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Ecuador, Water Pollution

How water pollution affects food security in rural Ecuador

I am taking a closer look at how water pollution is affecting food security in rural Ecuador. Food production is threatened by polluted water and a lot of people that depend on now polluted rivers are struggling to find a clean water and food source. This water is polluted because of bacteria, chemicals and oil spills. I will start by providing some background information and will then discuss various problems and challenges. Lastly, I will provide a few solutions to address the problem of water pollution.

First, some basic information on Ecuador. Ecuador is a representative democratic republic and there is one assembly that legislates and votes. The politics of Ecuador are multi-party and a new president is elected every four years. Ecuador is a country in South-America with a current population of almost 18 million people. Of these people, 64 percent live in urban areas and 36 percent live in rural areas. (The World Bank, 2021)

The country has a land area of 283,560 square kilometres (The World Bank, 2020) and currently 21.8 percent of Ecuador's land is cultivated. (TRADING ECONOMICS, 2020) Ecuador knows many climates. The lower-lying areas in south-west Ecuador have a subtropical climate while north-west Ecuador has a tropical climate. Inland Ecuador has a maritime climate with dry winters, these winters take place from June to August. The upland areas of Ecuador have an alpine climate. Because of the mountains in Ecuador, the temperatures are lower than one would expect with the tropical circumstances Ecuador finds itself in. The impact of the ocean on the climate is also reduced by the mountains. There is an uneven distribution of rainfall in Ecuador. Some areas receive only 250 millilitres of rainfall per year while other areas receive as much as 6,000 millilitres per year. Most of the rain falls from february to may, after may there is a drier period. (Klimaainfo, n.d.)

The major crops produced in Ecuador are: corn, potatoes, beans and cassava. Because there are a lot of subsistence farmers, these major crops make up most of their diet. (Britannica, n.d.) Ecuador's major exports are: crude petroleum, bananas, crustaceans, processed fish, cut flowers and cocoa beans. (OEC, 2021) Farms on the coast are largely oriented towards the export market. The size of farms depends on what kind of crops are grown on the farms. Cacao farms are about 60 hectares or bigger while banana and coffee farms are usually smaller. (Nations Encyclopedia, n.d.) A meal in Ecuador typically consists of a main protein like: pork, chicken or fish. A starch, such as rice or potatoes. Accompanied by water, coffee or juice. (Adventure Life, n.d.)

A typical Ecuadorian family consists of a father and a mother and two children with a fertility rate of 2.05 percent. (TRADING ECONOMICS, 2023) Of the low-income households, 60 percent deal with

housing deficits. Yet 98.85 percent of the population has access to electricity. (TRADING ECONOMICS, 2023) Contrasting this, a considerably lower amount of the population has access to clean water. With 66.8 percent of the population having access to clean water and only 53.9 percent of the rural population having access to clean water. (MacroTrends, 2020)

The average salary of an Ecuadorian is 466.63 USD per Month. (TRADING ECONOMICS, 2021) Ecuador's economy relies heavily on oil and agriculture, these sectors provide jobs to Ecuadorians and about three-fifths of Ecuador's labour force works in the service industry. (Britannica, n.d.) The unemployment rate of Ecuador is rather low with it being 3.19 percent. (CEIC, 2022). Despite Ecuador having a low unemployment rate, the poverty rate in 2021 was still 27.7 percent. (García-Vélez et al., 2022)

When looking at education, the constitution states that the first nine years of school are free of charge for all children. Starting from the age of six, 95 percent of children attend primary school up until the end of 5th grade when a quarter of these children will have dropped out. (Scholaro Database, n.d.) The government spends the most on the educational services sector out of all the public sector programmes but the quality of education is still poor. The gender gap in education seems to have been closed but the gap between urban and rural populations and the rich and the poor has been expanding. (Vos & Ponce, 2004)

Ecuador has a universal healthcare system which is funded by the government and major cities have public hospitals. Only a small portion of the total national budget is allocated to public health which has caused health conditions in rural areas to be fairly poor. The healthcare system has a hard time keeping up with the demand as there is a lack of medical professionals. These professionals often migrate to jobs in wealthier countries where they can expect a higher salary. (Reece, 2020)

Ecuador has a problem with its water supply. Only 53.9 percent of the rural population has access to clean water. (MacroTrends, 2020) It is easier for urban areas to obtain sanitised water than it is for rural areas. This is due to municipalities that rural areas often have to rely on. These municipalities often make mistakes and there is a lack of good communication between inhabitants and municipalities. The infrastructure is also better in urban areas than it is compared to rural areas. Urban areas are more technologically advanced and therefore these areas have a better sanitisation process than rural areas where infrastructure is often lacking. To illustrate, only a quarter of the wastewater in the Amazon region, which is a rural area, is sanitised. Meanwhile the three big cities of Cuenca, Guayaquil and Quito are the only ones to fulfil the international standards for water quality. (Arcentales-Ríos et al., 2022)

In the Amazon region untreated wastewater is poured straight into the rivers, which pollutes the rivers. (Arcentales-Ríos et al., 2022) This polluted water is used in food production which can lead to low harvest. The crops that do get harvested can be of lower quality. The chemicals and bacteria in the water can contaminate the food that gets produced, exposing the people that consume this food to health risks. This polluted water is used as drinking water for people as well as for livestock, which can lead to illnesses. (Vinueza et al., 2021)

People living in the rural areas of Ecuador also face oil spills that contaminate their water. These oil spills are caused by ruptured pipelines that were supposed to transport the oil. Over the last 15 years around 15,800 barrels of oil have contaminated Amazon rivers as a result of rupturing pipelines. The

oil is toxic and these spills are terrible for the environment. (EOS Data Analytics, 2022) A lot of indigenous communities live near rivers and depend on fish as their main food source and market. But with polluted water, this food source and market is shut down and these people's livelihoods are shut down. These people have no choice but to use the water from these contaminated sources even though they know it's risky to use it. (Rice & Simpson, 2020) This can lead to health issues such as: higher occurrences of abortion, increased rates of fungal infection, dermatitis, headaches and nausea. (Nelson, 2021)

To illustrate, the oil spill on April 7th in 2020 took place during the covid pandemic in the Amazon rainforest. Indigenous communities were trying to protect themselves from the virus by quarantining. Two pipelines got damaged and as a result, leaked into water sources. This caused 27,000 people to lose the ability to farm and catch fish. (Brown, 2020) (Mongabay, 2022) There have been at least 1169 oil spills in Ecuador from 2005 to 2015 and 952 of those oil spills took place in the Amazon region. From 2015 to 2021, 899 oil spills occurred. (EOS Data Analytics, 2022) These oil spills keep happening because these pipelines are not always well devised. For example, the OCP pipeline was constructed in a geologically unstable area. This area is at risk for events like earthquakes and landslides. These events could damage the pipeline and cause leaks. (Rainforest Rescue, 2022)

Because of these oil spills, the rivers in the Amazon region are contaminated. A lot of people live here and are struggling to find a clean water and food source because they can't eat fish and drink from the rivers anymore. To counter this, ideally we would stop the transportation of oil entirely, nevertheless this might not be possible. Thus, I would like to propose that the surveillance of the oil pipelines improves. This could be done by having a surveillance system in place, either an automated or a manual system. The manual system would have cameras in place watching the pipeline at the most unstable parts of the pipeline. People would be watching the live footage so they can be on the lookout for any damage that occurs. The automated system would be a sensor that notices when a pipeline has been damaged and then alerts certain people of this damage. This system would probably be more expensive but would also be faster and more accurate than the manual system. Hypothetically, after damage has occurred a team will be dispatched to the site where the damage has occurred. This team will restore the pipeline and a disastrous leak will be evaded. Both systems will also provide job opportunities.

The companies that own the pipelines will need to implement one of these systems. This could be expensive but the funding for this project could come from the USAID. The USAID has made 36.7 million dollars available to Ecuador. This money is to be invested in development projects that, among other things, support conservation and sustainable use of natural resources to combat climate change. I would argue that this project qualifies to receive funds from USAID. (USAID, 2022) This project will be beneficial to all parties involved, the communities that depend on the rivers will have less contaminated water, the government will have to deal with less oil spills which in the long run will save money. And the companies that own the pipelines will not lose oil due to these spills anymore, which will also save them money.

Right now only a quarter of the wastewater in the Amazon region of Ecuador gets treated. That number should be a lot higher. A solution to this would be to implement more DWWTPs, this stands for: Decentralised Wastewater Treatment Plants. This means that wastewater will not have to travel to another location to get treated, which would be the case with the usual centralised approach. Instead, the water is treated at the site of supply or demand, or preferably both. There are several benefits to DWWTPs and these are that: the treatment and eventual supply of the wastewater will be faster

because the water does not need to be transported from and to a distant location, less transportation leads to less emissions that pollute the environment, and there is no money being spent on transportation. Because the water is essentially being recycled, there is also a decreased demand for 'fresh' water, this leads to less water shortages and less water wastage. (Alvarado et al., 2017)

These DWWTPs have already been implemented in Cuenca, but not all of these plants are as efficient as they should be. Some of these plants have even stopped working entirely. The plants located in the rural areas of Cuenca are mainly focused on preventing the spread of diseases. But deficiencies in the process of the treatment of wastewater and technical deficiencies don't always allow for this objective to be achieved. There are also other reasons as to why these plants are failing, starting with the fact that the location of the plants makes them difficult to access when maintenance is needed. And the lack of involvement of communities causes the municipal institution of the area, in this case ETAPA, to be solely responsible for the DWWTPs. (Alvarado et al., 2017)

These technological deficiencies and deficiencies in the process of treatment need to be redressed. Most of the deficiencies in these sectors have already been found and ETAPA is working on sorting out solutions. (Alvarado et al., 2017) It is also beneficial to involve the communities that make use of the DWWTPs. When communities get involved, the people using the water could have more control over their own water supply and could work with ETAPA to improve the situation. By educating these communities, more people could understand exactly what is going on with their water supply. Some of the people in these communities could be trained to work at a DWWTP. That would mean that these communities are engaged, aware and have more power.

It would be of interest to invest in more DWWTPs in rural areas to prevent health issues that are due to polluted water. DWWTPs would also prevent pollution of the rivers in the Amazon region. This will be expensive, but it is also very expensive to construct pipelines that transport water over long distances. Transporting water to isolated areas is especially difficult with centralised wastewater treatment. The water supply to these areas will definitely improve and be less expensive with a decentralised approach. (Diaz & Garnick, 2021)

ETAPA is owned by the city of Cuenca and this is where the company gets its funds. ETAPA could expand outside of Cuenca and construct DWWTPs in other areas of the country. Or more major cities could invest in companies like ETAPA that construct DWWTPs in their own urban and rural areas. It would provide more areas with all the benefits that come with a decentralised approach to water treatment and supply.

In conclusion, water pollution is a big problem in Ecuador. Poor wastewater treatment and oil spills are large contributing factors to this problem. A lot of people that depend on now polluted rivers are struggling to find a clean water and food source. This is why I am proposing a surveillance system that monitors oil pipelines either manually or automatically. Disastrous leaks could be prevented or redressed immediately because of this system. This would lead to less water pollution. Polluted water is used in food production which can lead to low harvest. The crops that do get harvested can be of lower quality. Polluted water is also used as drinking water which leads to health issues. Therefore, I am suggesting that more DWWTPs (Decentralised Wastewater Treatment Plants) be constructed and that the existing DWWTPs are improved by addressing technological deficiencies and deficiencies in the process of treatment. I also suggest that the communities who make use of the DWWTPs are more involved. The communities would have more control over their own water supply and that would mean that these communities are engaged, aware and empowered.

References

Adventure Life. (n.d.). *Ecuador Food*. Adventure-Life.

<https://www.adventure-life.com/ecuador/articles/ecuador-food#:~:text=The%20diet%20in%20Ecuador%20generally,glass%20of%20juice%20or%20coffee>

Alvaradoa, A., Larriva, J., Sánchez, E., Idrovo, D., & Cisneros, J. F. (2017, March).

Assessment of decentralized wastewater treatment systems in the rural area of Cuenca,

Ecuador. (Wastewater treatment system).

https://www.researchgate.net/profile/Esteban-Sanchez-12/publication/315593583_Assessment_of_decentralized_wastewater_treatment_systems_in_the_rural_area_of_Cuenca_Ecuador/links/5bd320f1299bf1124fa4c23b/Assessment-of-decentralized-wastewater-treatment-systems-in-the-rural-area-of-Cuenca-Ecuador.pdf

Arcentales-Ríos, R., Carrión-Méndez, A., Cipriani-Ávila, I., Acosta, S., Capparelli, M., Moulatlet, G.M., & Pinos-Vélez, V. (2022, December). Assessment of metals, emerging contaminants, and physicochemical characteristics in the drinking water and wastewater of Cuenca, Ecuador. (Water quality).

<https://www.sciencedirect.com/science/article/pii/S2773050622000295>

Britannica. (n.d.). *Ecuador - Economy*. britannica.

<https://www.britannica.com/place/Ecuador/Agriculture-forestry-and-fishing>

Brown, K. (2020, September 5). FEATURE-'Trapped again': Quarantined Ecuador indigenous groups fight Amazon oil spill. (Oil spill).

<https://www.reuters.com/article/ecuador-environment-oil-idUSL8N2FS20X>

CEIC. (2022, December). *Ecuador Unemployment Rate*. ceicdata.

<https://www.ceicdata.com/en/indicator/ecuador/unemployment-rate#:~:text=Ecuador%20Unemployment%20Rate%20dropped%20to,an%20average%20rate%20of%204.47%25>

Diaz, J., & Garnick, J. (2021, December 13). *QUITO'S WATER: DECENTRALIZED SOLUTIONS TO DECENTRALIZED CHALLENGES*. Urbanwateratlas.

<https://www.urbanwateratlas.com/2021/12/13/quitos-water-decentralized-solutions-to-decentralized-challenges/>

EOS Data Analytics. (2022, July 19). *Oil Spills In The Amazon: A Never-ending Tragedy*.

Eos.

<https://eos.com/blog/oil-spills-in-the-amazon-a-never-ending-tragedy/#:~:text=On%20the%20country%20level%2C%20the.2021%2C%20there%20899%20registered%20incidents>

García-Vélez, D.F., Quezada-Ruiz, L.D., Tituaña-Castillo, M.C., & Río-Rama, M.C. d. (2022, March 30). Regional Analysis of Poverty in Ecuador: Sensitivity to the Choice of Equivalence Scales. <https://www.frontiersin.org/articles/10.3389/fpsyg.2022.877427/full>

Klimaatinfo. (n.d.). *Het klimaat van Ecuador*. Klimaatinfo.

<https://klimaatinfo.nl/klimaat/ecuador/>

MacroTrends. (2020). *Ecuador Clean Water Access 2000-2023*. macrotrends.

<https://www.macrotrends.net/countries/ECU/ecuador/clean-water-access-statistics>

Mongabay. (2022, March 18). *Indigenous communities in Ecuador struggle with the aftermath of another oil spill*. News.Mongabay.

<https://news.mongabay.com/2022/03/indigenous-communities-in-ecuador-struggle-with-the-aftermath-of-another-oil-spill/>

Nations Encyclopedia. (n.d.). *Ecuador - Agriculture*. nationsencyclopedia.

<https://www.nationsencyclopedia.com/Americas/Ecuador-AGRICULTURE.html>

Nelson, D. (2021, October 25). *Water Pollution in Ecuador*. Storymaps.Arcgis.

<https://storymaps.arcgis.com/stories/843600afa98446e9b5b538ef5a0002b6>

OEC. (2021, December). *Ecuador (ECU) Exports, Imports, and Trade Partners*. oec.world.

<https://oec.world/en/profile/country/ecu>

Rainforest Rescue. (2022, February 1). *Ecuador: Pipeline rupture causes oil spill in rainforest*. Rainforest-rescue.

<https://www.rainforest-rescue.org/updates/10653/ecuador-pipeline-rupture-causes-oil-spill-in-rainforest>

Reece, J. (2020, September 16). *Healthcare In Ecuador*. (Healthcare).

<https://borgenproject.org/healthcare-in-ecuador/>

Rice, C., & Simpson, M. (2020, November 17). *The State of Drinking Water in Ecuador*.

(Water quality). <https://storymaps.arcgis.com/stories/74d9240654f54f598e6465f7517a0c16>

Scholaro Database. (n.d.). *Education System in Ecuador*. scholaro.

<https://www.scholaro.com/db/countries/ecuador/education-system>

TRADING ECONOMICS. (2020). *Ecuador - Agricultural Land (% Of Land Area)*.

Tradingeconomics.

<https://tradingeconomics.com/ecuador/agricultural-land-percent-of-land-area-wb-data.html>

TRADING ECONOMICS. (2021). *Ecuador Gross Average Nominal Monthly Wages*.

Tradingeconomics. <https://tradingeconomics.com/ecuador/wages>

TRADING ECONOMICS. (2023, March). *Ecuador - Access To Electricity (% Of*

Population). Tradingeconomics.

<https://tradingeconomics.com/ecuador/access-to-electricity-percent-of-population-wb-data.html#:~:te>

TRADING ECONOMICS. (2023, March). *Ecuador - Fertility Rate, Total (births Per Woman)*. Tradingeconomics.

<https://tradingeconomics.com/ecuador/fertility-rate-total-births-per-woman-wb-data.html>

USAID. (2022, August 30). *USAID Commits Nearly \$20 Million In Additional Funding To Support Democracy And Prosperity In Ecuador*. usaid.

<https://www.usaid.gov/news-information/press-releases/aug-30-2022-usaid-commits-nearly-20-million-additional-funding-support-democracy-prosperity-ecuador>

Vinueza, D., Ochoa-Herrera, V., Maurice, L., Tamayo, E., Mejía, L., Tejera, E., & Machado, A. (2021, September 3). Determining the microbial and chemical contamination in Ecuador's main rivers. (Water Pollution). <https://www.nature.com/articles/s41598-021-96926-z>

Vos, R., & Ponce, J. (2004). Education. *Chapter 3*(Education), 34.

https://www.un.org/en/development/desa/policy/mdg_workshops/training_material/vos_and_ponce_2004.pdf

The World Bank. (2020). *Land area (sq. km) - Ecuador*. Data.worldbank.

<https://data.worldbank.org/indicator/AG.LND.TOTL.K2?locations=EC>

The World Bank. (2021). *Urban population - Ecuador*. Data.worldbank.

<https://data.worldbank.org/indicator/SP.URB.TOTL?end=2021&locations=EC&start=1960&view=chart>