Water as a Detonator of a Model of Communitarian Sustainable Development: The Case of Villa García Márquez at La Barca, Jalisco, Mexico

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Abstract

The present work describes in general way a model of sustainable development applied to small communities, from considering to the water as a development axis. This proposal would be located in the community of Villa García Marquez, Municipality of La Barca, Jalisco Mexico, which comprises the river basin of the Lake of Chapala, which is the most important natural water reservoir of the country and it displays remarkable environmental problems and of over-exploitation at the present time. The community Villa de García Marquez, have an important backwardness in its development mainly because of the lack of fresh water, deforestation, low farming productivity, low quality of urban services and urban image, high migration from men to the United States, that’s why women integrated the population mainly, lack of job opportunities and human development.

The model would try to promote the results acquired in terms of: sufficient water and of good quality for the human consumption with local solutions and technologies accessible; the generation of communitarian organizations for management and administration of the water at local level; improvement of the urban image and the territorial landscape taking advantage of the stormwater overflows through domestic rainwater catchments systems and retention ponds; generation of job opportunities and self-sufficient businesses in ecological tourism and ecological rural farms; experience for the dissemination in the municipality and the region of the model.

In the same way, it deals with to link through an integral vision: the training of the community in the handling of its hydraulic resources; the elaboration and implementation for small projects for conservation, supply and sanitation water; the coordinated participation between community and municipal government in the financing and management of the actions; the linking between civil associations of young people, consulting companies and the University of Guadalajara for the development of technical proposals of integrated water management and its application in urban and productive projects; the improvement of the environment, the territorial landscape and the urban image of the community; as well as the job generation and opportunities for rural business with an ecological tourism direction and sustainable rural development.

This project is integrated to the Integral Water Management Plan for the Municipality La Barca, Jalisco Mexico, which is approach to get a planning and efficient hydraulic management of the resource, as much in the urban zones as in the rural ones, orienting them to the sustainable development in the management of the resource and to the water as a detonator axis for the communitarian development.
1. Zone of Study

State of Jalisco is located in the western part of México, is one of the most important states in the country, as much by the wealth and fertility of its lands. The extension is 80.137 Km² and it represents the 4.1% of the surface of the national territory. Jalisco is constituted by a total of 125 municipalities grouped in 12 regions. The Region 04, or La Ciénega, is constituted by 13 municipalities; one of them is La Barca. La Barca is a town of the state of Jalisco, Mexico. It is located in the east of the state, in the Ciénega Region. Its territorial extension is of 379,48 km². It represents the 0.475% of the total surfaces of Jalisco. The municipality has 59,990 inhabitants and they mainly dedicate to the agriculture. It is a famous municipality in the region by its cream and cheese. The extreme coordinates of La Barca are of 20°15'30" to 20°26'45" of North latitude and of 102°20'40" to 102°21'20" of west longitude; to a height of 1,530 meters on the level of the sea. The adjacent municipalities to La Barca are; to the north Ocotlán, Atotonilco Alto and Ayotlán; to the east Ayotlán and state of Michoacán; to the south state of Michoacán; to the west with the municipalities of Jamay and Ocotlán. La Barca is located nearby the Lerma River in the south.

This proposal would be located in the community of Villa Garcia Marquez (Figure 1) municipality of La Barca, Jalisco Mexico, which comprises the river basin of the Lake of Chapala, which is the most important natural water reservoir of the country and it displays remarkable environmental problems and of over-exploitation at the present time. The community Villa de Garcia Marquez, have an important backwardness in its development mainly because of the lack of fresh water, deforestation, low farming productivity, low quality of urban services and urban image, lack of job opportunities and human development high migration of men to the United States, women integrated the population mainly.
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<td>Population of La Barca.</td>
<td>59,086 habitants.</td>
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<td>Population with daily income of 10 dollars or</td>
<td>50.91%</td>
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<td>lesser of La Barca.</td>
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<td>Population of Villa García Márquez community.</td>
<td>2020 habitants</td>
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<td>Urban Area of Villa García Márquez community.</td>
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<td>39.23 habitants/ha</td>
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<td>Supply resources for Villa García Márquez.</td>
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<td>Percentage of houses from Villa García Márquez</td>
<td>98.4 %</td>
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<td>Percentage of houses from Villa García Márquez</td>
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<td>Percentage of wastewater treatment at Villa García Márquez</td>
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Table 1. Water Indicators of Villa García Márquez (2005)

2. La Barca and its context of management of the water

The potential use of the water in the municipality is very important for human consumption, agriculture, industry and services sectors. The diversity of water bodies is defined by springs, aqueducts, prey, draining, rivers and streams. The precipitations and storm runoff's, aqueducts, rivers, and streams come mainly from the North region. The overexploitation seriously affects to the communities with greater number of habitants and an increasing productive plant, because this problem was produced by the agricultural and industrial developments, as well as of the excessive demand of water in the great metropolis.

The aquifer of La Barca is located in the portion center-southeast of the State of Jalisco; its extension is of 1.162 km². In the last two decades, the extraction has been increased because of perforation of the deep well, which has caused that the regional underground flow has been intercepted. In the northeast of the zone, mainly the levels of the water have descended one meter per year, by consequence, the phenomenon of the overexploitation in the water-bearing appears. At the moment, water removes from its storage, which is the nonrenewable part of itself.

The hydraulic infrastructure of the municipality of La Barca includes underground extraction by means of 17 active wells, 26 deposits of water storage, tanks of chlorine and networks. The system covers 92.3% of the municipality. The active well of the Community of Villa García Márquez shows following characteristics:

- Depth of well 150.00 meters
- Dynamic Level 134.00 meters
- Static Level 45.00 meters
- Gaging 7.47 lts/seg
La Barca has six elevated tanks of 50 m$^3$ each of one. Villa García Márquez community has one of these high tanks. The wells have equipment of horizontal pumping type with electrical motor and with chlorine devices and its approximated volume of flow is 8 liters per second. The water supply system is by means of pumping to the distribution network and the overflows are storage in tanks. Its operation is not optimal because of deterioration conditions. The daily requirement proposed by the municipal authorities is 192.11 m$^3$ per day to cover the necessities in the entire municipality. In the municipal head of La Barca there is a Potabilization plant, nevertheless the potable water is not enough to supply the total necessities of the population, only around 20% of the zones is being benefited. The sewage system mainly shows deficiencies by excess of sweepings and soils in the areas that do not count on paving.

3. Problems of sustainability at La Barca

The main associated problems of sustainability with La Barca are:

- The contamination of the superficial and underground bodies of water in rivers, streams, as well as basins due to the settlements of human groups around of them, in addition to the urbanization and industrialization.
- The generation of artificial forests that introduce exogenous flora (mainly latifoliadas and eucalyptus) and which competes with the original species of the region.
- In spite of the zone is rich in agricultural lands, it has lost great part of these productive grounds because of the deforestation, in addition the bad constant agricultural practice which made and the polluting agents that are added to the lands through agrochemicals.
- The usage of artificial fertilizer can also diminish the properties of the ground generating loses of capacity to retain water and present hardening.
- The contamination of ground by inadequate disposition of solid wastes.
- Due to inadequate disposition of solid wastes in the communities, the rainwater is contaminated and it is discharged to drainage and rivers producing pollution problems.
- The concentration of half of population in the head of La Barca and the rest is dispersed in 70 small of communities, one of them is Villa García Márquez.
- Lack of urban-environment planning instruments in order to organize public and private investment, as well as the good and rational use of available resources in the territory.
- Centralization of Water Public Administration in only one administration agency (Water and Sewage Department), that avoids the local water management at the small communities of the municipality of La Barca.

In the case of Villa García Márquez, to these problems, we add some more:

- Low density of population with a broad urban occupation of the territory, it impacts the cost of the urban infrastructures which are divided and dispersed.
- Lack of strategy of water measurement of water consumption that specifies the behavior of the consumption of community.
- Centralized administration by one water municipality agency. This agency doesn’t have the capacity to manage the well of Villa Garcia Marquez and maintain it.
4. General Strategies for action in Villa García Marquez Community

The basis of the main proposal depends on Integrated Water resources Management (IWRM). Integrated water resources management is a systematic process for the sustainable development, allocation and monitoring of water resource use in the context of social, economic and environmental objectives. At its simplest, integrated water resources management is a logical and intuitively appealing concept. Its basis is that the many different uses of finite water resources are interdependent. That is evident to us all. High irrigation demands and polluted drainage flows from agriculture mean less freshwater for drinking or industrial use; contaminated municipal and industrial wastewater pollutes rivers and threatens ecosystems; if water has to be left in a river to protect fisheries and ecosystems, less can be diverted to grow crops. There are plenty more examples of the basic theme that unregulated use of scarce water resources is wasteful and inherently unsustainable.

IWRM is, above all, a philosophy. As such it offers a guiding conceptual framework rather than a concrete blue-print. Implementing IWRM does not for example require that a new super-ministry be created. What it does demand is that people try to change their working practices to look at the bigger picture that surrounds their actions and to realise that these do not occur independently of the actions of others. It also seeks to introduce an element of decentralised democracy into how water is managed, with its emphasis on stakeholder participation and decision making at the lowest appropriate level.

The main proposal rounds to the development of one interaction model between chains of sustainability, which establish the water as an integrator axis of one model of urban-rural-environ management.

The chains of sustainability are a group of social-economic, institutional, environ and productive activities, linked to a one sustainable specific thematic that keep one or several relationships of mutual interdependence. The types of chains proposed are:

• The Water chain relates the actions which search increase its amount, as well as guarantee the regulation and quality of water. The rainwater harvesting and stormwater management have an important role to reach a sustainability management of water in Villa García Márquez.
• The Productive-economic chain organizes the action addressed to identify goods and environ services that produce productive alternatives, in terms of fortify the feeding security of the community, to open green markets since the biodiversity of the regions, and to identify the opportunities of eco-tourism.
• The Social chain that articulates the actions addressed to establish job chains and instruments of communitarian management of the hydraulic resources linked to the environ services.
• The Environmental chain articulates the conservation and rescue of the biodiversity and the elements which integrate the landscape.
• The Institutional chain links the actions and instruments of management and administrations, in terms of financing, transparency and fortification of the institutional management that support and push the other chains.

The objective of this proposal is locating the water as an integrator axis of a model of urban-rural-environ management that could establish itself as an alternative of development for the
communities of La Barca and Ciénega Region, relating the environment to the production, retention and regulation of hydraulic resources with the demand.

In order to reach out this interaction it considerate the following levels of action:

1. Social level includes a campaign to sensitize the people of the necessity to change the way of think related with water management. The involvement of habitants is clue for the success or failure of the project. The purpose in this level is getting involve mainly the youth with out occupation and mothers of the community. Some students from University of Guadalajara will do the sensitive campaign, and later they accomplish the training programs that we comment further above this paper.

2. Territorial Landscape level includes the integration of the landscape through actions taking part in visual quality, diminishing its fragility and increasing its landscaping capacity. These interventions take a small micro captions (ponds and infiltration techniques) as an integrator axis, the utilization of the biodiversity and strategic location of ecological self-sufficient farms around the community.

3. Urban Design in the community includes urban design actions linked to small ponds (small retentions ponds and infiltration devices) as a integrator axis in order to produce open public spaces like squares, gardens and communitarian park.

4. Equipment of houses and buildings includes hydraulic-sanitarian changes in their installations; integrating domestic rainwater harvesting and decentralized local treatment of waste water alternatives. It also includes the integration the rain water harvesting systems of the houses into small unities that we call “Barrial Unities” with pretreatment wastewater for irrigation systems.

5. Educational strategies. It is an important action linked to the other strategies, because if the implementation depend on the perception of the habitants. It is clue to begin with water conservation, rainwater harvesting, business issues training, especially with women and children who spend almost the time in the community. Not only be necessary educate and the beginning of the project even during all the process.

The proposed process of action is the following:

1. To sharpen the chains of sustainability of community.
2. Campaign of Promotion of culture of conservation of water in order to sensitize the people of García Márquez community.
3. Promotion of good practices to good use of water to the habitants especially women, teenagers and children.
4. Workshops with the community in order to integrate the Master Plan of the interaction of chains.
5. Master Plan and interaction of chain into a matrix.
6. Selection of alternatives in terms of project.
7. Integration of Projects management and administration committees.
8. Surveys of feasibility and business plan.
9. Selection of detonating actions in the five levels of action.
10. Financing raising actions through federal and state government.
12. Definition of projects teams where the habitants participate with municipal authorities, supported by external experts and consultants.

13. Normative Shield through the generation of urban-environ planning instruments for the community that allows a good management and administration of resources.

One of the important pieces of the management process of this proposal is the creation of a Municipal of Administration Committees which rule and manage in a participating way, the activities of the plan. This team includes: 2 representatives of the community, coordinator of the project and 2 external consultants, one by the University of Guadalajara and another from local government of La Barca. They define and delegate duties and activities for teams of specific projects, which implement the specific actions of each project.

Finally, other important aspect is the consideration of technological alternatives which are linked to all the projects integrate in the General Plan. These alternatives should have local emphasis. There are some of them:

• Solar energy
• Biomass
• Recycle
• Bioclimatic Architecture
• Aeolic Energy
• Rainwater Harvesting, stormwater management and pretreatment of wastewater.

Conclusion

The outcomes of the process are the following:

- Change of water management in two levels, communitarian and public level. The people need to change the way of use water. They should be aware water is invaluable resource, and their involvement in the solution of lack of fresh water through active participation is necessary. The government authorities get a different vision of water administration, transferring their duties to local people. For example, women and children can harvest rainwater; men can administrate the deep well and tariffs. The government can only give to them technical support.

- Fresh Water is an outstanding outcome. The community will count with constant water supply during all the year by a good administration of the deep well and domestic rainwater harvesting systems at houses.

- Environmental improvement. The benefits are in two levels; landscape and re-usage of wastewater. The stormwater runoffs will storage on ponds which will use for irrigation and landscape areas. The environment by this way will be improved impacting forest and damping the soil. The pretreatment of wastewater is another benefit because it will be used for irrigation.

- Economic benefits. Once constructed the ponds and good landscape, these places can serve for tourist services. The local people can establish restaurants and other kind of business for visitors and the local economy will be reactivated. Another benefit is the ecological self-sufficient farms which promote the investment for farming production.

The further steps to be taken:
1. Campaign of Promotion of culture of conservation of water in order to sensitize the people of García Márquez community.
2. Promotion of good practices to good use of water to the habitants especially women, teenagers and children.
3. Implementation of workshops with the community in order to integrate the Master Plan of the interaction of chains.
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References