmentally more liveable. This includes infinitive of fields which involves: economy, infrastructure, housing, land development, governance and management, between others.

On the other hand, urbanization is related to the increase in the population of cities and towns. This means that spatially their characteristics change going from rural to urban areas; only because of population growth. Without taking into account any kind of improvement in infrastructure or services. These transformations are highly present in municipalities along the Bogota River basin, which have few territorial planning and just absorb rural terrain and emerge in newly urban areas. This is given as consequence of the rapid urban development of the capital city and the need of new areas to receive and accommodate population. This is when they start to urbanize without planning and the natural structure starts to be transformed and destroyed changing the use of the soil. As a conclusion, in my concept urban development causes urbanization.

The two main elements principally affected in the natural system structure of the river basin are: the water and the soil. They have powerful properties of self-regulation and interaction among human activities. Unfortunately, the nature of the hydrological cycle from where communities receive almost everything to exist is having a conflict with the increasingly and destructive modern human activities to supply their needs.

Retaking the definition contrast, it is important to compare also the terms ecology and environment. Then, ecology refers to how ecosystems function and the relationship of plants and animals to their physical and biological environment; despite the term environment that is mainly implemented to the human interaction with the natural structure. So on one hand there is the ecological structure of nature and how it works and then how it becomes environment when it is intervened and extracted by human activities. These definitions were relevant for the analysis and further operation of the systems involved in the river basin. The ending of this section showed the thin boundary between what is known and what has been learned and remembered through time. The things we think are not relevant anymore.

4.1 Rescue of a forgotten fragment of the geography

In the following subsection I demonstrate in quantities some issues that are being affected inside the model of governance and the dramatic excessive use of the resources. The actual model of Colombia and the Bogota River basin presents in social terms enormous population growth; in economic terms the productivity is organized in an extractive model which has high dependence on the intensive extraction of natural resources and finally in cultural terms the agriculture has been highly tech to produce more in reduced time. In addition, rural areas don't offer chances to grow and improve anymore; there is lack of educational system which leads for no opportunities and no jobs; 16.5% of the housing contained in the countryside has limited or no access to public services (water, electricity and sewage). As a result, population migrates to big cities - urban areas.

These pressures have saturated the system and have demonstrated the principal issues in the failure of the model of governance and development. Therefore, the urgency on recovering the natural system structure on the river basin is significant and essential. Despite the variety of studies made for the Bogota River, the

quantity has not been granted in quality to consider them. These documents have principally emphasized on the study of the water resource or the soil quality, but not in the joined natural system structure that includes both and other physical elements. Overall they constitute the cycle by which human activities are benefit from. There have been numerous proposals for protection and recovery of the ecosystem. However, nothing has been achieved from the programs in contribution. For this reason, the problem is not about the amount of proposals made but on the implementation of the ones created. This is the principal failure which involves not only the population growth but the flows mention before in this specific case in a regional scale.

Furthermore, the Bogotá River basin is not the only one that involves a natural system structure. Many other water structures in the country present similar situations in which the environment and the resources are taken over. For example, the Magdalena River is also a productive area, one of the biggest in Colombia. The Bogotá River has a length of 380 Km approximately; its basin has around 6.000 Km². On the other hand, the Magdalena River has around four times more the length of the Bogotá River; approximately 1.500 Km. Its basin has 250.000 Km² that corresponds to 24% of national territory. Both give vital economic contribution in the GDP of the country. The comparison is huge, although it could be key to draw attention to given that if a progress could be done in the Bogotá River basin, maybe in the future it could be implemented in the Magdalena River as well. The Magdalena River presents in its environment pollution and deforestation given to the industrial development of the country. The watershed claims its lost space which is also relevant and urgent need to develop projects that protect the environment and the preservation of the natural resources along the river. In conclusion, the benefits reached from this different model of governance could not only be seen in a regional perspective where the Bogotá River passes through forty six municipalities in one department; but also in the long term for a national point of view where the Magdalena River passes through eighteen departments.

Over populated regions, with a sustainable model, in balance with economic, social and environment fields and with a solid working model of governance, brings the opportunity of innovation capacity plus political power. The ecosystems preservation and protection of biodiversity could improve the physical and mental health of society. “The innovation lies not so much in developing new infrastructural technologies but to work with what we already have. The results are often far cheaper and more sustainable as well.” (Elmqvist. 2012). This is the path to accomplish and reach the top. The United Nations declared the Biodiversity decade between the years 2011 and 2020. This implies the conservation of: natural corridors, parks and any kind of green areas which are defined as carbon sinks; “natural or artificial reservoirs that accumulate store or absorb carbon from the atmosphere and contributes to reduce CO₂.” The product of this exploration proved the reclaiming scream of the environment of recovering back its space and place in the natural system structure. Rescuing its values and physical structure is the most innovative gift that can be given.

5 Water is dignified when it runs over the landscape and not when it’s confined to the underground

In the following section I research and give details about two selected referents in the European context. There are two examples of regional governance that are relevant to stand out, given to its improvements along the spatial strategies they have implemented in social, environmental and economic fields. The first is the regeneration of the Emscher River or RUHR Region Basin. Originally it was a pastoral landscape; then between the 1800s and 1900s century it was Europe’s important site of industrialization. It was one of the most polluted and environmentally devastated regions of the world. As a consequence it got environmental degradation been called as the sewer for human and industrial waste. There was a conflict between environmental and development goals. The main objective was to encourage the ecological, economic and urban revitalization of the Ruhr Valley and the Emscher River. This made to re-establish connectivity between green spaces of the area creating a robust ecological system. The crucial vision was seen as a green connector with a cohesive green infrastructure. So the new model of governance was changed, transforming the region in a polycentric urban development which is more sustainable. Smaller towns are linked together avoiding the multiple problems of sprawling. This was decided to preserve the connectivity with nature and replaced the industry with housing, commerce, culture, art, offices, between others. This intervention inspired a new urban development that reduced the pressure to urbanize into green areas by transforming former industrial areas. It was known as the sustainable - oriented regeneration.

Second, the Zuidvleugel or “south wing” is the group of cities and towns in the south west of the Randstad in

the province of South Holland in the Netherlands. The background in territorial governance is structured in a decentralized unitary state. They have one principle: co-government. “The central government involves the provinces, the municipalities, or both in the formulation and implementation of its policies.” In this model of governance, the city regions are called Joint Arrangements Act Plus or WGR - plus regions. These areas are characterized by having one large city surrounded by municipalities that share or become part of the urban system. These city regions have responsibilities over fields that cover environment, transport, housing and regional economy.

From these two examples, there are different circumstances and contexts. Although, they are cases in which they illustrate the alternatives given for every situation. The environmental ruin in the first with the recovery of its water structure and the restructured model of governance for future developments; plus a decentralized structure in the second for balance and coherence in the coordination of its spatial planning and its economic, social and environmental responsibilities.

The result of this piece of the research left some questions. What we can learn about them is how to confront environmental threats and opportunities that we have over a water structure. In the case of the Emscher River they had to hit the bottom to understand the conflict presented. How much deeper do the Bogotá River needs to go so that it hit the behaviour and structure of governance in the region? And in the case of the Zuidvleugel and generally in the Netherlands, water has always been part of its territory; their planning goes in line with the water resource. Why do we need to discover that the water is precious and needed when it is almost gone?

6 Conclusion: recover what has disappeared; Recreate the region from the memory

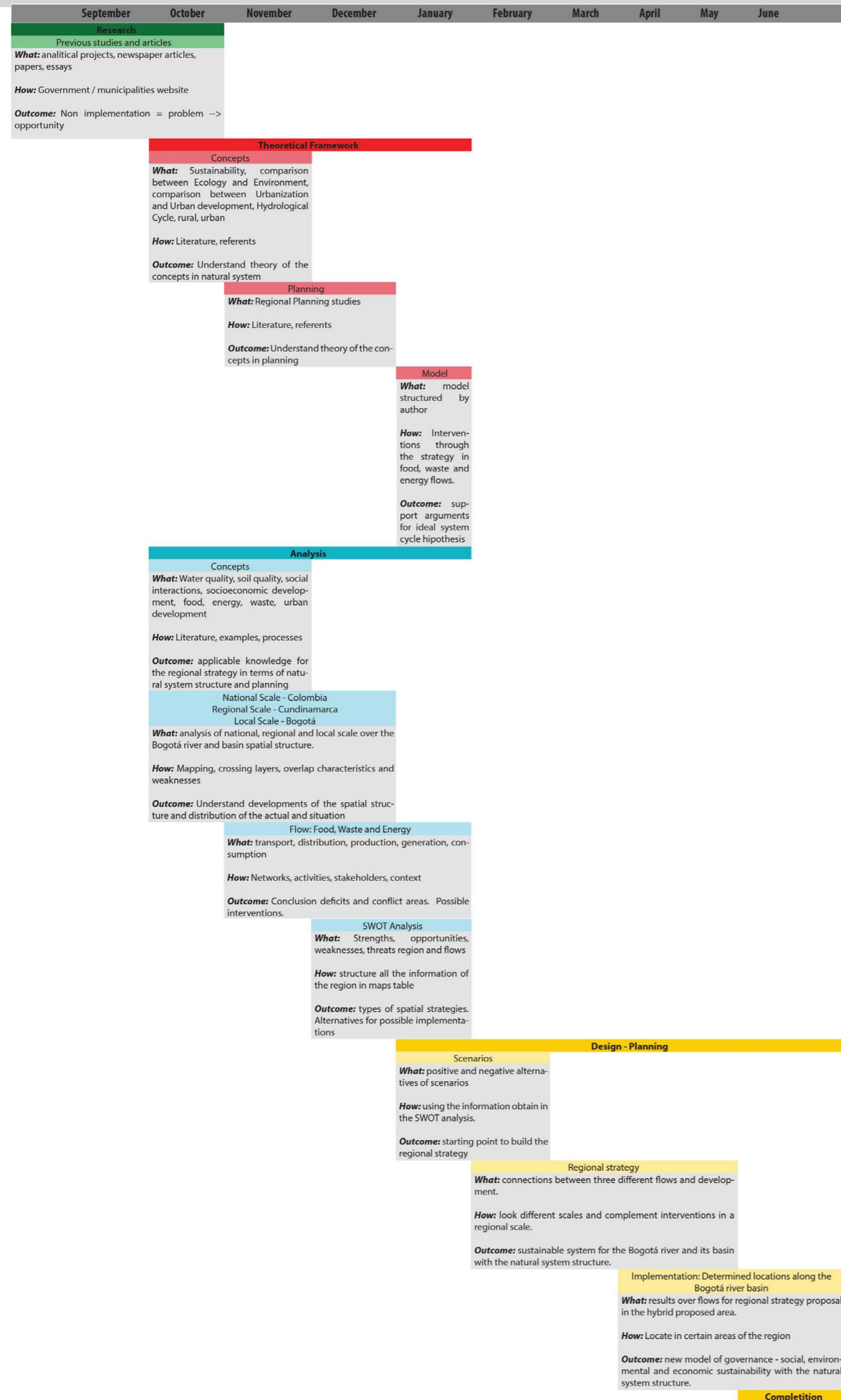
As a conclusion, taking as referents these European projects and talking about the Colombian context in my opinion I could say they are relevant. I made a comparison between the environmental problems in these different cases. Both in Germany and Colombia involved industrial development and growth plus sewages that brought massive problems over the water structure mixed with waste management. This gave huge impacts over the natural system structure which was one of the principal problems. On the other hand, the goal of the RUHR Region Basin is: urban development, social, cultural and ecological measures as the basis for economic change in an old industrial region. It could be shared with the Bogotá River basin which is recovering the environmental structure. And highlights the importance of improvements along agriculture, waste management, clean tech energy generation and urban development in this productive region. Which altogether with the natural system structure could work as a self sustained system. “Cities have enormous potential in taking better advantage of the biodiversity located in, around and flowing through them.” (Elmqvist. 2012).

By the other hand, the model of governance implemented in Zuidvleugel in the Netherlands has shown up the significance of having a decentralized structure in the region. This would help in the spatial planning, developing interventions that could generate opportunities in the biggest cities and enhance the connections between them to create a more balance and sustainable system. Build a network with all the qualities that the productive region has including activities in agriculture, waste management and energy generation. That as a consequence is going to bring urban developments that together with the environment could transform the territory in a balanced self sufficient region.

Moreover, the motivation on this intervention in the social point of view is to stand out the importance of the Bogotá River and its basin for the people in the region. The magnitude of the explosion and contamination of the natural resources doesn’t compensate the protection and balance in the recovery of the area. Prioritize and create interest in the generation of a sustainable system structure through collaboration, cooperation and protection habits. Contribute to the generation of a sustainable system structure for a healthier quality of life and improved habits for upcoming generations of people. All the factors mention before that have opportunities for being upgraded are the key ingredients or my strategy to develop the innovative model of governance that is needed and can give the environment the value and position that it deserves.

Section 6

Timeline



Literature

Avellaneda Cusarí, J. (2012). *Gestión ambiental y planificación del desarrollo: el sujeto ambiental y los conflictos ecológicos distributivos*. Bogotá: Ecoe Ediciones.

Baena Jaramillo, M.P. (2015, July 15). *Colombia urbanizada y biodiversa*. El Espectador. Retrieved July 15, 2015, from <http://www.elespectador.com/noticias/medio-ambiente/colombia-urbanizada-y-biodiversa-articulo-572840>

Couch, C. & Fraser, C. & Percy, S. (2003). Urban regeneration in Europe. *The Ruhr: from Dereliction to Recovery* (pp. 149-165). Oxford: Blackwell Science.

El Espectador, Bogotá. (2012, January 5). El relleno sanitario Dona Juana debe desaparecer El Espectador. Retrieved December 2, 2015, from <http://www.elespectador.com/noticias/bogota/el-relleno-sanitario-dona-juana-tiene-desaparecer-articulo-319699>

El Espectador, Dejusticia, Patrimonio Natural. (2014, August 11). ¿Cuáles son los municipios que contaminan el río Bogotá? *El Espectador*. Retrieved September 11, 2015, from <http://blogs.elespectador.com/el-rio/2014/08/11/cuales-son-los-municipios-que-contaminan-el-rio-bogota/>

El Espectador, Nacional. (2015, August 3). Más de 19 millones de hectáreas ricas para agricultura estarían a punto de perderse. *El Espectador*. Retrieved August 3, 2015, from <http://www.elespectador.com/noticias/nacional/mas-de-19-millones-de-hectareas-ricas-agricultura-estar-articulo-576828>

Guerrero Legarreta, M. (2010). *El agua*. FCE - Fondo de Cultura Económica.

Internationale Bauausstellung Emscher Park. (n.d.). Retrieved October 12, 2015, from http://www.iba-emscherpark.de/pagelD_2507086.html

Isocarp, (2014). *Water and cities managing a vital relationship*, Poland: Shi Nan, China, Jim Reilly & Fran Klass, USA.

Medina, M. A. (2015, September 15). *El campo de Colombia se está envejeciendo*. El Espectador. Retrieved September 17, 2015, from <http://www.elespectador.com/noticias/economia/el-campo-de-colombia-se-esta-envejeciendo-articulo-586377>

Overview of the Ruhr Metropolis. (n.d.). Retrieved December 15, 2015, from <http://www.metropoleruhr.de/en/home/ruhr-metropolis/data-facts.html>

País. (2014, March 29). Río Bogotá le pasa factura al gobierno. *Revista Dinero*. Retrieved September 20, 2015, from <http://www.dinero.com/pais/articulo/contaminacion-del-rio-bogota/194085>

Pineda, C. J., & Giraldo Samper, M. (2009). *Agua y vida en Colombia: apuntes y conclusiones foro Paipa 2007*. Politécnico Granacolombiano.

Robinson, J. (2011), *Cities in a World of Cities: The Comparative Gesture*. International Journal of Urban and Regional Research, 35: 1–23.

Spaans, M., Stead, D. (2013, June). *Case Study: Integration between public transport and urban development in the metropolitan region of Rotterdam-The Hague*. Territorial Approaches for New Governance. Delft: Delft University of Technology.

Secretaría de Planeación, Departamento de Cundinamarca, (2010). *Plan de Desarrollo Cundinamarca*. Retrieved October 20, 2015, from <http://www.cundinamarca.gov.co/wps/wcm/connect/7f2338ad-3f47-4165-9304->

'Schieland en de Krimpenerwaard' is a regional water authority. "n.d." Retrieved October 21, 2015, from <https://www.schielandendekrimpenerwaard.nl/english-1>

Shaw, R. (2002). "The International Building Exhibition (IBA) Emscher Park, Germany: A Model for Sustainable Restructuring?". *European Planning Studies*, Vol. 10, No. 1

Sundseth, K. & Raeymaekers, G. (2006). *Biodiversity and Natura 2000 in Urban Areas – Nature in Cities across Europe: A review of key issues and experiences*. Brussels: Ecosystems Ltd

United Nations, CBD COP11, (2012, October). *Cities and biodiversity. Rich biodiversity CAN exist in and around cities*. Retrieved January 5, 2016, from <http://www.stockholmresilience.org/21/research/research-news/10-4-2013-rich-biodiversity-can-exist-in-and-around-cities.html;jsessionid=EE27EC423400B556BADBA81652B70D-B6?state=viewUnsubscribe&sv.url=12.33db2ae01355ec8e8f21d36>

Walljasper, J. (2009, October 27). *The Victory of the Commons*. Retrieved January 11, 2016, from <http://www.yesmagazine.org/new-economy/the-victory-of-the-commons>

References

1. Source: World Map, n.d. photograph, viewed 30 September 2015, <<http://wurstwisdom.com/picsbehd/world-map-outline-printable-with-countries>>
2. Source: Shadowxfox, 2009, Mapa de Colombia (orografía), photograph, viewed 20 September 2015, <[https://commons.wikimedia.org/wiki/File:Mapa_de_Colombia_\(orograf%C3%ADa\).svg#filehistory](https://commons.wikimedia.org/wiki/File:Mapa_de_Colombia_(orograf%C3%ADa).svg#filehistory)>
3. Source: Rio Cano Cristales, n.d. photograph, viewed 27 November 2015, <<http://ovationdmc.com/country/colombia/>>
4. Source: Amazon River , n.d. photograph, viewed 27 November 2015, <http://www.depaisajes.com/detalle_imagen.php?id_imagen=71&RutaAtras=http://www.depaisajes.com:80/buscador.php?criterio=amazonas>
5. Source: Río Magdalena, n.d. photograph, viewed 27 November 2015, <<https://democraciaenlared.wordpress.com/2015/04/17/que-buscan-los-chinos-en-el-magdalena/>>
6. Source: Páramo de Guacheneque, n.d. photograph, viewed 27 November 2015, <<http://ridingcolombia.com/home/index.php/es/blog/1-blog/72-discover-the-paramo-an-exotic-mountain-destination-in-colombia>>
7. Source: Landscape, Ramirez, D. photograph, viewed 15 December 2013
8. Source: Salto del Tequendama, n.d. photograph, viewed 27 November 2015, <<http://www.culturarecreacionydeporte.gov.co/la-casona-del-salto-de-tequendama>>
9. Source: elmundo.com , n.d. photograph, viewed 27 November 2015, <https://noticiasorienteanioqueno.files.wordpress.com/2013/02/domingo_14_10_2012eco-crisantemos-6001.jpg>
10. Source: FINKEROS , 2015. photograph, viewed 27 November 2015, <<http://abc.finkeros.com/holstein/>>
11. Source: Landscape, Ramirez, D. photograph, viewed 15 December 2013
12. Source: Southern Savers, n.d. photograph, viewed 27 November 2015, <<http://www.elcondimentariodemargarita.com/2012/09/donde-comprar-y-comer-organico-en-el-pais/>>
13. Source: Crops, n.d. photograph, viewed 27 November 2015, <http://www.larepublica.co/agronegocios/actualiza-el-cultivo-de-hortalizas_26607>
14. Source: Skyscrapercity La sabana, Ramirez, J. L. photograph, <<http://www.skyscrapercity.com/showthread.php?t=566812&page=14>>
15. Source: Newspaper cut, nd. photograph, viewed 11 January 2016, <<http://oab.ambientebogota.gov.co/es/con-la-comunidad/comentarios/pacto-para-conservar-y-recuperar-el-rio-bogota>>
16. Source: Newspaper cut, nd. photograph, viewed 11 January 2016, <<http://movimientomira.com/incertidumbre-por-rio-bogota-atraso-en-obras-y-recursos-ponen-en-duda-la-recuperacion/>>
17. Source: Newspaper cut, nd. photograph, <<http://blogs.elspectador.com/el-rio/2014/08/11/cuales-son-los-municipios-que-contaminan-el-rio-bogota/>>
18. Source: Marketplace Chia, 2012. photograph, viewed 30 November 2015, < <https://www.flickr.com/photos/dyetransfer/6870424045>>

19. Source: Marketplace Chia, 2012. photograph, viewed 30 November 2015, < <https://www.flickr.com/photos/macamahandi/6879199497>>
20. Source: El Tiempo. Corabastos, 2015. photograph, viewed 30 November 2015, < <http://www.corabastos.com.co/>>
21. Source: Corabastos, n.d. photograph, viewed 30 November 2015, <<http://www.eltiempo.com/bogota/imagenes-aereas-de-bogota-asi-se-ve-el-suroccidente-desde-el-cielo/16423440>>
22. Source: Exito, n.d. photograph, viewed 30 November 2015, <<http://www.rutanoticias.com/almacenes-exito-a-la-baja-su-accion-pero-busca-exito-en-su-expansion/>>
23. Source: Carulla Smartbrands, n.d. photograph, viewed 30 November 2015, <<http://www.smartbrands.com.co/carulla>>
24. Source: Trucks congestion, n.d. photograph, viewed 12 January 2016, < <http://www.lafm.com.co/noticias/paro-nacional-habilitan-paso-144828>>
25. Source: Trucks traffic, n.d. photograph, viewed 12 January 2016, <<http://www.colombia.com/actualidad/nacionales/sdi/36771/unos-400-camiones-articulados-salen-en-caravana-de-protesta>>
26. Source: Trucks traffic, n.d. photograph, viewed 12 January 2016, <http://www.larepublica.co/el-transporte-de-carga-hacia-venezuela-ha-ca%C3%ADdo-50_150091>
27. Source: Road infrastructure deterioration, n.d. photograph, viewed 12 January 2016, <<http://www.elpais.com.co/elpais/valle/noticias/invertiran-50000-millones-en-tres-vias-del-valle-del-cauca>>
28. Source: Air contamination, n.d. photograph, viewed 12 January 2016, <<http://agenciadenoticias.unal.edu.co/detalle/article/premian-investigacion-de-la-un-sobre-contaminacion-del-aire.html>>
29. Source: Region map Paris, n.d. photograph, viewed 12 January 2016, <<http://www.rungismarket.com/en/rouge/rungisenvir/index.asp>>
30. Source: Rungis Market Paris map, n.d. photograph, viewed 12 January 2016, <http://www.rungismarket.com/en/rouge/coeur_reseau/index.asp>
31. Source: Road infrastructure Rungis Market Paris, n.d. photograph, viewed 10 December 2015, <<https://www.labovida.com/institutionnel/magasins/rungis.php>>
32. Source: Rungis Market Paris, n.d. photograph, viewed 10 December 2015, <<http://fxcuisine.com/Default.asp?language=2&Display=32&resolution=high>>
33. Source: Archivo / EL TIEMPO, 2014. Diagnóstico elaborado por la CAR se detectó que la contaminación del río Bogotá es elevada, photograph, viewed 25 October 2015, <<http://www.eltiempo.com/bogota/fallo-para-salvar-al-rio-bogota/13757455>>
34. Source: fundacion alverde vivo, 2015. contaminación del río , photograph, viewed 13 December 2015, <<https://www.flickr.com/photos/fundacionalverde vivo/6193185200/>>
35. Source: Bohorquez, N. 2010, Río Bogotá, photograph, viewed 24 September 2015, <<http://contaminacionriobogota.blogspot.nl/>>
36. Source: Greenandres, 2011, El rio bogota, photograph, viewed 15 October 2015, <<http://www.taringa.net/posts/info/13047139/Los-10-rios-mas-contaminados-del-mundo.html>>
37. Source: Contamination Río Bogotá, 2015. photograph, viewed 13 December 2015, <<http://sostenibilidad.semana.com/medio-ambiente/articulo/rio-bogota-contaminacion-tregua/32929>>
38. Source: Sabana de Bogotá, 2015. photograph, viewed 12 January 2016, <<http://fenixconstrucciones.com/blog/el-esplendor-de-la-sabana-de-bogota/>>
- 39.
- 40.
41. Source: Crops, 2013. photograph, viewed 10 December 2015, <<http://www.teorema.com.mx/sostenibilidad/desastre-natural-agropecuario-en-cuatro-entidades/>>
42. Source: The core subsystems in a framework for analyzing social-ecological systems, 2013. photograph, viewed 10 December 2015, <<https://www.flickr.com/photos/ricstephens/8752892340>>
43. Source: Tragedy of the commons, 2011. photograph, viewed 10 December 2015, <<https://mpiptova.wordpress.com/2013/10/09/iii/>>

