

The Difference for Your Watershed

Abstract

The RíoMío mobile app is currently being developed as a compliment for the web application carrying the same name. Both apps have the same purpose, to monitor the rivers that integrate a watershed in the tropical region of Veracruz, Mexico. The mobile app will be used to gather data in remote locations where the web app cannot be used. The team developing both applications is integrated by students from Michigan Technological University, as a requirement for their professional experience. The students developing the applications are working under the supervision of Dr. Alex Mayer, who currently is on sabbatical in Mexico; with the coordination and professional guidance of Dr. Marika Seigel and Dr. Robert Pastel. This application is also being developed in collaboration with a Mexican Non-Governmental Organization called IMCAS-X.

The Difference in Your Watershed

A river flows constantly, and it is never the same river twice. What if you could make a difference by informing others about how the river has changed? So much more could be learned about the conditions of the river, when numbers of citizens are watching the changes in the environment surrounding the river and its state.

In the tropical zone of Mexico, in the State of Veracruz, our study begins. Veracruz is a state in the coast of the Gulf of Mexico. This area has a tropical weather, with temperatures above 70°F all year round.

One variable that RíoMío app is going to be consider for the watershed is the fact that the State of Veracruz is in constant danger of Tropical Storms and Hurricanes, due to its location near the Gulf of Mexico. Another important variable for this app is the importance of Veracruz for the oil industry, because this State is one of the top three oil producers in the country, as well as the main maritime port in Mexico.



Image taken from vmapas.com. "Mexico Political Map." Retrieved February 28, 2014

Why Should You Make a Difference?

Monitoring watersheds is important to everyone in the area, and future residents to come. There are five main reasons why it should be conducted:

1. Characterizes waters and identifies changes or trends in water quality over time.
2. Identifies specific existing or emerging water quality problems.
3. Gathers information to design specific pollution prevention or remediation programs.
4. Determines if the watershed meets pollution regulations.
5. Helps there be a faster response to emergencies, like spills or floods. (United States)

How Can You Be the Difference?

Making a difference is more accessible with new technology in the palm of your hand. The ever-changing conditions of the river can be observed and recorded by you, and others can learn about it and even have the potential to help the river be a healthier version of itself.

There's only one thing you need before you go and be the difference. Take out your smartphone and download an app that can keep the quality of your river up to date, giving essential information to scientists who are constantly studying the watershed flow.

What is This App?

The RíoMío mobile app is an extension of the web app of the same name. The web app was created by IMCAS-X, a Non-Governmental Organization (NGO), with the help of a Michigan Technological University (Michigan Tech) senior design team, as the first step to start having citizens monitor the local watersheds and to have them register their observations with the NGO. The web app helps citizens and scientists to observe and record the conditions of the river you are visiting, but you can only upload this once you are home and not directly looking at the river. The mobile app uploads your observations to the web app's online database as you are directly observing it. Your observations help IMCAS-X, to keep track of the quality of the rivers.

The mission for RíoMío is: "To insure safe drinking water, by allowing citizens to report and make public watershed health observations". (Mayer)

The applications will keep track of a watershed formed by different rivers and creeks.

The two most important rivers that form this watershed are the Gavilanes and Pixquiác. Both rivers are located in Coátepec County, near the city of Xalapa, which is highly populated and it works as the center of economic activity for smaller townships around.



Image taken from Explorandomexico.com. "Veracruz." Retrieved February 28, 2014.

The main risks affecting the watershed these apps are monitoring, as identified in 2011, are deforestation

in the area to have larger lands for kettle, illegal logging, having croplands in low agricultural production potential areas, and short or inexistent response from the community or the authorities (Uscanga). The National Institute of Statistics and Geography (INEGI by its name in Spanish, Instituto Nacional de Estadística y Geografía) has a database that is focused in tracking the use of the water resources of every state in Mexico, but the access to this database is restricted, one must apply online to get approval and be granted with access the information.

This watershed is extremely important for the adjacent communities, for it feeds the main dams in the area. In Mexico, dams are used to store water from rain season, rivers and creeks. Then after being stored in the dams the water is sent to filter plants to make it potable. The water from the sink is not drinkable in most of Mexican cities, only in certain major urban areas.

This is where RíoMío will be used; in the small communities that this watershed feeds. It is important to keep track of the watershed, because the water is directly used without treatment. Specifically in the areas of Xalapa, water monitoring is extremely relevant. The management of water resources is limited and can cause a hazard to the people dependent of those sources. Having citizens track and observe the watershed helps the area obtain public drinking water, sewerage and more effective sanitation (Citizen Monitoring). Keeping track of the state of this watershed will ensure the consumption and usage of cleaner water.

How Do You Make An Observation?

To make a proper observation, you have to carefully look at the conditions of the rivers that scientist will be analyzing: the water conditions, stream current, stream bottom, presence of algae, shade from tree canopy, and land and water uses.

The screenshot shows a mobile application interface for 'RioMio'. At the top, there's a status bar with Wi-Fi, signal strength, battery, and time (9:25). Below that is a navigation bar with a back arrow, the 'RioMio' logo, and a menu icon. The main content area is titled 'Stream Details'. The first question is 'What color is the water?' with the instruction '(Check all that apply)'. It lists six options: Clear, Muddy, Black, Oily, Foamy, and Brown. 'Foamy' and 'Green' are checked. The second question is 'What is the water odor?' with the instruction '(Check all that apply)'. It lists four options: No odor, Gasoline/Oil, Rotten Egg, and Chemical. 'No odor' is checked. A blue 'Next' button is located at the bottom right of the form.

Screenshot of RioMio's survey.

While using the app, you make an observation by completing a survey. It is like the survey completed in the online version.

The survey is broken down into multiple sections to help you have the best information possible for the health of the watershed. The different sections ask a series of multiple-choice questions, to help identify common problems or situations while the watershed.

By completing the survey, you are making a difference in the health of your watershed and becoming a true citizen scientist.

Who's Using It?

The intended audience for this app is citizens who have a genuine interest in the health of their watershed, which may be you.

The audience that will be using this android app, in its majority, belongs to IMCAS-X. There is understanding of the difficulty of 4G service and Wi-Fi capabilities in the area of Xalapa and Coátepec. The mobile app is developed to accommodate the difficulty of these capabilities, so that your observations are saved and easy to download once there is internet service available.

What is the Possibility of the Future?

With your help, IMCAS-X and others can help improve the quality and conditions of your watershed. The observations made could make a difference and the results seen in your area could help other watershed all around the world.

Although RíoMío is designed for the specificity of the Gávilanes and Pixiquiac rivers, there is the potential for it to be edited for use in other areas. More citizen scientists would be able to make the difference you are in the health of their watershed.

Who is In Charge of the App?

Dr. Alex Mayer is the scientist client for the mobile app. He is a professor of civil and environmental engineering at Michigan Tech. His teaching interests are in groundwater flow and transport and subsurface remediation. He is currently on sabbatical in Mexico, working with the NGO, IMCAS-X.

IMCAS-X is a NGO, which is an alliance of individuals, academics, civil society, government, and the private sector of the metropolitan area of Xalapa, concerned about water issues. According to their website, they strive to support the development of social skills to promote sustainable and efficient management of water resources in the region, promoting a holistic view on relevant for the conservation, restoration and management of water bodies environmental factors, services of water supply for the population and sanitation of sewage.

Who's Making This App?

The Watershed Monitoring Project (**Watershed Project**) will use web and mobile apps to empower citizens to report and make public watershed health observations. Watershed Project will also facilitate all citizens in learning about watershed pollution issues and incidents.

Watershed Project does not have direct monetary value, but can increase the visibility of Michigan Tech in environmental sciences and increase the funding in environmental projects. The project can also highlight developers' expertise and help secure employment.

Watershed Project is for all citizens to learn about watershed pollution incidents and more active citizens to report watershed incidents.

Javier Oliveros and **Monica Lester** wrote and designed this white paper for the project.

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