

Mitigation and Prevention of Conflicts on Border Aquifers between Colombia and Venezuela: Far from the Rhetoric, Closer to the Reality.

UNESCO-IAH-UNEP Conference, Paris, 6-8 December 2010

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ABSTRACT

Political and social conflicts about water resources in today's world should be eliminated. Realistically however, we can only reduce and/or deter such conflicts; it is imperative to do so. The majority of aquifers located in border areas between Colombia and Venezuela are not seriously considered as means towards eliminating or mitigating future conflicts about groundwater supply in both countries. It is necessary to have a better understanding of these aquifers if those governments would like to implement positive public policies protecting this precious natural resource. The absence of adequate knowledge concerning groundwater resources, and the lack of common public policies in those regions from both countries, are two problematic concerns. This situation can generate border conflicts in diverse areas such as science, economy, military, international policy, and social relations for Colombia and Venezuela.

The main objective is an evaluation in order to mitigate a conflict. It is based on personal field work on groundwater supply and geological exploration in different regions of Colombia, next to the border, where the groundwater usage has increased; also, academic knowledge and experience on public policy with emphasis in prevention and mitigation of disasters will be used to support the risk assessment. In addition, a literature review from official documentation will be included.

According to the levels of industry, agriculture and services in these regions, the use of groundwater supply was not a political priority in the past. Nevertheless, a rise in the coal industry has been steady for the last thirty years. The research paper will demonstrate that both governments have a political stake in studying and protecting their border's aquifers and compiling hydro-geological data. In addition, it is necessary to elaborate and share public policies for groundwater supply, implementing a special international agreement. For more efficiency, it is necessary to follow and control these policies on a deep emphasis on education through the creation of higher level educational institutions emphasizing groundwater themes. Finally, the paper provides recommendations such as the use of mitigation and prevention tools, strategies of management, and obviously, ways for stopping surface contamination.

Key words: Mitigation; Risk Assessment; Risk Management, Vulnerability; Political Conflict; Policy; Hydro-geology.

The interest of United Nations UN/ONU for groundwater supply, especially in the transboundary aquifers around the planet, has been conducting thought for the UNESCO for several years in the XXI century. The Internationally Shared Aquifer Resources Management (ISARM) Program is focused on trying to do very serious analysis about border aquifers in order to mitigate, to reduce, or to eliminate conflicts between nations and their governments (2000s). This institutional preoccupation pretend to create more motivation for scientists, technicians, lawyers, and other professionals related with sciences, environmental protection, engineering, mining, and more. In addition, some public, private and non-profit organizations around the world are interested in this topic working as part of some scientific investigations. The majority of aquifers located in border areas between Colombia and Venezuela are not seriously considered in order to eliminate or mitigate future conflicts about groundwater supply in both countries. It is necessary to have a better understanding of these aquifers if those governments would like to implement positive public policies protecting this precious natural resource. The absence of adequate knowledge concerning groundwater resources, and the lack of common public policies in those regions from both countries are two problematic concerns. This situation could be a generator of border conflicts in diverse areas such as science, economy, armed forces, international policy and social relations for Colombia and Venezuela. We must remember the history of the political conflict between Colombia and Venezuela regarding the ownership of the oil reservoirs in the Venezuela Golf. The research is based on personal field work on groundwater supply and geological exploration in different regions of Colombia, next to the border, such as Arauca, Casanare, Cesar, Guajira, and Santander, where the groundwater usage has been increasing. In addition, a literature review from official documentation in the two countries and some papers will be included

According to the low levels of development in industry, agriculture and services in these regions, the use of groundwater supply was not a political priority in the past. Nevertheless, an increment in the extraction of coal has been steady for the last thirty years. For example, the Guajira area in Colombia has the largest overland mine in the world. The coal extraction has been developing mining processes which can affect the groundwater conditions such as the water's quality level, its contamination, the lack of regulation of use and the drastic decrease in the water table and piezometric levels. At the North part of the border between Colombia and Venezuela, there are two Departments – Cesar and Guajira- in Colombia bordering the Zulia State in Venezuela. Both countries have had a conflict for territorial delimitation in the Guajira and Zulia sectors since the middle of the XX century, which is not finished yet. Since 1970s, the area has had recent mining extraction especially coal. In addition, the middle part of the border in the Catatumbo basin, both countries and the American States Organization ASO/OEA signed an agreement in order to protect hydrological resources. In contrast, the South-East border like Departments -Arauca and Vichada- in Colombia and Apure and Amazonas States in Venezuela have been extracting oil for more years without conflict but with a doubt regarding which nation is the owner. Moreover, these areas have no control over shared groundwater.

On the other hand, as a geologist with 25 years of experience in groundwater supply in Colombia, I knew about some conflicts for local and regional aquifers. I studied several aquifers in Colombia trying to show the community and authorities some benefits of groundwater supply. Another preoccupation is the general interest over the particular interest. Apparently, the border between Colombia and its neighborhoods is an 'intangible' where nothing happens. Colombia and Venezuela have been confronting much kind of conflicts since 1830 when "The Great Colombia" (*La Gran Colombia*) was dissolved. The conflict by groundwater transboundary aquifers does not still exist between governments but it is a potential hazard. However, due to a recent general interest in the last 30 years of the international organizations such as ASO/OEA in 1982, an agreement was signed with Colombia and Venezuela to protect hydrologic resources in a specific area; it is possible that it no works with effectiveness. Also UNESCO developed a program in 2000s, in order to learn more about hydro-geological information. In addition, it is important to analyze, compare and contrast some concepts from Scientists and Investigators in America and Europe about risk, conflict, mitigation, prevention, and more. Many mathematics formulas were created in trying to explain an uncertain situation, which will create a hostile atmosphere.

A territorial system simply raises the interactions that take place in a space. If you know the ordinance of a territory, you can prepare management plans seeking to reduce conflicts and obtain balances from one or more of the social, economic, environmental, political, emotional aspects in a neighborhood, community, region, nation or continent. If we do not know how the territory is organized, we will have many conflicts. My concept about problem is the difference between an actual situation and a situation hoped for. For instance, I need to know how the transboundary shared aquifers between Colombia and Venezuela are. The global interest of UN/ONU and ASO/OEA represents the benefit that improving quality of life can have on the scientific communities, governments, decision makers, academic activities, and populations in many countries. For example, to combat poverty was one mandate from a group of countries called G-6 (today G-8) in Helsinki 1974. One way to combat poverty is to explore and utilize groundwater for diverse uses. Especially, in shared transboundary aquifers, which provide the opportunity to create and develop in shared interactions. However, some shared transboundary aquifers, will create conflicts (Medina, 2008).

It is important to analyze the necessity of some simple public policies and cooperation between actors in a potential conflict in order to improve the quality of life of people in those two countries. In addition, it is a priority to analyze why governmental agencies cannot enforce the laws and regulations regarding groundwater. In Colombia, the National Water Plans is trying to push all regions towards privatization of this precious natural resource through the Departmental Water Plans. It is illogical to give the administration of shared aquifers to a private company ignoring the mutual spatial possessions of other nations. International agencies such as UN/ONU, ASO/OEA, UNESCO, FAO, Andean Community, Andean Parliament, among others, need to help Colombia and Venezuela in the imminent potential conflict over groundwater in share aquifers.

Is it necessary to visualize real interests in regional and locals governments for an industrial future?

Governments of Colombia and Venezuela has had some industrial interest in the areas of their common border such as Norte de Santander (Colombia) and Estado de Táchira (Venezuela) in the denominated Catatumbo basin, since second part of the XX century, more specifically since 1969 when the countries' Presidents talked about the possibility of protecting hydrographic basins. These regions had accrue enough human interaction, transportation, natural resources, local and regional markets, financial institutions, and business through the border. However, the possibility to increase the agricultural and livestock industry or other industrial productions in the immediate future is low by today. The main cause is the lack of dialogue between these governments during the last decade. It is certain that both the Presidents of Colombia and Venezuela and their Chancellors have congregations every year, but those reunions are more about etiquette than substance.

According to Medina (2008) in Maganda (2008), the surface and groundwater shared resources are "invisible" to the common people in South America. Water could become a potential source of conflict or, in contrast, improve cooperation and regional integration. This statement is not entirely accurate because since 1981, I found organizations with an advanced methodology in order to protect groundwater. For example, in the South West part of Colombia a region named Valle del Cauca region, the common people and politicians at that time had the same level of information that academics and scientists had. It is certain that people can use groundwater for regional development. Fortunately, at this region, the Corporación Autónoma Regional del Valle del Cauca (CVC), had control over all aquifers regarding levels and extensions. Its data include the hydro-geological and hydraulic conditions of the aquifers. In Colombia and Venezuela most people know that they drink water and soda from aquifers drilled in the multinational bottling industry. According to Medina de Pérez (2006 y 2008), a Plan for the Conservation and Comprehensive Utilization of Water Resources of Catatumbo River Basin, signed in 1982 by Colombia, Venezuela, and the General Secretary of the Organization of American States OAS/OEA, unfortunately so far, it has not been executed, so this requires greater commitment from the two countries. It means that both governments do not have interest in industrial development in the near future. Maybe the current employees do not know the agreement. The efficiency of employees has decreased since the last century in many countries. It is amazing that they only know where the computer is; it is a sad but

recurring behavior. In addition, it is necessary to recognize groundwater sources and their conditions because both countries have received information using Public Policy of Government (each four years). Actually, the two governments are acting without Public Policy of the State (20 or more years). As a result, a deficiency in knowledge of their shared aquifers can cover up some expectative of them as social, industrial, economic, and political ties. On the other hand, at the border at the Guajira and Cesar Departments (Colombia) in front of Zulia State (Venezuela), we can find an incipient interest in industries around mining coal. There are potential industrial and human developments. However, there is not enough information about the Perijá ridge for more mineral extractions or about groundwater.

In addition, the most extensive area is Arauca and Vichada Departments (Col) in front of Apure State (Venezuela) which complements Vichada Departments (Col) in front of Amazonas State (Venezuela) along Arauca and Orinoco basins. Most scientists and experts argue that a good knowledge about groundwater and shared aquifers will help any region increasing its future industry. The Bloom's taxonomy helps us to understand the way how the cognitive processes act. Usually, areas with high density of population have more scientific information. Is it discrimination or non-preoccupation from governments that causes this lack of information? Governments need to acquire more geological, geomorphologic, topographic, geophysical, hydrological, geochemical, statistics and more scientific information. In addition, sociological information is needed in order to complete their cognitive pyramid. In the future, we will have the necessity to understand how the share transboundary aquifers are interacting, and how they should act for benefits in both countries. The analysis of positive or negative effects is urgent. Next, a potential evaluation of the amount goes to increase our satisfaction. Finally, the creation of a shared plan to manage each transboundary aquifers will be the main goal.

On the other hand, Colombia and Venezuela's citizens have racial diversity, plural ethnicity, and show multicultural presence inside both countries; As a result, the discrimination is profuse. Nevertheless, similar to the majority Western's continent, the individualism and the sanctity of private properties are important cultural values in Venezuela. In contrast, Colombia's government usually does not have the same lucidity over its property and sometimes gives away its territory (i. e. Panama territory, Coquivacoa or Venezuela Gulf), to others. Therefore, it is important to adjust to Mileti's theory, which stated an approach to hazards in order to get the governments attention. The two Presidents of those countries must work on important aspects such as adopting a global systems perspective as ISARM objective, accepting responsibility for hazards and disasters; anticipating ambiguity and change; rejecting short-term thinking; accounting for social forces, and finally, embrace sustainable development principles.

Are the protection laws and regulations of water usage adequate in the borders of Colombia and Venezuela?

No, they are not. The protection's rules of water there are not adequate for shared transboundary aquifers. Actually, in both countries we can find legislations for superficial water and groundwater. The rules for shared groundwater are not clearly expressed. Local, regional, and national regulations are current in both countries, but apparently, they are working separately.

The Political Constitution of 1991 in Colombia changed the concept of the subsoil's owner. Before it, the Constitution of 1886 expressed clearly that the State was the owner of all natural resources in the subsurface. Now, it is not expressed. For instance the vagueness provides to any citizen the "potential right" to be the owner. However, it is possible to sign a business agreement with the government. Some rules for groundwater use such as "Código de Recursos Naturales de Colombia" (1974) had not real application because this new Constitution changed and introduced innovative but unproductive public agencies. Some communities ignored them because of their self convenience. Some people believe that the groundwater sources are public. Some people agree that groundwater aquifers will be private without the problem of getting an official authorization or contract. For example, Tunja city is located on a syncline; it has extended flanks. During 1990 to 1993, I directed a program there. Immediately, the construction was ended, a private company from Spain got control of the urban aqueduct through an official wrong transaction because Colombia did not have a Water Law. In contrast, the Political Constitution of 1999 and the Law for Water of 2007 in Venezuela, are protecting groundwater as the governmental property and its sovereign.

Today, we can find several methodologies for social and economic disasters as well. All of them are rhetoric more than effective. We need efficiency; for example, mitigating economic disasters, through the use of Business Continuity Plan, which is used by less than 40% of the big companies (Hiles, 2004). It is known that some authors like Miletti (1999), Beck (1999 & 2006), and Paulus (2004) show us interesting concepts on "risks" based on sociological and psychological issues more than natural issues. They agree that "risk" has a literary definition in all dictionaries, but the scientific definition of this concept is uncertain. In the same manner, some psychologists, like Professor Norman Groner (oral communication at John Jay's class 2007) mentioned that during a negative event many people do not suffer shock.

On the other hand, following Mileti (1999), we can find the root of the problems in order to prepare plans of mitigation and prevention. I agree with Mileti in his theory regarding the three main influences: first, working on the border zone between Colombia and Venezuela, such as the Earth's physical continuous changes; also, changes in the demographic composition and distribution along the border; and finally the third influence is the built environment is growing density and making the potential losses. We need to adapt some of Mileti's mitigation tools such as land use, engineering and building codes, new technology, and emergency preparedness. Mileti's theory suggested that a sustainable approach to hazard mitigation will require extraordinary actions such as building local networks, competence and consensus, establishing a holistic framework, building bi-national databases, providing Comprehensive education and training, measuring progress, and sharing knowledge internationally.

Did the conflict about Venezuela Gulf productivity to lead the vulnerability of the Colombian or Venezuelan governments?

The conflict about Gulf of Coquivacoa or Venezuela has been unproductive for Colombia's government. In contrast, it has been positive for Venezuela's government and population. The conflict by Venezuela's Gulf never ended; however, Colombia moved out of its naval border patrol in 1987. Colombia has missed the opportunity to use the water and others sources inside the gulf for twenty-three years. Obviously, Colombia has been missing the opportunity to get natural resources from there. The conflict was approximately between 1957 and 1987 when the last event occurred, but the conflict is current and remains silent. Those governments based on intuition more than reasonable analysis used emotional, political, and cultural aspects in order to solve that social and economic crisis. However, Venezuela's government has been using benefits from the oil more than Colombia. Why? In Colombia has been using the concept of Irving Janis "Groupthink" as a Presidential management system for many years. The worst symptoms of groupthink are an illusion of invulnerability, collective construction of rationalizations that permit group members to ignore warnings or other forms of negative feedback, unquestioning belief in the morality of the in-group, strong negative, stereotyped views about the leaders of enemy groups, shared illusions of unanimity of opinion, and more (Shafritz & Russell E. W. p. 249). Finally, according to Allison and Zelikow (2001) who make decision models, there are changes of the models in the last twenty years. Both countries have had Governmental Political Models for two centuries. They have been showing autocratic tendencies. For the transboundary share aquifers those countries will use the Model for International make decisions. According to (Mameli at John Jay class in 2006) the Rational Actor Model has core concepts which are: a) Goals and Objectives (interest and values of the agent are translated into "payoff" or "utility" or "preference" function. b) Alternatives (decision tree). c) Consequences (to each alternative is attached a set of consequences), and d) Rational preference.

CONCLUSIONS AND RECOMMENDATIONS

It is important to mention that the Colombian government has not had a Water Law while Venezuelan government has had one since 2007. Venezuela's government has interest in protecting this natural resource while Colombia's government pretends to privatize water through a regional initiative denominating as the Departmental Plan of Waters. It is the most incredible and pessimistic decision from the Colombian government ignoring the existence of shared superficial and groundwater deposits in their borders. Colombian and Venezuelan governments did not follow their hydrological agreement about Catatumbo basin signed in 1982 with AOS/OEA as a third part. Also, both countries abandoned their

issue on the gulf of the Coquivacoa or Venezuela. Sometimes, the Colombian government likes to give away its territory and sovereignty. For example, in the XX Century, it gave the Isthmus of Panama, Gulf of the Coquivacoa, and the Peruvian border, among others.

As recommendations, Presidents of Colombia and Venezuela must make decisions regarding shared transboundary aquifers based not on the individual beliefs or Individual Attitude theory. The general interest is more important than the particular interest. They will act based on collective beliefs, values, attitudes, behaviors, customs, traditions, rites, ceremonies, and more. The President of both countries must maintain a positive attitude in order to improve the quality of life in areas close to the border. The suggestion is that they need to act based on governmental processes using the Rational Actor Model. Also, both governments must plan activities for mitigation of a potential conflict for shared transboundary aquifers, such as: a) promoting international interest integrating third or fourth parts on their agreements; b) promoting international cooperation writing active agreements; c) searching international grants from UN/ONU, ASO/OEA, Andean Parliament, and others; d) accepting International rules for shared transboundary aquifers over national norms, and e) Systematization of the information on the shared aquifers, complementing data for its internationalization. Management Strategies via a bi-national agency can help conflict resolution. Private organizations like in the oil industry can be evicted because both countries will be affected.

In addition, both governments must plan activities of mitigations and prevention, such as: a) elaborating hydro geological studies scale 1:50,000 and 1:25,000 close the border, b) Creating a University specialized basically in geology, hydrogeology, chemistry, statistics, diplomacy, international groundwater law, and environmental sciences, c) implementing public policies for management share aquifers, and d) creating a permanent Bi-national commissions with sources to deter conflicts regarding groundwater. The project will offer products from the Geographical Information System and some modern software, such as: Maps (i. e. Geology, Hydrogeology, Geotechnical, Hydrology of basins shared, and Disasters prevention.) In addition, some products such as a) Quantification of the groundwater resources b) Promotion of the groundwater use c) Strategies for management all groundwater sources d) Potential development, and e) an inventory in a Map of the current and potential conflict. The resources to mitigate the potential conflict are basically budget appropriations from different entities, such as direct appropriations of Congresses of each country and from OEA/ASO, ONU/UN, ISARM, and other countries clients of the university. It is necessary that both governments have one or more international agencies in order to work on goals as soon as possible in the relationship to share aquifers and their use. In addition, it is necessary to consider Conflict Mitigation and Prevention compromises, such as not privatizing the underground resource; encouraging the parties to implement bi-national commitments; encouraging the community about the importance of groundwater resources through community education, school and university; organizing and implementing a University of Water in border areas; establishing branches in the Guajira Cesar/Zulia, Norte de Santander/Táchira and Arauca/Apure regions; increasing their development; allowing the oversight of international organizations on the progress of activities. This body would be overseer of all aspects of groundwater. This body would be in close contact with organizations like Potential Conflict to Co-operation Potential PCCP; International Shared Aquifer Resource Management Programme ISARM; International Hydrological Programme IHP; Andean Parliament, Energy and Mines Commission, creating a subcommittee where groundwater.

Finally, it is necessary to develop Public Policies, such as a) creating a bi-national institution of higher education through the both congresses in the two countries; this institution would focus on promoting, strengthening and address the links between the governmental institutions of the two countries that are governing the investigation of natural resources. Institutions like *Ingeominas* in Colombia and *Ingeomin* in Venezuela should control it. Other institutions that would be furthered national authorities are responsible for the environment, water, and other related activities in Colombia and Venezuela; b) developing public policy to protect groundwater resources. Each country should develop a public policy for the protection of underground drinking water reserves. A simple internal regulation of each country is not accepted in a medium of conflict. Public policy will allow you to obtain resources; c) establishing a joint monitoring system. The agency should be no military-type interests; the only serious concern

political and economic aspects, for the welfare of underground water resources, so as for the welfare of the residents of border areas Colombia and Venezuela as well. It could be used as a model and could be to extend the functions of these bodies in other areas bordering the two countries with other countries, d) reviewing of Departmental Water Plan with tendency to privatization of transboundary share aquifers in Colombia. Also, e) implementing a regional water plans in Venezuela for transboundary share aquifers, and f) eliminating contamination of transboundary river basins, especially upper valleys.

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