

## THE MAN REVAMPING BRAZIL'S APPROACH TO WATER QUALITY

How Adalberto Bianchini's research is helping the largest country in South America rewrite its rules on one of its most precious resources

POSTED BY BRIAN BANKS ON SEPTEMBER 20, 2017

**When the large dam** holding back iron ore tailings from the Samarco mine in the district of Bento Rodrigues in the state of Minas Gerais in southeastern Brazil ruptured on Nov. 5, 2015, the local devastation was immediate. Sixty-two million cubic metres of toxic metal waste and a wall of mud poured into the nearby Doce River, flooding a village and killing 19 people.

From there, the contaminated stew of tailings and mud flowed downstream, wreaking havoc as the worst environmental disaster in Brazil's history. In two weeks, it reached the river's estuary in the state of Espírito Santo, about 650 kilometres northeast of Rio de Janeiro, and began to enter the Atlantic Ocean.

That's when Adalberto Bianchini got a call from the Chico Mendes Institute for the Conservation of Biodiversity, an independent agency linked to Brazil's Ministry of Environment. A professor at the Institute of Biological Sciences at the Federal University of Rio Grande in the state of Rio Grande do Sul, Bianchini has emerged as the country's pre-eminent aquatic toxicologist and water-monitoring expert. Notably, key aspects of his expertise and influence are the product of a just-completed, seven-and-a-half-year International Development Research Centre [research project](#).

That work involved two related applications: developing state-of-the-art models to predict levels of toxic metals in Brazilian coastal waters, and identifying and monitoring appropriate biomarkers (cell-and-tissue-level biological reactions to environmental conditions) in aquatic species to determine when dangerous contamination thresholds are reached. Such tools can be used to devise management strategies to guide industrial development and safe water use — exactly the help the Chico Mendes Institute for the Conservation of Biodiversity asked Bianchini to bring to bear on the country's now-polluted coast.

Bianchini monitored the water and found high levels of metal contamination in a key fishery. The government responded by closing the coastal and estuarine area of Espírito Santo state to all fishing until further monitoring by Bianchini's research group determines it's safe.

According to biologist Chris Wood, Bianchini's Canadian IDRC research partner, such responsibility and recognition reflects a broader achievement. "What Adalberto's really done is build a foothold for a modern, scientific approach to water quality in Brazil," says Wood, former Canada Research Chair in Environment and Health at McMaster University and now an adjunct professor in the department of zoology at University of British Columbia.

In most of the developed world, toxicity modelling and biomarker technologies are widely used to set water policy and pollution regulations. That's not the case in Brazil, says Bianchini. "The regulatory approach here only takes into account the concentration of pollutants in the water. Often, this results in situations where we have mass fish mortality yet when we check the chemical measurements they are within the regulatory limits."



Members of Adalberto Bianchini's research team pick through samples pulled from the Atlantic Ocean to determine the environmental damage wrought by the 2015 Samarco mine disaster. Bianchini's research is helping Brazil rewrite its rules on water quality. (Photo: Fernando Moraes/Rede Abrolhos)

This gap was the motivation for Bianchini's IDRC research. "We wanted to develop biomarkers to show that it's necessary to include the biological component in regulations," he says.

His modelling work used the biotic ligand model, a common tool in aquatic toxicology designed to examine metals in water to determine how likely they are to accumulate at lethal levels in fish and other organisms. "We did field trips collecting samples over several years at different locations in the southern part of Brazil, trying to select the best monitoring species," says Bianchini, "and from those, we selected the best biomarkers to apply to contamination by pesticides, hydrocarbons, metals and personal care products — the new class of contaminants."

Bianchini then began educating government officials on the findings. His goal: to see water-testing rules and planning and development guidelines rewritten based on his work.

The first to update its rules was the environmental secretariat in his local Rio Grande municipality. Bianchini hopes for broader uptake soon. "We did our final workshop in April with the 10 different municipalities that cover the three main water basins for southern Brazil, about 700 kilometres by 700 kilometres," he says.

Bianchini says several large companies have also agreed to start testing his approach in their operations. One is the Rio Grande do Sul state water supply company, CORSAN. Another is Petrobras, the Brazilian multinational petroleum company.

Ultimately, however, he is in some ways proudest of the impact the IDRC-funded work has had on educating and training Brazilian students and building local capacity to take this science and its applications forward. "We now have a new generation more concerned about environmental preservation and care of aquatic systems," he says. "And they're more skilled as well."

## THE MAN REVAMPING BRAZIL'S APPROACH TO WATER QUALITY

How Adalto Bianchini's research is helping the largest country in South America rewrite its rules on one of its most precious resources

### READING AS THINKING

1. After reading the article, create a timeline of the events that occurred.

2. Outline the immediate and long-term effects of the disaster based on what was discussed in the article.

IMMEDIATE EFFECTS OF THE DISASTER	LONG-TERM EFFECTS OF THE DISASTER

3. Explain why Adalto Bianchini is seen as Brazil's preeminent aquatic toxicologist and water-monitoring expert.

---



---



---



---

## THE MAN REVAMPING BRAZIL'S APPROACH TO WATER QUALITY

How Adalberto Bianchini's research is helping the largest country in South America rewrite its rules on one of its most precious resources

4. What is Bianchini's ultimate goal? Do you think that goal is realistic? Why or why not?

---



---



---

5. What impact has Bianchini's work had on the local communities? Explain why this is important.

---



---



---

6. Explain how Brazil's water policy and pollution regulation is different from those of developed countries.

---



---



---

7. Fieldwork is extremely important to environmental scientists. Outline Bianchini's fieldwork by filling out the following chart:

Where did Bianchini go to conduct his fieldwork?	
What type of information was Bianchini searching for? What was the purpose of his fieldwork?	
Suggest what type of equipment Bianchini may have used to gather his information.	
What did Bianchini learn while in the field?	
What were his next steps, post-fieldwork?	

## THE MAN REVAMPING BRAZIL'S APPROACH TO WATER QUALITY

How Adalto Bianchini's research is helping the largest country in South America rewrite its rules on one of its most precious resources

### Think-Pair-Share

#### Think

Water is a precious resource and is connected to a country's economy, landscape, culture, overall population health and government. The rupturing of the dam in southeastern Brazil had devastating effects on the entire country as a whole. Using Brazil as an example, or selecting a developing country of your own, fill in the chart below, outlining how water affects that specific country.

Country: \_\_\_\_\_

<b>Economy</b>	
<b>Landscape</b>	
<b>Culture</b>	
<b>Health</b>	
<b>Government</b>	

8. **Pair**  
With a partner, compare your answers and add any additional information you think is relevant based on your discussion. If you have two different countries, compare how they are similar and different.
9. **Share**  
Share your findings with the class. Once everyone has shared, have a class discussion on how water affects the lives of Canadians and fill out the same chart above as a class, using Canada as an example.

## THE MAN REVAMPING BRAZIL'S APPROACH TO WATER QUALITY

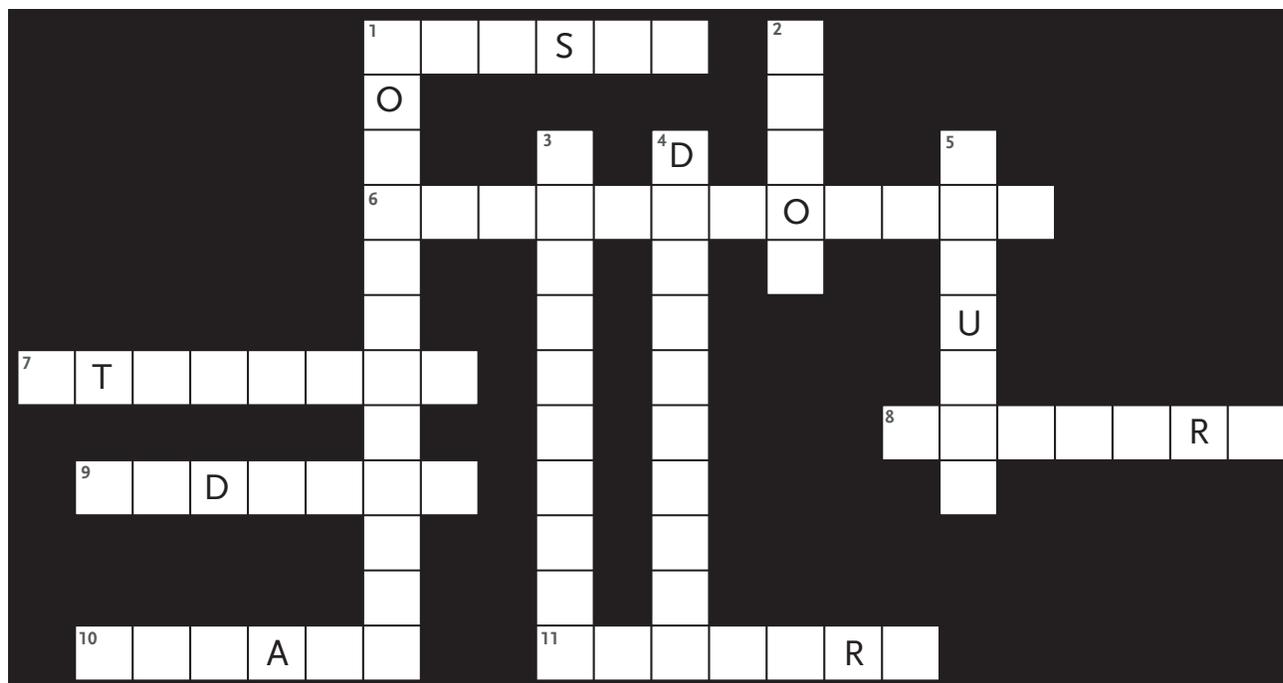
How Adalberto Bianchini's research is helping the largest country in South America rewrite its rules on one of its most precious resources

### ONLINE

1. [Explore other innovative ways](#) people in the developing world are creating solutions and then create an invention of your own.
2. Explore the United Nations position on [water and sanitation](#) and determine how water is interconnected with your everyday life.
3. Read this article about [water conditions on First Nation](#) reserves and offer a solution.
4. Learn more about water and water availability in Canada [here](#).
5. Canada has one-fifth of the world's freshwater. Explore WWF-Canada's [freshwater infographic](#) and create one of your own.

## THE MAN REVAMPING BRAZIL'S APPROACH TO WATER QUALITY

How Adalto Bianchini's research is helping the largest country in South America rewrite its rules on one of its most precious resources



### CROSSWORD:

#### Across

- Rio Grande do Sul state water utility
- A scientist who is concerned with nature, and the effects and detection of poisons
- The ocean in which the contaminants entered the water
- A rock or mineral from which iron can be extracted for profit (2 words)
- Name of the university where Adalto Bianchini teaches as a professor
- The model which Bianchini was modelling his work after: Biotic \_\_\_\_\_ model
- The mine in southeastern Brazil in the district of Bento Rodrigues

#### Down

- When something is polluted or made impure
- Wide spread destruction, often associated with a natural disaster
- A measurable tool in an organism, which Bianchini relies on for monitoring organisms in contaminated places
- The direction of flow of a river, and the direction the iron ore tailings travelled
- The mouth of a large river, where the tide meets the stream