# ANNEX A – QUALITATIVE MATRIX OF ISSUES (QMI)

## A.1 Matrices

In order to support the identification of the urban water issues was prepared a Qualitative Matrix of Issues (QMI). It is an extensive description of the problems which could be found in developing countries cities related to urban waters services. This is the first insight of the matrix which should be updated including future experiences.

There are two groups of matrices: Services matrix group; and Goals matrix group.

There is a natural interconnection of both groups, since as consequence of the lack of water services there are impacts on the main services goals, which are the Impact on the society and in the environment. This separation was made because is important to understand the separation of services processes and the identification of the impacts in the end objectives.

There are structural issues and specific issues. Structural issues are mainly those problems which require global solution from a big picture of the issues, such as Lack of Water and Sanitation Plan. Specific issues are aspects specific of each service such operational aspect of a treatment plant. In this document QMI presented more structural issues, not specific.

The matrices presented below were constructed by main aspects in each one of the above themes and the identification of the issues inside of it together with the interconnect aspects. Below is presented a summary of the identified issues presented in the matrix.

### A.1.1 Planning and Urban Services matrix QMI

In the Tables A.1 to A.7 is presented QMI for each theme and some description of this issues is presented below by subject.

**Urban development**

In urban development the following aspects were identified (table A.1):

*Urban development Master Plan (UDMP)*: This is the main tool for soil use planning in the city. It plans how the population will going to use its space for service, commerce, industrial and housing. The main questions are: Is this a UDMP? Is this new or old? Is this UDMP enforced? in what proportion? Is this reflecting the urban water services and environment?

*Unregulated or informal occupation:* Low income population used to develop long term unregulated occupation. What is the proportion of this occupation in the city? Is this any plan for this population? Is the population vulnerable? The population can be vulnerable to floods, water transmitted diseases or others. In this urban waters facilities in these areas?

*Urban expansion:* is related how the city is growing in the space and time. Usually the tendency is to grow in its borders by migration and decrease downtown by deterioration of space use by drug traffic and gangs which decreases the propriety value. The main questions are: Is the border expansion important? Is this done by unregulated development? in what proportion? The reasons can be related to the lack of income and social pressures, invasion of public areas, lack of investment in infra-structure. Impacts are in the contamination of water sources of the city.

Table A.1 Urban development

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **Main Aspects** |  |  |  | ***Integrated*** |
| ***Sub-topiccs*** | ***Legal*** | ***Management*** | ***Assessment*** | ***Economic and social*** | ***Water*** | ***Environment*** | ***Main aspects*** |
| **1.1 Urban Planning**  Urban Master Plan | There is not a Master Plan or the existing is outdate | The Master Plan is not enforced | There is not a monitoring of the urban development and problems | There are two much pressure for construction outside of Plan limits | Urban Plan does not take into account the water capacity and sustainability | There is not environment aspects in the Master Plan | Lack of regulation in a sustainable urban waters development |
| **1.2 Informal occupation**  Proportion of informal/slum areas | There is not a policy for the informal population | Informal population is outside of the city management | There is not assessment of the population and conditions | The population is vulnerable: death and health | Lack of most of the water services in the slums areas |  | High impacts on urban waters in small spaces |
| **1.3 Urban Expansion** | High proportion of unregulated urban expansion | There is not management actions in mitigation of unregulated developments | Lack of assessment on the city expansion | Invasion of public and private lands by the poor; lack of income | Lack of infrastructure: paved streets, energy, water services | Contamination of water sources and environment | Impact on the water supply and increase impacts related to urban waters services |
| **1.4 Governance at local and Metropolitan Level** | Lack of legal : local level and instruments for integrated planning in the Metropolitan Areas | Bad management: at local levels and lack of metropolitan coordination | Lack of assessment of integrated impacts at metropolitan and local levels | Weak institutions, lack of investments and funds | Lack of qualification and knowledge in planning |  | Lack of public participation |

*Governance:* Is related how de urban development is management and regulated in the city. Usually the main issues are related to the: lack of legal instruments which is used to implement the policies. For instance there is an Urban Plan, but no legal instrument to implement it; Bad management: There is not goals, investments or efficiency on the services; Weak institutions and lack of funds; lack of political will and law enforcement; lack of qualification and knowledge. The implication for the other services is the difficulty in the control of the soil use and implementing the management of the urban water services.

**Water Supply**

In the table A.2 is presented the main aspects related to Water supply which are:

*Water availability:* it is the quantitative limitation to water availability for water supply in the city. The limitation and issues related to this aspect are: Lack of information about the water sources; the increase demand for the existing water yield; the decreasing capacity of the existing works by its design live or lack of maintenance; uncertainty of the water yield by change watershed conditions, climate change or climate variability; Lack of investments in increasing water availability; Irregular occupation on the municipal basins; Contamination of water sources: urban and rural pollution sources

The water source contamination can happen by loads (point pollution) from industrial, commercial and housing developments, if the effluents were not treated in a level which the water systems has the capacity to absorb. The loads could be from stormwater and agriculture lands (non-point pollution), contamined sediments and solid waste and land fill, which can produce long term contamination of aquifer and toxicity in surface systems such lakes and rivers. The main cause of that is lack of sanitation services and the impacts are in all other services, health and environment.

*Water Access*: the identified issues related to water access by the population are: lack of information of about the lack of water supply; Lack of projects for improvement of the water access; contamination at local level (surface and groundwater) when population uses alternatives sources; lack of education and hygiene; risk of spreading diseases; Lack of investments and funds in water access; Population without capacity to pay for the services and Reduction of water table by over-exploration

*Water Treatment and Storage:* Storage can be an issue when the system does not have enough volume for regulation during draughts resulting in lack of water. There are scenarios where the Water Company increase the treatment capacity, but does not increase the water yield or regularization from water sources, which results in lack of water during draught because the system has a demand greater than its source can supply.

The other main issues are: Lack of international standard treatment procedures; Lack of monitoring of the water supplied by the source’ and water quality treated; Lack of auditing in the procedures in water treatment, distribution and unsustainable disposal of the residuals from treatment. The quality of receiving water could not have conditions which require measures in the treatment in order to attend the water quality standard for the population. A common scenario is when the water source is contamined by nutrients, resulting in eutrophication and toxicity in water.

Table A.2 Water supply issues

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Issues** |  |  | **Potential Source** | **of the problems** |  |  | **Integrated** |
|  | ***Information/***  ***Institutional*** | ***Plan/projects*** | ***Risk*** | ***Economic*** | ***Social*** | ***Environment*** | **Main aspects** |
| **2.1 Water availability**:  Quantitative limitation on the water an access (*Lack of water*). | Lack of information about the water sources | Increasing the demand or lack of storage for regularization | Lack of water sources; risk on water yield: Climate variability or climate change | Lack of investments in increasing water availability | Irregular occupation on the municipal basins | Contamination of water sources: urban and rural pollution sources | Conflict with other water uses in the basin |
| **2.2 Water Access** | There is not information related to lack of water access and use | Lack of projects for improvement of the water access | Contamination at local level; lack of education and hygiene; risk of spreading diseases | Lack of investments and funds in water access | Population without capacity to pay for the services | Reduction of water table by over-exploration | Lack of sanitation which impacts all other services, health and environment |
| **2.3 Water Treatment and storage**  Limitations of water services | Lack of standard monitoring inflow and treated water quality | High demand for the treatment capacity and demand | lack of treated water or international standard treatment procedures | Lack of investments in increasing water treatment | No safe water | Unsustainable disposal of the residuals from treatment | Quality of water services |
| **2.4 Water distribution**  Limitation of water services | Intermittence on the service | Lack of network expansion;  High proportion of network losses | Contamination in the network and in house reservoirs | Lack of investments in increasing water distribution | No safe water | Contamination in the network by intermittence | Quality of the service |
| **2.5 Water Governance** | Lack of political will and weak institutions; lack of regulation | Lack of plans and projects | Bad services and lack of supply | Lack of investments and cost recovery | Lack of capacity of payment for the services; | Lack of water and environment standards | Difficulties in integrate policies |

*Water Distribution:* is related to network and deliver to the end user. There are many issues related to this component in the water supply assessment which are*: Intermittence on the service*, when energy, treatment or water availability is limited, together with higher demand, the intermittence can be higher; *High proportion of network losses*: when the network is old or with construction problems or when there are use of water without payment; *Contamination in the network*: it usually is linked to intermittence when the networks losses pressure and allow contamination of the water supplied; *Contamination in house reservoirs*: it is very common to use house reservoirs for regulate the water for a couple of days but it could be a source of contamination when it is not often cleaned. Usually it is not related to the service distribution but is user responsibility, but for uneducated population could be a source of diseases.

*Governance in* Water supply: Governance is strongly dependent of the service regulation. The usual issues related to management are lack of: project, plans and investment, which results and lack of coverage to attend the demand. It could be related the lack of cost recovery on the services and investment, which increase the difficulties of investments and is related to the lack of political will, resulting in weak institutions with weak technical capacity. It usually is developed when the there is not an independent auditing of the water services.

**Sanitation**

In the table A.3 are described the main issues based on the following aspects:

*Sewage in the source:* The main issues are related to: (i) when there is not sewage network, septic tank is often used. It can be source of contamination in the upper layer of the soil, where the population may uses for pump water for supply. Other critical scenario is when the soil does not have capacity of infiltration or the water table is too high. In this situation, sewage flows in the streets or through groundwater; (ii) When there is sewage network and the houses are not be connected to it, since the population does not want (or does not have capacity) to pay for the service. These scenarios results in stormwater contamination.

Sewer Networks: there are a few issues often found such as: separate network with sewage flowing in drainage and stormwater in the sewer network; Bad design and construction, frequent spill to the streams, collapse of the network by erosion of corrosion, bad smell and contamination during floods.

Sewage Treatment: Treatment of sewage could be developed in different levels and water quality parameters conditions, depending of the receiving water capacities for receiving it. For organic source of sewage and normal streams with some dilution capacity the secondary treatment with reduction of DBO and coliform usually are the standard design, but for receiving waters such as reservoir and lakes a tertiary treatment is required because of the risk of eutrophication.

The main issues are related to: lack of treatment; low load treated and efficiency; unsustainable residual treatment and disposal; treatment interruption and sewage flowing to the river; bad smell for neighbors.

Table A.3 Sanitation

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Issues** |  |  | **Potential Source** | **of the problems** |  | **Integrated** |
|  | ***Management*** | ***Technical*** | **Economic** | **Social** | **Environment** | **Main aspects** |
| **3.1 Sewage at the source** | Lack of house connection to network | Low infiltration and high load with spill to drainage | Population does not want connections to network to avoid the payment | Poor population without capacity to pay for services | Contamination of wells and neighbor areas | Contamination of surrounding and water sources |
| **3.2 Sewer network** | Bad design and construction;  Lack of maintenance | Separate system with Stormwater in the network; Collapse due to external effects such as erosion | Lack of networks due to lack of funds and cost recovery | Floods from combined system with diseases | Bad smell and overflow or combined sewer system | Impacts in the streams and water sources |
| **3.3 Treatment** | Lack of treatment; operation with bad performance | Low load for treatment and efficiency | Lack of funds and cost recovery for investments and operation | Bad smell for neighbors; space in the city for treatment plant ’ | Treatment interruption’s; overflow; Unsustainable residuals disposal | Impact on receiving waters |
| **3.4 Effluent disposal** | Lack of monitoring the receiving waters | Concentration of load without treatment | Lack of investment in conservation | Potential diseases development | Lake eutrophication; Lack of dilution capacity in the receiving waters. | Health and environment risks |
| **3.5 Governance** | Bad management: maintenance and operation. | Lack technical capacity | Lack of political will, investments and cost recovery | Lack of services assessment and goals; lack of subsidy. | reuse opportunities;  Lack of managing industrial and high risk loads | Difficulties in integrate policies |

Effluent disposal: It is related to the water body which is receiving the effluent. When the sewage infiltrate, the contamination in the basin is diffuse and spread, but when it is collected by stormwater or sewer network and dispose without treatment in a water body, the impact is concentrated. The main aspect is the water body capacity in receive the load, treat or untreated. Low water body capacity requires more efficiency in treatment in order to have stream or lake conservation.

Governance: bad management in operation and maintenance, unqualified personal; lack of political will, investments and cost recovery (the price of the service is below the cost). There is not monitoring of river water quality and lack of independent assessment of the services and goals; No regulation of the services which assess its efficiency; the cost of the services is charged to the population when there is only collection of the sewage (sometimes even without it). In this scenario why this company will invest in order to have all the services?

**Stormwater**

Table A.4 presents the stormwater issues based on the following sub-divisions of it:

Drainage in the source: It is stormwater of the property which is managed by its owner. At this level the main impacts are related to the increase of impervious area, reduction of infiltration, soil erosion and solid waste which could lead to a degraded area and contamined surfaces.

*Network and storage:* Public stormwater systems usually have a network of channels, conduits and storages (detention or retention ponds) integrated in order to flow the rain water. The issues of this system are related to the following: sewage in the drainage network for separate systems. The high proportion of sewage in the drainage contaminating the receiving waters; Collapsing of the system by corrosion when there is sewage or by high velocity of drainage; High proportion of solid waste and sediment can decrease the flow capacity of the drainage allowing flood conditions; Floods in the networks as result of flow increase or bad measures upstream; for natural stream or storage the erosion and sedimentation together with sewer in the drainage may result in degraded areas.

*Measures in major drainage:* the main issue in the major drainage are floods for lack of storage or flow capacity which results from upstream flow increase, downstream level control, flow reduction capacity by solid waste and channelization upstream (bad solutions); Increasing total solids upstream during urbanization and lack of control of this sources which results in decreasing capacity of the flow in the network and storage together with degraded areas; Water quality of rain water after it flows in urban contamined surfaces such as roof, side walk, streets and commercial and industrial areas brings important load to the stream. For modern urban drainage management this water needs a treatment in retention or detention ponds together with a connection to treatment plants which requires an integrated lay-out.

*Governance:* Usually there is no a “utility” to develop urban drainage services. The municipality uses some existing department to attend some of the issues without any real management. The main issues are also: no regulation on source areas which deliver impacts to downstream, transferring the private responsibility to the public; bad management since there is not operation and maintenance and law enforcement; limited knowledge in urban drainage since most of the engineer does not identify the source of the problems.

Table A.4 Stormwater

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Issues** |  |  | **Potential Source** | **of the problems** |  | **Integrated** |
|  | **Urbanization** | **Technical** | **Economic** | **Social** | **Environment** | **Main aspects** |
| **4.1 Drainage in the Source**  At property level | High level of impervious areas and high density | Increasing flow and velocity, erosion | Transference of impacts and cost from private to public | High vulnerability to floods | Degraded areas and water quality contamination | Reduction of infiltration and recharge |
| **4.2 Network and storage**  Micro and major drainage | Obstruction in drainage due to bridges, building piles and others urban constructions | Collapse of the network by erosion or corrosion; sewage in the network | Lack of network due to lack of investments | Frequent floods in the networks | Bed erosion, sediment yield and solid waste deposition | Impacts on population and receiving waters |
| **4.3 Measures in the major drainage** | Lack of Integration of drainage solutions to urbanization; lack of space for storage | Flood transference in the drainage; | Lack of funds for measures at major drainage | Increasing flood vulnerability by flood transference | Lack of sediment or water quality management | Impacts on environment and water sources |
| **4.4 Governance** | No regulation for source areas impacts | Bad management: operation and maintenance and law enforcement | There is not an utility for the service and cost recovery | Limited knowledge in stormwater management | There is not environment license for stormwater projects | Difficulties in integrate policies |

**Total Solids**

Total solids are the sediments from erosion and solid waste. Table A.5 shows the matrix with the main aspects, which are:

*Solid Waste collecting services:* It is related to the usual service to collect the waste in homes, offices and industrial installations. The collecting and disposal of highly contaminated waste is assumed as specific aspect to this report as mentioned above. There are many scenarios such as: most of the city without services of collecting or receiving centers; no home collecting services, low frequency services which increase the time of storage in the source, allowing diseases vectors, bad population habits which usually through solid waste to streams. There are also scenarios, where the city may have good services, but some areas are of difficulty access because of narrow or bad conditions of the streets, gangs and drug dealers control of the area.

*Cleaning streets and public areas:*  it is the service which should be provided by the municipality. The issues related are the following (table 4.5): There is not service or low frequency of cleaning, bad management and dumping of waste by the population are the mains issues

*Soil erosion and sediments:*  During the development of the urbanization there is a high increase of the sediments because the vegetation is removed and constructed streets without protection of the surfaces. During the rainy days the increase of laminar erosion in the unprotected surface due to flow velocity increases in the impervious areas. It also can generate concentrated erosion and degraded areas. Usually it happens when there is no land protection in the construction and in the urbanization, which should be enforced by the municipality.

*Storage Transport and disposal of the solid waste and solids collected in the streets:*  After the home and street cleaner services were developed the solids are storage and transport to a disposal site. The logistic of these services is important in the development a sustainable service which lack of contamination in the storage and transportation and low cost. The land fill has to be developed in sustainable way in order to avoid contamination of the soil and surface waters

*Governance:* the main issues are related to a: the existence of a sustainable service with cost recovery, bad management of the existing services, lack of independent assessment of the service, policy or program for decreasing solid waste by recycling.

**Institutional and integrated management**

Along the analysis of the services in the former matrices the governance are identified since most of the institutional issues are cross-cutting issue. The overall Institutional issues is related mainly to integration of the governance and water resources management at basin and administration are presented here.

Table A.6 shows the main institutional aspects and integrated management issues related to the overall urban water services and its integration to Water Resource Management at National and Regional levels. The main aspects are:

Table A.5 Total Solids

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Issues** |  |  | ***Potential Source*** | ***of the problems*** |  | ***Integrated*** |
|  | ***Urbanization*** | ***Service*** | ***Economic*** | ***Social*** | ***Environment*** | ***Main aspects*** |
| **5.1 Solid waste collecting service** | Waste from construction sites | There is no home services or low frequency | Lack of funds and cost recovery services | Lack of education; use of drainage for solid disposal | Solid waste and degraded areas | Large amount of solids in receiving waters and decreasing flow capacity and floods impacts |
| **5.2 Cleaning streets and public areas** | Narrow streets | No services or Low frequency of cleaning | Bad management services | Dumping waste by the population in the streets | High amount of solids in the streets and stormwater | Decreasing flow capacity of the rivers and environment impact |
| **5.3 Soil Erosion and sediments** | No construction practice for erosion control | No design control for downstream areas and streams protection | High cost of river cleaning | Solid waste near to population and spreading diseases | Deforestation without protection; degraded areas | Degraded areas, pollution to downstream streams |
| **5.4 Storage, Transport and Disposal** | Lack of urban space | contamination of storage areas; Bad logistic | Lack of funds for services | Poor population collecting waste | Land fill without monitoring or maintenance or in recharge areas | Surface and Groundwater contamination, lost of funds |
| **5.5 Governance** | No utility for the service and cost recovery | Bad management of the services | No policy or program for recycle; lack of cost recovery | Lack of management of service of poor population | Lack of license and environment regulation | Difficulties in integrate policies |

Table A.6 Institutional and Integrated aspects

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Issues** |  | ***Potential Source*** | ***of the problems*** |  |
|  | ***Legal*** | ***Management*** | ***Economic*** | ***Environment*** |
| **6.1 National Water Framework** | No National water policy or integrate legislation | No National Water Authority; fragmented management | There is not sustainable investment in water at national level | Limited environmental and institutions |
| **6.2 Water Resource Management at basin** | Lack of national or regional legislation on urban waters | There is not basin organization | Conflicts of water use; lack of economic support for basin management | Impact from the cities are exported to downstream in the basin |
| **6.3 Geographic and water administrations** | Conflict of jurisdiction on water | Conflicts of management | Institutional Economically weak | Conflict of jurisdiction on environment |
| **6.4 Integrated Urban Water services management** | Fragment services on urban waters; no regulation | Different levels of management for water in city | There is not cost recovery for the services | Different levels of management for environment in city |
| **6.5 Environment assessment and enforcement** | There is not legal framework of urban waters impacts | Lack of monitoring and data for planning | No funding for environment | There is no environment assessment or conservation in the city |

*National Water Framework:* It is important for the urban management if the country has a policy for Water Resource and uses the concepts related to IWRM? Together with that the Country has a policy for urban waters? The country has a National Authority for Water? These are important aspects in order to construct a trend for solutions of the urban water issues.

*Water Resource Management at basin level:* It is important to know if there is any management at basin level, such basin committee and agency relate to the basin decision and support. In that way is important to understand if the basin organization applied any limits or incentives for the city’s urban water management and control of its impacts. In addition to that an important aspect is to find out if there are institutional conflicts among cities and how the impacts from one city to another are managed.

### A.1.2 Goals matrix issue

The main aspects related to the impact on the society and environments are on the:

HEALTH OF THE POPULATION and related to diseases proliferation related to water sources and urban water lack of services. The water and sanitation diseases usually are related to lack of safe water and sanitation. Some common diseases related to this lack of services are: diarrhea, cholera, and other bacterial transmission.

The water related diseases can be classified by (Proust, 1993):

* *Water borne diseases* are related to water quality and they depend on water for their transmission. A few years ago cholera spread through South America mainly to areas where the coverage of safe drinking water was low, such as Peru, the Amazon and the Northeast of Brazil;
* *Water-washed* diseases are related to hygienic practices which depend mainly on the social and health improvement of the community. They are related to skin, ear and eye infections;
* *Water-related* and *Water-based* diseases in which the agent uses water. Prost (1993) reported that any project which increases water surface results in the development of the Anopheles mosquito vectors of malaria and of one of the fresh water snail vectors of schistosomiasis. Another example is leptospirosis a disease that can develop after a flood due to rat’s urine.

NATURAL FLOODS: when the river leaves its lower bed and floods the plains near it. The impact is the result of the occupation of risk areas near to streams by the population as a lack of soil use planning. Others risk area which can resulted in impact to the population are in hill slope since during flood season the soil in the hill moves down because of water weight damaging houses and killing many persons. The main aspects related to flood management were presented in table A.7 which are:

* Large part of the population occupying risk areas (flood plains and hill slopes). It is an issue when a city is crossed by a river which often overflows its natural banks. Poor population usually occupied these areas since it is public area and is near the jobs and facilities. In resettling this population other comes to the same space, which requires a long term sustainable regulation and planning of the space and social arrangements;

Table 4.7 Impacts in the Goals

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Issues** |  | ***Potential Source*** | ***of the problems*** |  |  |
|  |  |  |  |  |  |
| **7.1 Health** | Water borne diseases | *Water-washed* | *Water-related* and *Water-based* diseases |  |  |
| **7.2 Natural Floods** | Large population in flood plain risk areas | Lack of risk area mapping | Lack of regulation and law enforcement on the occupation of flood plains | No alert system of management of the impacts | Incentives by no refund funds without prevention |
| **7.3 Environment** | No regulation on urban water environment | Lack of law enforcement | No Conservation and preservation areas in the city or small part of the city | Rivers impacts: Long extension of rivers without fauna or preservation of banks vegetation | Large extension of degraded areas |
| **7.4 Amenities** | Small urban area for recreational use: green and water related spaces | Large number of degraded recreational areas | Risk of water use for recreation in the urban space | There is no amenities related to water in the city |  |

* Lack of risk area mapping: without knowledge of the risk area and without including this issue in the urban plan (bad planning) it is natural that the population will occupy the space more flat, which usually is the risk one. In some cities with many hills the population with lowest income move to steep slopes without much infrastructure which could move down during floods.
* *Lack of regulation or/and law enforcement in flood plains*: The process mentioned above is mainly due to lack of regulation of the space or law enforcement when it exists.
* No alert system: The alert of the floods are used to mitigate the floods, informing the population in advance and give support to its difficulties. The lack of a system such as that will increase the impacts;
* Incentives by refund funds without prevention. Usually the countries try to mitigate the floods after it happens using no refund funds, but it will delay the prevention, since the local population knows that during the events.

ENVIRONMENT: There are many related to environment in urban areas. It is impossible to bring in the assessment all of the aspects. The main issues are:

* No regulation on urban water environment The primitive condition is a complete lack of legislation for environment control in the country and in the cities;
* Lack of law enforcement: Even when exists legislation it is common to find a lack of law enforcement and environment planning for the city;
* Small space for conservation and preservation areas: Urban environment conservation requires some spaces for the more important areas such as wetlands, hill slope, among others. These are conservation and preservation areas more sustain part of the environment. It is important to understand how the city deals with that.
* Rivers impacts: Rivers are the ultimate area where what is done in the basin reflects in its course. The common issues are the lack of oxygen and aquatic live, sometimes the river is closed in order to get more space for cars and to covers the pollution. How it is important in the city what is left from vegetation near the banks which supports its conditions, together with erosion and sedimentation.
* Degraded areas: The effect of soil erosion, urban development without soil protection, urbanization and velocity increase is likely to develop many degraded space in the city. It is important to understand how this issue is important for the assessed city.

AMMENITIES: Quality of live is related to the safe live, where the city services improve the service to eliminate the water related diseases, avoid floods impacts and improve environment. Another important component of the quality of live is the amenities which the city can offer to its population. Some of these amenities are related to water services in the city. Some of the main important are:

* Small area for recreational use: what is the space for population recreation, is it important? In the city urban perspective?
* Large number of recreational degraded areas: the existing recreational area are degraded by many reasons such as lack of maintenance and population lack of care;
* Risk on the recreational use of the water: the water is used for recreation, but there is a risk for health or even floods conditions.
* Lack of amenities related to water in the city: the limited existence of amenities related to water is a condition in the city and it is an important issue.

**ISSUES MATRIX**

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| --- | --- | --- | --- | --- | --- |
| **Main Aspects** |  | **Selected Issues** |  |  |  |
|  |  |  |  |  |  |
| **Urban Planning** |  |  |  |  |  |
| **Water Supply** |  |  |  |  |  |
| **Sanitation** |  |  |  |  |  |
| **Urban Drainage** |  |  |  |  |  |
| **Solids** |  |  |  |  |  |
| **Institutional** |  |  |  |  |  |

**GOALS MATRIX**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Main Aspects** |  | **Selected Issues** |  |  |  |
|  |  |  |  |  |  |
| **Health** |  |  |  |  |  |
| **Floods** |  |  |  |  |  |
| **Amenities** |  |  |  |  |  |
| **Environment** |  |  |  |  |  |

**FINAL MATRIX**

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| --- | --- | --- | --- | --- |
| **ISSUES** | **CAUSES** | **IMPACTS** | **STRATEGIES** | **GOALS** |
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