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Pesticides, Pollution, and People: An overview of Public Health and Environment in Costa Rica



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Executive Summary

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In a developing country that prides itself on having a green reputation, a balance is required between sustainable development and economic progress. As Costa Rica's healthcare system continues to evolve to meet the needs of its growing population, the legislation required to protect the country's environmental assets is hard pressed to keep up. This project was designed to provide a comprehensive assessment of Costa Rica's healthcare system and a general look at the current health problems that Costa Rica faces. It also provides an in-depth look at a few specific environmentally related health issues that the country is currently dealing with.

Health & Environmental Effects of Pesticide Use in Costa Rica

Costa Rica's development relies heavily on the exportation of crops as well as a national devotion to environmental sustainability, Costa Rica is faced with the challenge of utilizing pesticides to maximize crop yields while simultaneously guarding against negative human health and environmental consequences. A heavy-handed approach to pesticide application paired with loose enforcement of safety standards has resulted in a high number of pesticide related deaths and illnesses including cancer, sterilization, and pesticide poisoning.

Additionally, excessive pesticide dosages and shoddy application methods result in the transfer of pesticides to the ecosystems surrounding agricultural land. Exposure to traces of pesticides is damaging to both the land that the pesticides are used on and the animal populations that inhabit the areas where the pesticides are used. Pesticide pollution is the cause of an array of different health effects in animal populations including reproductive and developmental disabilities and death. Furthermore, once pesticide pollution is introduced into an ecosystem, the pollution is hard to remove because the pesticides are placed directly on the cultivated land and the chemical characteristics of the pesticide compounds often make decomposition slow or impossible. Pesticide pollution results in a buildup of hazardous chemicals overtime that animals are exposed to which subsequently results in bioaccumulation in organisms.

In order to minimize and eventually eliminate pesticide pollution and its harmful effects on the environment and human health, Costa Rica needs to develop a comprehensive strategy to optimize pesticide use so that it is utilized in the most efficient way possible in conjunction with alternative pest control methods and thereby minimize and eventually eliminate the pesticide pollution that makes its way into the environment and comes into contact with both humans and animals. The current legislation regarding pesticide use in Costa Rica is well-written and comprehensive, but improvement is needed pertaining to enforcement mechanisms. Suggestions for improvement include:

- Imposition of stricter standards on pesticide companies
- Changes in international import policy that prohibits the import of agrochemicals that have been banned for health reasons in foreign countries

- Separate, delineate, and delegate specific aspects of enforcement of regulatory functions to certain agencies taking into consideration common policy objectives
- Secure funding to ensure that agencies have adequate means to conduct quality testing in a laboratory setting and that complete, organized records are kept
- Implementation of incentives for farms that utilize Integrated Pest Management practices

Water Quality and Wastewater Management

In Costa Rica, the Institute of Aqueducts and Sewers (*Instituto Costarricense de Acueductos y Alcantarillados* or AyA) is tasked with the management of potable water and sewage systems (infrastructure that conveys sewage). Costa Rica has thirty-four watersheds, area of land that drains all the streams and rainfall to a common outlet, which provide water to Costa Ricans. However, the water that citizens get from these watersheds is often polluted. Polluted waters are the cause of many health related issues.

There are dozens of regulations that govern wastewater management and treatment in Costa Rica, but there are very few sewerage networks in use. In urban areas sewerage networks service only 34% of the area and treat only 4% of the wastewater. The lack of effective and widespread water treatment and the continuous contamination of fresh groundwater have created an environmental risk factor that is causing detrimental health effects.

Healthcare System of Costa Rica and the Indigenous Peoples

Costa Rica provides universal healthcare to its citizens and permanent residents. Studies have shown that Costa Rica offers some of the best health care in Latin America, because of the continuous upgrades being made to the private and public health care systems. The *Caja Costarricense de Seguro Social* is in charge of a majority of the nation's public health sector and is obligated to formulate and execute health programs that are both preventive (such as: vaccinations) and healing (such as: surgery, therapy, clinical, etc.) in nature. Today, there are approximately 29 public hospitals operating under the CAJA and about 250 public clinics located throughout the country. In the past ten years, Costa Rica has emerged as a top destination for both eco-tourism and medical tourism attracting clients from both the US and Canada as well as other foreigners. Costa Rica provides high quality health care at a much lower cost than many other countries.

However, the great benefits of Costa Rica's health care system is not experienced by the entire population. Indigenous peoples of Costa Rica are mostly excluded from economic development, social services, and legal protection. Although the government pays for their insurance (Aseguros por el Estado), the indigenous often are unable to gain access to healthcare or emergency care. They also struggle to access clean water and maintain possession of their land. Although the indigenous peoples of Costa Rica only represent less than 1.5% of the population their human rights should be protected.

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Pesticides, Pollution, and People

An Overview of Public Health and Environment in Costa Rica

Introduction

When looking at wealth on a global scale we find that an underlying cause of poor health is poverty, which is a logical conclusion when statistics show that more than one billion people earn about a dollar a day, living in extreme poverty.¹ Under developed and developing countries often struggle to adequately balance the need to conserve the environment through sustainable development with the need to provide the people with the fundamental human rights. In general, poor people lack access to “clean water and healthy, diverse diets,”² and in many cases they rely on assistance from the government to gain access to clean water and a healthy diet. “One major challenge to reducing health disparities is that many governments in under developed countries do not focus on the needs of the poor and the specific challenges that they face.”³ However, when a developing country decides to become a beacon in its efforts to preserve natural areas and provide universal healthcare, we must wonder why other countries are not following in its footsteps.

Costa Rica, a country in Central America, is “one of the least impoverished countries in the Third World,” providing its residents universal healthcare which has led to the highest life-expectancy averages and the lowest infant mortality rates in Central and South America.⁴ It has a land mass of 51,100 square kilometers,⁵ with an estimated population of 4.6 million people.⁶ The capital city of Costa Rica is San Jose. The country has two land borders and two oceanic borders. The northern part of Costa Rica is bordered by Nicaragua, while the southern part is bordered by Panama. Its western border is carved by the Pacific Ocean, while the eastern border, known as the Caribbean Coast, is formed by the Caribbean Sea. Costa Rica is a developing third-world country with a universal public healthcare system, but it is experiencing first-world health problems such as obesity and other chronic health problems. The Costa Rican healthcare system is divided into four different levels of care: (1) tertiary level of care, (2) secondary level of care, (3) area level of care, and (4) sector level of care.⁷ The system’s level of care is ordered in an inverted pyramid scheme; the first level at the top of the pyramid is the widest part because

¹ "Poverty Overview." *The World Bank*. Web. 26 June 2014.

<<http://www.worldbank.org/en/topic/poverty/overview>>. Paragraph 3 and 4.

² "Public Health Issues and Costs." HEAL Health & Ecosystems: Analysis of Linkages. Web. 26 June 2014. <<http://www.wcs-heal.org/global-challenges/public-health-issues-and-costs>>. Paragraph 3.

³ *Id.* Paragraph 4.

⁴ Evans, Sterling. "The Costa Rican Uniqueness Factor." Introduction. *The Green Republic: A Conservation History of Costa Rica*. Austin: U of Texas, 1999. P.1.

⁵ "Informacion General," *Transmisión Del Mando Presidencial, Costa Rica 2014*. Web. 25 June 2014. <<http://costarica2014.go.cr/informacion-general/>>. Section: Área y situación geográfica.

⁶ *Id.* Section: Población, censo año 2011.

⁷ Guest Speaker: Esteban Avendano, MD, MPH. PowerPoint Presentation: Local Health Care Management System in Costa Rica.

it provides the basic essential level of care, and the fourth level at the bottom of the pyramid is the narrowest section of the pyramid because the level of care provided is very specific. At the highest level of care, the tertiary level, Costa Rica is divided into seven regions with a total of 29 Hospitals.⁸ While at the bottom of the pyramid, the sector level of care, Costa Rica has one thousand sectors offering consultations, diagnosis, and treatment services. Although the system seems to provide an adequate number of healthcare facilities, the question arises whether each person is provided with equal treatment and equal access.

This Consultancy Report will provide an overview of Public Health and Environment in Costa Rica, focusing on the history of the healthcare system of Costa Rica, the link between health and the environment, and international and domestic policies and legislation which govern the health care system. The overview of the public health and environment in Costa Rica will be subdivided into three topics: (a) the effects of pesticides, (b) wastewater and water quality, and (c) healthcare access to the indigenous population.

History of the Healthcare System of Costa Rica

In 1821, following battles in Mexico and South America, Costa Rica, along with four other Central American countries, signed “La Acta de Independencia,” gaining its independence from Spain.⁹ In 1852, thirty-one years after Costa Rica’s independence from the Spanish Empire, *Hospital San Juan de Dios* was created to provide care to the people of Costa Rica. At the time, the hospital was run by nuns, and today it has 700 beds, and 7 kilometers of corridors. Five years later under the administration of the Costa Rican President don Juan Rafael Mora Porras, the *Protomedicato de la República de Costa Rica* was created as the public health consulting body.¹⁰ The *Protomedicato* was the governing body until April 3, 1895, when through the initiative of Dr. Juan José Ulloa Giralt the *Facultad de Medicina Cirugia Y Farmacia de Costa Rica* (Faculty of Surgical Medicine and Pharmacy of Costa Rica) was created and assumed the functions of the *Protomedicato*.¹¹

In 1873, the Costa Rican government sought to protect and generate resources for social security; thus, the government created the *Junta de Proteccion Social de San José* (JPSSJ).¹² The JPSSJ generates resources for social security through the national lottery and other official sweepstakes nationwide. The JPSSJ, previously called Board of Charity of San José, was founded in 1844 and today is a praised institution. The institution has helped fund hospitals, city

⁸ Guest Speaker: Esteban Avendano, MD, MPH. PowerPoint Presentation: Local Health Care Management System in Costa Rica.

⁹ Kane, Corey. "Costa Rica Gears up to Celebrate 192 Years of Independence on Sunday." *The Tico Times*. 13 Sept. 2013. Web. 26 June 2014. <<http://www.ticotimes.net/2013/09/13/costa-rica-gears-up-to-celebrate-192-years-of-independence-on-sunday>>.

¹⁰ "Historia Y Organización." *Colegio De Médicos Y Cirujanos De Costa Rica*. Web. 26 June 2014. <<http://www.medicos.sa.cr/web/quienes-somos/historia>>. Paragraph 1.

¹¹ *Id.* Paragraph 2.

¹² Guest Speaker: Esteban Avendano, MD, MPH. PowerPoint Presentation: Local Health Care Management System in Costa Rica. Slide 10.

cemeteries, city centers for leprosy and tuberculosis, and more recently the Hospital Carlos Sáenz Herrera (National Children Hospital) and other centers of social importance for the country. In 1924, not too long after the creation of JPSSJ, the President of Costa Rica Ricardo Jiménez Oreamuno, while on his second term, created the *Instituto Nacional de Seguros* (INS) or the National Insurance Institute.¹³ Through government directives INS had a monopoly on the administration of insurance.¹⁴ It became illegal for private insurance companies to issue insurance policies directly to individuals. By the late 1930's the Ministry of Health was created, which was followed by the creation of private clinics and charity hospitals. The Ministry of Health works in conjunction with *Caja* to formulate policy, regulate medical markets, coordinate disease eradication efforts, and monitor food and water quality.¹⁵

Then in 1940, President Dr. Rafael Ángel Calderón Guardia took a personal interest in establishing a social security system so his administration drafted the legislation which created the *Caja Costarricense del Seguro Social* (Costa Rican Department of Social Security).¹⁶ The *Caja* plays an important role in national health policy making. Its principles are solidarity, universality, and equality.¹⁷ *Caja* created the first hospital of social security called the Hospital Central (today *Hospital Calderon Guardia*). As a public institution, the *Caja* has the obligation to formulate and execute health programs that are both preventative and healing in nature. Through *Caja* insurance was made available to all citizens and residents of Costa Rica.¹⁸ In the health sector, for sector employees membership in *Caja* was mandatory, while self-employed and informal-sector workers were encouraged to join *Caja's* voluntary plans.¹⁹ However, access to the insurance was based on a person's salary. Insurance was essentially limited to those who could pay, because through *Caja* an individual was required to pay one third of the insurance and the rest was paid one third by the government and one third by the individual's employer. Before *Caja* created public health insurance, "citizens had to pay for health care out-of-pocket, work for a company that had its own doctor, or beseech the few charity clinics."²⁰ The poorer population's lack of access to healthcare created a disparity that would soon become a human rights issue that the government would have to address.

¹³ "Historia." *INS Instituto Nacional De Seguros*. Web. 26 June 2014. <<http://portal.ins-cr.com/portal.ins-cr.com/Institucional/Historia/Historia/>>.

¹⁴ *Id.*

¹⁵ Clark, Mary A. "HEALTH SECTOR REFORM IN COSTA RICA: REINFORCING A PUBLIC SYSTEM." *Tulane University Woodrow Wilson Center Workshops* (2002): 1-23. Print. p.4.

¹⁶ Guest Speaker: Esteban Avendano, MD, MPH. PowerPoint Presentation: Local Health Care Management System in Costa Rica. Slide 12.; Clark, Mary A. "HEALTH SECTOR REFORM IN COSTA RICA: REINFORCING A PUBLIC SYSTEM." *Tulane University Woodrow Wilson Center Workshops* (2002): 1-23. Print. p.3.

¹⁷ Guest Speaker: Esteban Avendano, MD, MPH. PowerPoint Presentation: Local Health Care Management System in Costa Rica. Slide 12.

¹⁸ "Junta Directiva." *CCSS Caja Costarricense De Seguro Social*. Web. 26 June 2014. <http://www.ccss.sa.cr/jd_fundamento_legal_detalle?id=4>.

¹⁹ Clark, Mary A. "HEALTH SECTOR REFORM IN COSTA RICA: REINFORCING A PUBLIC SYSTEM." *Tulane University Woodrow Wilson Center Workshops* (2002): 1-23. Print. p.2.

²⁰ *Id.* at p.3.

On December 1, 1948, the President of Costa Rica, Jose Figueres Ferrer, abolished the military of Costa Rica after victory in the civil war in 1948.²¹ With a disbanded military Costa Rica was able to devote government funding to other important endeavors such as providing healthcare to all citizens regardless of wealth. With the newly available government funds the end goal of having a health system with separation of purchasing power from providing health services could be reached.

Caja has a complex internal organization which administers and oversees all of the entity's actions in every aspect of its functions. It is strategically managed and administered by the Board of Directors, Executive Presidency, and six Managements.²² Additionally, it has a supervising body that oversees the administrative actions taken. Through the creation of several institutions dealing with health care and social protection, Costa Rica took steps to better care for the people, but it was doing so through centralization efforts. The *Caja* was financially unstable because the state was unable to pay its contributions. In an effort to bring stability to the institution the legislature amended the constitution and mandated *Caja* to “universalize’ coverage in health and pensions.”²³ Creating universal coverage caused an increase from 17 percent to 46 percent in the total population covered; however, upon further inspection we learn that the increase was due to the fact that the newly insured were family member of workers previously enrolled.²⁴ Thus, it was clear that the salary cap as well as the state’s failure to increase the budget shifted the expansion of the institution’s services.

The budget problems of the *Caja* forced a legislation change in 1971 with the removal of the salary cap. The legislation also centralized public hospitals under *Caja*’s authority and shifted most of the state’s portion of social security quotas to employers. In an effort to grant health care access to marginal populations the government increased the ministry of health’s budget for preventative care and nutritional assistance.²⁵ Although *Caja* was making strides to provide the entire population with health care, by the 1980s the system was crashing.

Outdated medical equipment, dilapidated facilities, demoralized doctors, and long waiting lines for test and surgeries plagued the system.²⁶ At this point care was no longer universal because wealthier citizens were able to use personal connections or purchase private services to bypass queues. Prices for health care began to increase as medical technology became more sophisticated, as the population began to age, and as undocumented immigrants

²¹ "Abolición Del Ejército." *Guas Costa Rica*. 26 Aug. 2013. Web. 26 June 2014.

<<http://guiascostarica.info/acontecimientos/abolicion-del-ejercito/>>. Paragraph 3.

²² "Estructura Organizacional." *CCSS / Caja Costarricense De Seguro Social*. N.p., n.d. Web. 26 June 2014.
<http://www.ccss.sa.cr/cultura_organizacional_detalle?id=5>.

²³ Clark, Mary A. "HEALTH SECTOR REFORM IN COSTA RICA: REINFORCING A PUBLIC SYSTEM." *Tulane University Woodrow Wilson Center Workshops* (2002): 1-23. Print. p.3.

²⁴ *Id.*

²⁵ *Id.*

²⁶ *Id.* at 4.

were using health services. As the prices increased, the funding plateaued causing a strain on finances, which was exacerbated by the foreign debt crisis in the 1980s.²⁷

In the early 1990s the healthcare system was in need of improvement, therefore the Ministry of Health and *Caja* invited representatives of the World Bank to discuss health sector reform.²⁸ In 1993, the Costa Rican government signed a loan package that provided the health sector \$22 million. The three major components of the package were: “1) reorganization of the primary care model, 2) separation of the purchaser and provider roles, and 3) modernization of payment mechanisms.”²⁹ The country agreed to the terms of the loan package despite the high cost of overhauling the system. Prior to the reconstruction, “a single public institution monopolize[d] health insurance and provide[d] most of the curative and preventative services available in the country.”³⁰ The goal of the reconstruction was to improve the public system by de-concentrating administrative responsibility and removing the monopoly on health insurance.³¹

The slow change began with the creation of *Equipos Básicos de Atención Integral de Salud* (EBAIS) to provide care that focused on each community’s specific physical, social, and psychological health needs. The first EBAIS was established in 1995. As a model each EBAIS catered to about four thousand people and was required to have at least one doctor, one nurse, and one technician.³² Although the state had good intentions when it created EBAIS, some communities were under served because there was a 1:4,000 ratio of doctors to patients. The financing of the healthcare system also changed. The regime continues to be funded by “tripartite contributions (from employers, workers, and the State), but the amount of contributions from each has changed. Each insured person must contribute 22.91% of his or her salary, of which the employer provides 14.16%, the employee provides 8.25%, and the State provides 0.50%.³³ An uninsured person who needs medical attention can go to any hospital and receive treatment; however, the person would be billed personally for the services. But it is unlikely to find a person in Costa Rica without health insurance as a result of “aseguro voluntario,” which allows a relative to pay *Caja* a monthly fee to provide the uninsured person with healthcare insurance. And in the case of indigenous people, the government pays for their insurance (Aseguros por el Estado).

Despite the fact that the state took steps to reach their goal of decentralization of the healthcare sector, they settled for “deconcentration,” viewing it as more appropriate since Costa

²⁷ *Id.* at 5.

²⁸ *Id.* at 7.

²⁹ Clark, Mary A. "HEALTH SECTOR REFORM IN COSTA RICA: REINFORCING A PUBLIC SYSTEM." *Tulane University Woodrow Wilson Center Workshops* (2002): 1-23. Print. p.7.

³⁰ *Id.* at p.2.

³¹ *Id.*

³² *Id.* at p.9.

³³ Del Rocio Saenz, Maria, Juan Luis Bermudez, and Monica Acosta. *Universal Coverage in a Middle Income Country: Costa Rica*. Rep., 2011. Print. World Health Report (2010). P.11

Rica was still a centralized state.³⁴ “Deconcentration means only the redistribution of management power and responsibilities from the central administration toward units directly providing medical services within the same national institution.”³⁵ With deconcentration efforts came the 1998 *ley de deconcentración* (law of deconcentration), which created 124 *juntas de salud*, one for each hospital and large clinic.³⁶ A *junta de salud* is comprised of a seven citizens who are directly insured by *Caja*. The duty of the *junta de salud* is to bring community involvement to the health administration. The *juntas de salud* effectively brought each community’s needs to the forefront of considerations taken before the implementation of new policies.

In 2009, there were 5 specialty national hospitals, 3 general national hospitals, 7 regional hospitals, 14 peripheral hospitals, and 10 major clinics serving as referral centers for primary care clinics. Today, there are 29 hospitals in Costa Rica operating under *Caja* and about 250 public clinics located throughout the country.³⁷ The Costa Rican health reform is credited with reducing birth rates, infant mortality rates, and maternal mortality rates. However, the reform has also led to Costa Rica being one of the top destinations for medical tourism, because of its beautiful landscape, low costs, private insurance plans, and a great medical reputation. The high cost of many procedures and the lack of health insurance due to the high cost continues to attract foreigners in search of affordable health care options. Dentistry is also in high demand in Costa Rica since the cost of procedures like root canals, crowns, bridges, veneers, dental implants and oral surgery are much lower. The reform has also caused a shift in medical concerns from communicable diseases 15 years ago to chronic diseases today.

In conclusion, the health reforms has successfully reorganized primary care through EBAIS, but the reforms have failed to decentralize the health sector. Many EBAIS were implemented nationally, from small *cantones* all the way to the capital. However, an individual’s access to care ends when he or she cannot walk to or afford transportation to the nearest health center, raising human rights issues. Also, *Caja*, arguing that decentralized decision-making would waste resources, decided to retain control of some purchases, constraining hospital directors’ discretion over budgets. Therefore, the state has made a valiant effort, but the goals of Costa Rican health reforms will not reach the decentralization endpoint originally envisioned.

Connection between Environment and Health

Humans are continuously interacting with their environment, so it is logical to presume that humans’ “health is to a considerable extent determined by the environmental quality.”³⁸

³⁴ Clark, Mary A. "HEALTH SECTOR REFORM IN COSTA RICA: REINFORCING A PUBLIC SYSTEM." *Tulane University Woodrow Wilson Center Workshops* (2002): 1-23. p.13

³⁵ *Id.*

³⁶ *Id.*

³⁷ Guest Speaker: Esteban Avendano, MD, MPH.

³⁸ Environment & Health <http://www.lne.be/en/environment-and-health>

Therefore, a person's health and his or her environment are closely related.³⁹ However, the relation between these two is extremely complex, because "it is difficult to assess the seriousness, extent and causes of environment-related diseases."⁴⁰

It is likely that many of the ways the environment has been harmed by human activity comes back to haunt future generations in the form of sickness and death. The realization that the pesticide-laced foods people eat, the smokestack-befouled air they breathe, and the petrochemical-based products they use, negatively affect the quality of life is a big part of the reason why so many people and nations have "gone green" in recent years and Costa Rica is a pioneer in the area of eco-friendly practices.

Communicable and non-communicable diseases, malnutrition, mental illness, and lack of access to basic healthcare services cause millions of deaths annually in low-income countries and Costa Rica is not the exception.⁴¹ For example, the mosquito-borne viral disease, Chikungunya, was first described during an outbreak in Southern Tanzania in 1952.⁴² However in recent decades, the vectors of the disease have spread to Europe and the Americas. Although the Ministry of Public Health dismissed two suspected cases of Chikungunya virus in Costa Rica in recent months, there is still a risk that a large number of people could be infected.⁴³ The emergence of this virus is attributed to climate change, with higher temperatures and humidity. This, along with the rapid urbanization that occurred in recent years in the region caused an imbalance in the habitat of the mosquito vector of the disease, allowing them to reproduce in a larger number.⁴⁴

However, substantial global progress has been applied over the last several decades on a number of public health issues resulting in significant decreases in child and maternal morbidity and mortality, fewer new HIV infections and tuberculosis cases, and improvements in access to safe drinking water.⁴⁵ Most of the Millennium Development Goals (MDGs) are directly or indirectly related to health, and great progress has been made in some countries towards attaining several of these goals since they were first articulated more than a decade ago. For example, the number of deaths among children under age five decreased from 12 million in 1990 to 6.9 million in 2011. The incidence of HIV infections has decreased by 24% from 2001 to 2011, and the number of maternal deaths from pregnancy related complications has decreased from over half a million in 1990 to 287,000 in 2010. In addition, global immunization rates for some

³⁹ Id.

⁴⁰ Id.

⁴¹ Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, Abraham J, Adair T, Aggarwal R, Ahn Sy, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2012; 380:2095-128. <http://www.ncbi.nlm.nih.gov/pubmed/23245604>

⁴² La Nación. Salud descarta casos de virus Chikungunya en Costa Rica - ÁNGELA ÁVALOS http://www.nacion.com/nacional/salud-publica/Salud-descarta-casos-virus-chikungunya_0_1419858002.html

⁴³ Id.

⁴⁴ Infobae América. Cambio climático: el dengue, Chagas y la chikungunya amenazan a Latinoamérica. Guillermo Feres Castillo. <http://bit.ly/1ySqZyO>

⁴⁵ World Health Organization (WHO) [Internet]. Geneva, Switzerland. Fact sheet Number 290- Millennium Development Goals (MDGs); 012a [Cited 2013, Feb 15]. <http://www.who.int/mediacentre/factsheets/fs290/en/index.html>

diseases have increased substantially; for example, 85% of children under the age of two were immunized for measles by 2010.⁴⁶

The National Institute of Statistics and Census (INEC), reported that the infant mortality rate in Costa Rica during 2012 was 8.51 per thousand births, which is the lowest figure in its history.⁴⁷

Another important public health issue is the decline in the discovery of new medications to treat common communicable and non-communicable diseases. Despite significant advances in scientific technology and substantial investments in drug discovery over the last several decades, the rate of new drug approval for every dollar invested in research and development has been decreasing steadily.⁴⁸ Natural sources of new medications are in decline due to global biodiversity loss, threatening the drug pipeline.⁴⁹ At the same time, pathogens that cause common diseases such as tuberculosis (TB), pneumonia, and skin infections are increasingly developing resistance to currently available antibiotics, posing a substantial threat to the health of millions of people.⁵⁰

The public health community is increasingly concerned about the impacts of extreme weather, climate change, and natural disasters on vulnerable communities. Rural communities and indigenous peoples in developing countries are considered to be among the most vulnerable to the health impacts of climate change and extreme events, primarily due to their reliance on natural resources, poor baseline nutritional and health status, and social marginalization. A good example is the Indigenous Community of Ngöbe better known as Guaymí. They are located on the Pacific slope in four Indian reservations, three of them in the river basin Térraba in sub Coto Brus. The community relies on natural resources and agriculture for living. They used to hunt and live off the forest resources, but now it is not possible, also, natural resources are treasured and some plants are used for medical treatment. Thus, it reflects the connection and reliance this group has on the environment which time after time has been changing significantly.⁵¹

In the last 60 years, there have been significant changes in the climate and in the frequency of extreme weather events; in general, certain regions have experienced warming trends, increased heat waves, more frequent heavy precipitation events, and longer, more intense droughts. In the coming decades, the IPCC (Intergovernmental Panel on Climate Change) projects that climate change will result in increased intensity of tropical cyclones and extreme

⁴⁶ World Health Organization (WHO) [Internet]. Geneva, Switzerland. Fact sheet Number 290- Millennium Development Goals (MDGs); 012a [Cited 2013, Feb 15]. <http://www.who.int/mediacentre/factsheets/fs290/en/index.html>

⁴⁷ Memoria Institucional. 2012. <http://bit.ly/1lmuHqg>

⁴⁸ Scannell JW, Blanckley A, Boldon H, Warrington B. Diagnosing the decline in pharmaceutical R&D efficiency. *Nature Reviews Drug Discovery* 2012; 11:191-200. <http://www.nature.com/nrd/journal/v11/n3/full/nrd3681.html>

⁴⁹ Li JW, Vederas JC. Drug discovery and natural products: end of an era or an endless frontier. *Science* 2009; 325:161-65. <http://www.sciencemag.org/content/325/5937/161.abstract>

⁵⁰ Spellberg B, Guidos R, Gilbert D, Bradley J, Boucher HW, Scheld WM, Bartlett JG, Edwards J. The epidemic of antibiotic-resistant infections: a call to action for the medical community from the Infectious Diseases Society of America. *Clinical Infectious Diseases* 2008; 46:155-64. <http://www.ncbi.nlm.nih.gov/pubmed/18171244>

⁵¹ Interview with Valentín González Palacios. Cultural Promoter - Guaymí Indigenous Community.

temperature events and increased frequency of heavy precipitation events.⁵² Specific health consequences from the impacts of climate change and extreme events will vary by region but may include direct physical injury, increased transmission of certain vector borne diseases such as malaria, food shortages due to decreased agricultural productivity, heat stress, and decreased access to clean water.⁵³

Vulnerability to climate change and extreme events is determined by various socio-economic, cultural, and health factors. The resilience of communities to these events is provided by both nature and human activities.⁵⁴ Human activities that improve resilience include the implementation of early warning systems and strengthening of health systems to withstand the stresses brought on by climate change and extreme events.⁵⁵

This example illustrates that building resilience to climate change and extreme events requires a multi-dimensional, integrated approach that addresses the various factors that determine vulnerability. The specific problems found in Costa Rica are: Deforestation and land use change, largely a result of the clearing of land for cattle ranching and agriculture; soil erosion; coastal marine pollution; fisheries protection; solid waste management; air pollution.

Pesticide Use in Costa Rica

As a country that relies heavily on both agriculture and ecotourism, Costa Rica's utilization of pesticides (agrochemicals) requires striking a delicate balance between maximizing crop production and minimizing the negative effects of pesticide pollution. Costa Rica's heavy reliance on pesticides began in the 1940s when foreign corporations introduced pesticide use to Costa Rican farmers and pesticide reliance quickly began to grow.⁵⁶ In 2000, The World Resources Institute issued a report listing Costa Rica as the highest consumer of pesticides per hectare of agricultural land in the world.⁵⁷ While many farmers around the country attest that pesticides are absolutely necessary for crop production, the effects of such a heavy handed approach to agriculture on both the environment as well as on the residents of the country cannot be overlooked.

The term pesticides is a general term that refers to any substance used for the purpose of killing anything classified as a pest including fungicides, insecticides, herbicides, and nematicides. In Costa Rica some of the most commonly utilized pesticides include paraquat (a herbicide), organophosphates (insecticides), and carbamates (insecticides). In the 1930s

⁵² Sauerborn R, Ebi K. Climate change and natural disasters- integrating science and practice to protect health. *Glob. Health Action* 2012; 5(0):1-7.<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3525950/>

⁵³ Ramin BM, McMichael AJ. Climate change and health in sub-Saharan Africa: a case-based perspective. *Ecohealth* 2009; 6(1):52-7. <http://www.ncbi.nlm.nih.gov/pubmed/19418098>

⁵⁴ Keim ME. Building human resilience: the role of public health preparedness and response as an adaptation to climate change. *Am. J. Prev. Med.* 2008; 35(5):508-16.[http://www.ajpmonline.org/article/S0749-3797\(08\)00687-9/abstract](http://www.ajpmonline.org/article/S0749-3797(08)00687-9/abstract)

⁵⁵ Sauerborn R, Ebi K. Climate change and natural disasters- integrating science and practice to protect health. *Glob. Health Action* 2012; 5(0):1-7.<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3525950/>

⁵⁶ Thrupp. "Pesticides and Policies: Approaches to Pest-Control Dilemmas in Nicaragua and Costa Rica." *Latin American Perspectives* at 41.

⁵⁷ "Agriculture > Pesticide Use: Countries Compared." *World Resources Institute*. <<http://www.nationmaster.com/country-info/stats/Agriculture/Pesticide-use>>

organophosphates were initially developed as a nerve gas but were subsequently developed for their capabilities as insecticides. The genotoxic effects of organophosphate insecticides have caused many countries to outlaw their use (as was the case in the DDT (dichlorodiphenyltrichloroethane)) in the 1960s, but many others are still heavily utilized.

Pesticides pollution is such a difficult problem to deal with due to the hazardous nature of the chemicals paired with the virtual inability to control their application. During application overspray chemicals are often carried in the wind to nearby ecosystems. Even in cases when agrochemicals are carefully applied, rinsing and subsequent runoff from rain, leeching into soil, and evaporation and subsequent deposition in the form of chemically tainted rain will cause traces of pesticides to spread far beyond their application sites and cause harm to non-target species.⁵⁸

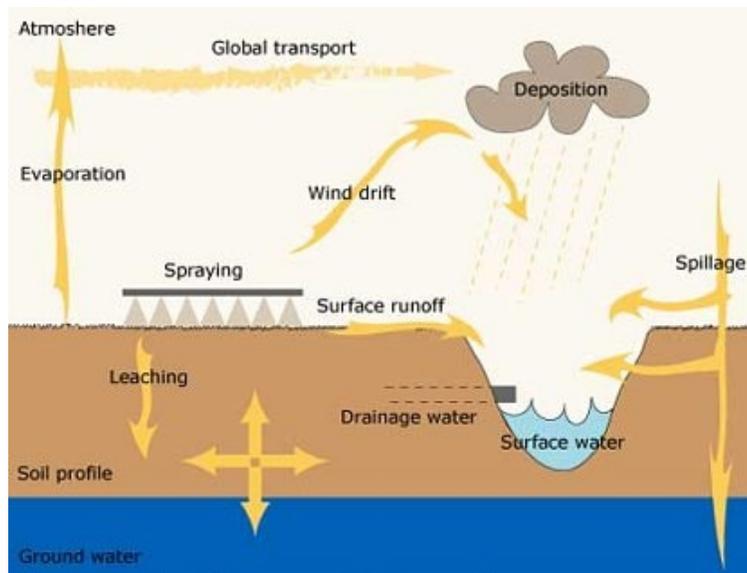


Figure 1 Pesticide spread in the environment

Human Health Effects

Organophosphates and carbamates are both fat-soluble and therefore are readily absorbed through the skin and transported through the bodies of both humans and animals. The health effects commonly associated with long term exposure to these substances include endocrine disruption, neurobehavioral abnormalities, and increased incidence of cancer.⁵⁹ Additionally, short term exposure often leads to less severe injuries such as spells of dizziness, fainting, and eye irritation.

⁵⁸ **Figure 1** "Pathways of Pesticide." *Centre for Chemical Pesticides*. < <http://www.slu.se/en/collaborative-centres-and-projects/centre-for-chemical-pesticides-ckb1/information-about-pesticides-in-the-environment-/pesticide-spread-in-the-environment/>>

⁵⁹ William, Sierra-Torres, Cajas-Salazar, Shipp, & Legator. "Cytogenetic Effects from Exposure to Mixed Pesticides and the Influence from Genetic Susceptibility." *Department of Preventive Medicine and Community Health, The University of Texas Medical Branch* at 501.

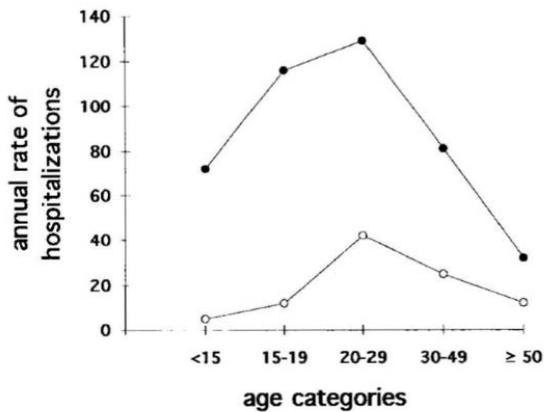


Figure 2. Hospitalizations among agricultural workers (annual rate per 100,000) caused by occupational and nonoccupational poisonings from pesticides in Costa Rica in 1980-1986 in relation to age.

The population with the highest incidence of pesticide related injuries are agriculture workers age 20 to 29.⁶⁰ **Figures 2 & 3.**⁶¹ Agricultural field workers accounted for ninety percent of occupational pesticide poisonings due to the nature of their work putting them in the closest contact with the chemicals.⁶² Exposure is often the result of faulty equipment (leaking backpack sprayers or spray nozzles), windy conditions during spray application, or accidental spills during transfer or mixing. Additional exposure may be the result of inadequate storage leading to confusion of pesticides with an ingestible material or the unprotected handling of empty containers.

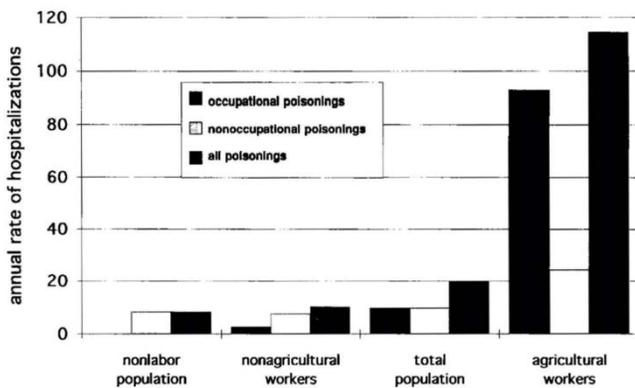


Figure 3. Incidence rates (annual rate per 100,000) of hospitalizations from pesticide poisonings in Costa Rica in 1980-1986.

There are many factors that make it difficult to gauge the effects of pesticide use on agricultural workers. The application of multiple pesticides on a single site make it almost impossible to determine exactly which compound is responsible for which ailments. The frequent movement of workers between farms and fields results in exposure to an array of different pesticides. Employers in Costa Rica have a legal obligation to report occupational injuries and disabilities to the Instituto Nacional de Seguros (INS) which would be responsible

for covering medical costs, but the reports are often incomplete missing information such as the age of the employee or the type of pesticide responsible for the injury.⁶³ A study conducted in 1996 used the Caja Costarricense de Seguro Social (CCSS) to identify the population of banana workers in Costa Rica and then cross referenced those individuals with the records from the National Tumor Registry.⁶⁴ (Both private and public health facilities are required to report cases of cancer.) This study showed an increased risk of melanoma and penile cancer in men, an increased risk of cervical cancer in women, and an increased risk of leukemia and lung cancer generally in banana plantation workers.⁶⁵

⁶⁰ Wesseling, Castillo, & Elinder. "Pesticide Poisonings in Costa Rica." *Scandinavian Journal of Work, Environment & Health* at 229.

⁶¹ **Figures 2 & 3.** *Id.* at 230.

⁶² *Id.*

⁶³ Flackman. "Pesticide Poisoning in Costa Rica: Connecting the Application of Toxic Chemicals to Effects on Human Health." *Mulenberg.edu* at 227.

⁶⁴ Wesseling, Ahlbom, Antich, Rodriguez & Castro. "Cancer in Banana Plantation Workers in Costa Rica." *International Journal of Epidemiology*.

⁶⁵ *Id.* at 1131.

In the 1970s DBCP (dibromochloropropane), a nematicide, resulted in the sterilization of around 1,500 banana plantation workers.⁶⁶ DBCP is manufactured in the United States, but in 1977 its application was banned in the United States after it was discovered to be the cause of the sterilization of 60 employees of the plant that manufactured it. Despite the illegality of its application in the states, the Federal Insecticide, Fungicide and Rodenticide Act still allowed export to other countries such as Costa Rica.

A 1998 study was conducted on geographical differences in cancer incidence in Costa Rica and the potential relation to pesticide exposure.⁶⁷ The study showed that areas with a large concentration of coffee farms (and consequently heavy use of paraquat) had increased incidences of lip, esophagus, and stomach cancer.⁶⁸ Regions with a high concentration of banana plantations (and consequently heavy use of DBCP, chlorothalonil, and mancozeb) had increased incidences of respiratory, ovary, and prostate cancer.⁶⁹

An interesting statistic worth noting is the incidence of pesticide related suicides among agricultural workers. Of the 198 deaths attributed to pesticides in 1986, 123 or 62% were suicides committed by the ingestion of pesticides.⁷⁰ An interview conducted with Dr. Xochiti Jaenz at the EBIAS La Casona confirmed that this continues to be an issue. There is however speculation that these statistics are inflated as a result of misreporting in an attempt to mitigate the responsibility of employers and pesticide companies.

Despite the apparent dangers associated with occupational pesticide exposure, a conversation with a rice and sugarcane farmer illustrated the general reluctance to forgo pesticide use. The farmer estimated that without pesticides, his crop yields would decrease by around 60% which would essentially put him out of business. Without profitable alternatives to dangerous agrochemical, farmers are forced to utilize pesticides in order to maintain their livelihoods.

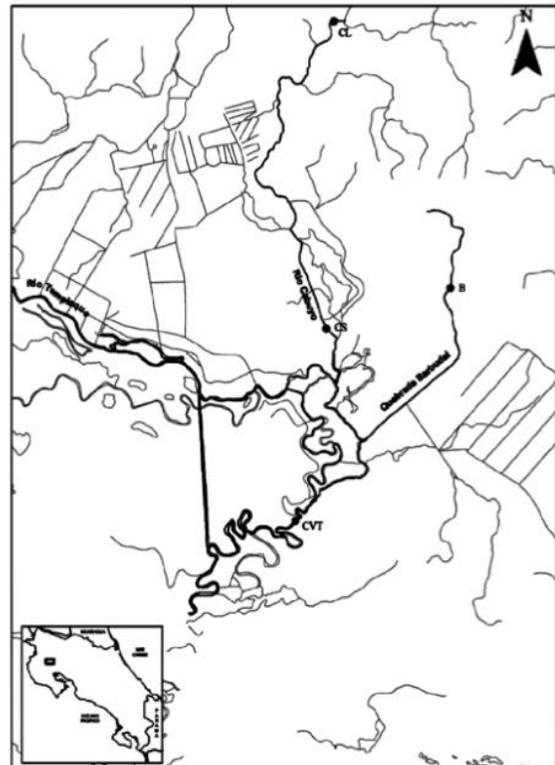


Figure 4 Map of Palo Verde National Park with the indications of the Sampling sites: Putative polluted sites (CS and CVT); putative reference sites (CL and B).

⁶⁶ Thrupp. "Sterilization of Workers from Pesticide Exposure: The Causes and Consequences of DBCP-Induced Damage in Costa Rica and Beyond." *International Journal of Health Services*.

⁶⁷ Wesseling, Antich, Hogstedt, Rodríguez, & Ahlbomb. "Geographical Differences of Cancer Incidence in Costa Rica in Relation to Environmental and Occupational Pesticide Exposure." *International Journal of Epidemiology*.

⁶⁸ *Id.* at 371.

⁶⁹ *Id.*

⁷⁰ Wesseling, Castillo, & Elinder. "Pesticide Poisonings in Costa Rica." *Scandinavian Journal of Work, Environment & Health* at 232.

Environmental Health Effects

While it is the human population that is most likely to come into direct contact with dangerous pesticides, the unintentional spread of traces of chemicals is becoming increasingly problematic for Costa Rica's nonhuman inhabitants as well. A 2013 study to determine the environmental risks of pesticide pollution on Palo Verde State Park indicated that pesticide contaminated runoff from nearby rice and sugar cane fields was making its way into protected aquatic ecosystems.⁷¹ See **Figure 4**.⁷² The study found traces of 15 different pesticides including fungicides, herbicides, and insecticides commonly used in rice, sugar cane, and melon farming.⁷³ A conversation with a biologist working at the Palo Verde OTS biological station indicated the suspicion pesticide pollution may be to blame for effeminization trends in male Tempisque crocodiles which will in turn lead to reproductive complications and subsequently diminishing populations.

In another 2013 study investing the cause of massive fish kills following rainfall, a group of scientists ascertained that organophosphates (specifically chlorpyrifos and ethoprosfos) used in nearby banana and pineapple cultivation was responsible.⁷⁴ Pesticide drainage from farms enters the Rio Madre de Dios which flows into a lagoon that is part of a protected wetland.⁷⁵ As the contaminants reach the water column, they likely bind to organic material in sediments and animals and bioaccumulate. Excessive presence of nutrients in the water will also cause eutrophication which will result in hypoxic conditions and subsequent fish kills.⁷⁶ In addition to massive fish kills, lower pesticide dosages will likely result in reproductive failure and other chronic effects that will ultimately lead to a decline in fish populations.⁷⁷ Another study conducted the same year found that

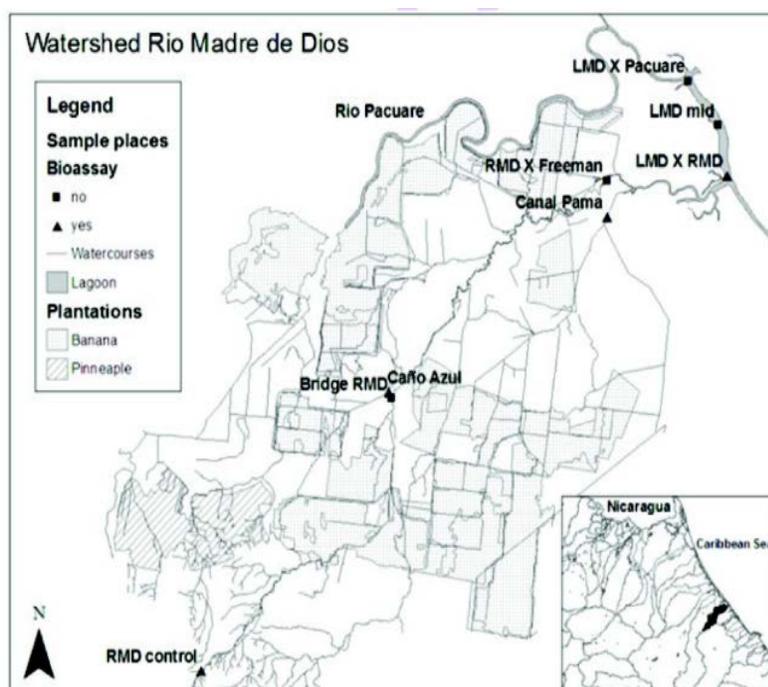


Figure 5 Sampling sites in watershed Rio Madre de Dios, Limon, Costa Rica. (RMD = Rio Madre de Dios; LMD = Laguna Madre de Dios) RMD control was used as control site.

⁷¹ Mena, San Jaun, Campos, Sanchez-Avila, Faria, Pinnock, Cruz, Lacorte, Soares, & Barata.

"Pesticide Residue Analysis and Biomarker Responses of Native Costa Rican Fish of the Poeciliidae and Cichlidae Families to Assess Environmental Impacts Pesticides in Palo Verde National Park." *Journal of Environmental Biology*.

⁷² **Figure 4** *Id.* at 21.

⁷³ *Id.* at 24.

⁷⁴ Diepens, Pfenning, Van dem Brink, Gunnarsson, Rupert, & Castillo. "Effect of Pesticides Used in Banana and Pineapple Plantations on Aquatic Ecosystems in Costa Rica." *Journal of Environmental Biology*.

⁷⁵ **Figure 5** *Id.* at 74.

⁷⁶ **Figure 6** *Id.* at 81.

⁷⁷ *Id.* at 78.

the presence of certain pesticides in aquatic ecosystems correlated closely with the import of the specific products into the country.⁷⁸ Based on this finding, pesticide import information may be utilized to construct indicators of environmental hazards, evaluate risk and create awareness in various stakeholder groups.

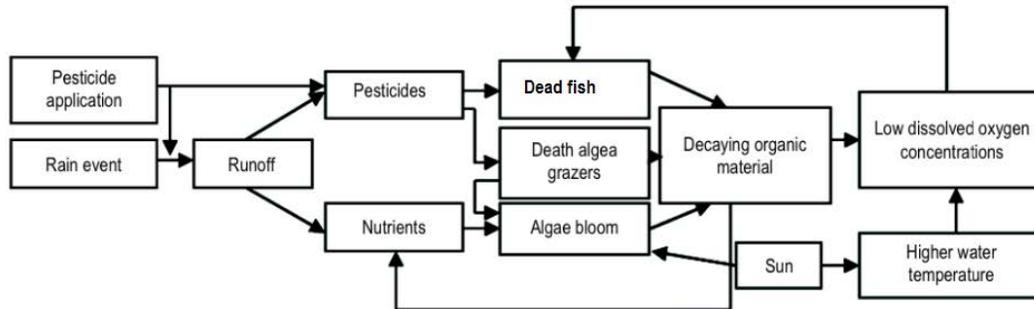


Figure 6 Conceptual model of environmental processes possibly leading to fish kills after a rain event.

Aquatic ecosystems are not the only ecosystems experiencing the effects of pesticide use in Costa Rica. For example, a 2013 experiment found traces of seven different pesticides commonly used in banana, pineapple, and cocoa production in blood, fur, and saliva samples of sloths living near agricultural areas.⁷⁹ Being arboreal mammals with small home ranges, sloths that live and feed in trees that border farms (forests edges, forest fragments, and living fences) will be at high risk of exposure and eventual bioaccumulation. Exposure to these materials can cause complications with bone formation and reduced sperm production.⁸⁰

While putting an end to the reliance on pesticides would be the most direct method of reducing future pesticide pollution in the environment, curative measures are also necessary. A study conducted in the northeastern region of Costa Rica found traces of nine different pesticides commonly used in banana farming in the blood of caimans whose habitats are located downstream from a banana farm (the Tortugureo Conservation Area).⁸¹ Interestingly, only two out of the nine pesticides detected are currently used in farming. One of the pesticides found in the blood samples was DDT which has been banned in Costa Rica for nearly a decade. While there is the possibility that farmers are using illegal pesticides, scientists believe that the results of their study suggest that the chemicals have accumulated in the environment due to their insolubility and have consequently accumulated in the tissue of large animals such as caimans. Exposure to pesticides has been linked to endocrine disruption and hormonal imbalances that can have detrimental effects on development and reproduction.⁸² Based on this information, even a complete stoppage of the addition of pesticides to ecosystems would leave species at risk from the contaminants already present in their habitats.

⁷⁸ Cruz, Bravo-Duran, Ramirez, & Castillo. "Environmental Hazards Associated with Pesticide Import into Costa Rica." *Journal of Environmental Biology*.

⁷⁹ Pinnock-Branford, De la Cruz, Solano & Ramirez. "Pesticide Exposure on Sloth in an Agricultural Landscape of Northeastern Costa Rica." *Journal of Environmental Biology*.

⁸⁰ *Id.* at 33.

⁸¹ Grant, Woudneh, & Ross. "Pesticides in Blood from Spectacled Caiman (*Caiman Crocodilius*) Downstream of Banana Plantations in Costa Rica." *Environmental Toxicology and Chemistry*.

⁸² Guillette & Gunderson. "Alterations in Development of Reproductive and Endocrine Systems of Wildlife Populations Exposed to Endocrine-Disrupting Contaminants." *Society for Reproduction and Fertility*.

While case by case studies provide specific instances of the harmful impacts of pesticide pollution on certain species, the general effects are equally alarming. Excessive pesticide application will ultimately lead to development of pest resistance (the ability to survive exposure to previously lethal amounts of pesticides as a result of genetic selection).⁸³ As a result of pest resistance, farmers will need to apply higher amounts of pesticides or employ the use of stronger compounds. This has both environmental and economic repercussions in that higher costs will be associated with newer pesticides and old pesticides will become worthless and require disposal which often leads to direct ecosystem pollution. Moreover, a 1982 study conducted by the Tropical Science Center discovered that of 50,000 hectares of previously fertile agricultural land had been sterilized due to an accumulation of residues from copper-based fungicides used in banana production.⁸⁴ As a result the land no longer had any economic value for agricultural purposes and its inability to support flora rendered it environmentally barren.

Current Policies and Legislation

In 1970, Costa Rica created an administrative body called the National Pesticide Commission which was charged with reviewing, revising, and enforcing pesticide related legislation. Unfortunately, this agency has been able to make little progress in remedying the current pesticide issues that the country is dealing with.⁸⁵ A table containing some of the most relevant laws governing the importation, sale, and use of pesticides follows:

Law	Year of Enactment	Brief Description
Plan Protection Law Ley Sanidad Vegetal	1978	Regulations regarding imports, marketing, transport, storage, general use of pesticides
General Health Law Ley General de Salud	1973	Enacted by the Health Ministry outlining mandatory safety measures related to pesticide related occupational hazards
Security and Hygiene Law for the Use of Toxic Substance in Agriculture	1968	Additional rules enacted by the Labor Ministry regarding pesticide related occupational hazards
Restriction of Organochlorine Pesticides	1980	Requires the authorization of a professions agronomist for use of organochlorines Enforced by the Ministry of Agriculture

⁸³ "Pesticides and Policies" at 42.

⁸⁴ G. Hartshorn, L. Hartshorn, Atmella, Gomez, A. Mata, L. Mata, Morales, Ocampo, Pool, Quesada, Solera, Solorzano, Stiles, Tosi, Umana, Villalobos, Wells. "COSTA RICA Country Environmental Profile: A Field Study." *Tropical Science Center*.

⁸⁵ "Pesticides and Policies" at 48.

Restriction on Sale and Use of Lead Based Pesticides	1982	Requires the authorization of a professions agronomist for use of lead-based products and restricts use to control of specific diseases during certain months of the year Enforced by the Ministry of Agriculture
Labor Risk and Insurance Law	1984	Regulations regarding occupational related hazards associated with pesticide use including incident prevention and compensation for medical costs associated with injuries
Inspection - Managment Law of the Professional Agronomists' Association	1980	Regulations regarding inspection of pesticides and marketing practices directed at direct regulation of pesticide manufacturers

This table serves as a concise illustration of the interrelated agencies and legislation involved in pesticide regulation and management in Costa Rica. One issue that is made obvious is the fact that many different entities have vague and overlapping responsibilities which makes enforcement difficult, bribery easy, and blame for faulty enforcement on other sectors a common occurrence.

A consultation with attorney and substitute judge for the Tribunal Ambiental Administrativo, Daniel Montero, J.D., confirmed the general consensus that while Costa Rica's environmental and health related policies are thorough and well-written, the imperfections lie in the lack of consistent, adequate enforcement. The Tribunal *Ambiental Administrativo* has only 20 attorneys working with a gradually decreasing budget to litigate all the cases brought for the entire country. Throughout the government there is generally a conflict between the desire to comply with the laws and support the green lifestyle that Costa Rica holds in such high esteem and the desire the maximize profits and expedite development by taking unsustainable shortcuts.

Water Quality and Wastewater Management in Costa Rica

Wastewater	Water quality
Spent or used water with dissolved or suspended solids, discharged from homes, commercial establishments, farms, and industries. ⁸⁶	Water quality is measured by several factors, such as the concentration of dissolved oxygen, bacteria levels, the amount of salt (or salinity), or the amount of material suspended in the water (turbidity). In some bodies of water, the concentration of microscopic algae and quantities of pesticides, herbicides, heavy metals, and other contaminants may also be measured to determine water quality. ⁸⁷

Source: Araya, K. 2014

⁸⁶ Business Dictionary. <http://www.businessdictionary.com/definition/wastewater.html>

⁸⁷ Florida Keys National Marine Sanctuary. <http://floridakeys.noaa.gov/ocean/waterquality.html>

In Costa Rica, the Institute of Aqueducts and Sewers (AyA) is in charge of the provision of potable water and sewage systems.

Costa Rica enjoys high coverage in the drinking water and sanitation; however, some deficiencies have been identified in the quality of service delivery, organization, lack of planning and inadequate investment.

Various international policy forums have been developed, such as conferences on health as the International Conference on Primary Health Care in 1978, Water Conference in Mar Beach in 1977, the Millennium Development Goals, The World Covers on Sustainable Development in Johannesburg in 2002, the Charter of Boon to safe water (IWA, 2004), and the UN Declaration of 2005-2015 as the International Decade for Action "Water for Life."

There are several entities that supply water throughout Costa Rica. AyA supplies 49% of water throughout the country, while ASADAS supplies 27% and the 28 Municipalities and District Councils supply 15%.

Around 700,000 people in 2009 were consuming water that did not meet the requirements of potability, which increase health risks. This was due to three main causes: lack of disinfecting the water supply, contamination by agricultural, industrial and livestock, and poor operational and administrative management in drinking.

WHO establishes the Water Safety Plans (WSP) that identifies potential risks from catchment to consumer?⁸⁸

The low coverage of sewerage networks, which in urban areas is 34%, with a treatment of wastewater of around 4%, coupled with the use of agrochemicals in the recharge areas and production of groundwater is an important environmental risk factor.

This situation is critical in the north and east of the River Virilla where Barba and Colima aquifers supply about 20% of the national population and source water will settle drinking of Heredia and San Jose Metropolitan Area for the next 15 years. The current rate of increase in nitrate concentrations in the aquifer Colima, indicates that this source could be lost within a period not exceeding 15 years. This is perhaps the most serious on the issue of drinking water sanitation and environmental water management problem, because it involves the current and future supply of approximately one million people.⁸⁹

There is a study conducted by Darner Mora⁹⁰ regarding the streams health quality to determine the sanitary quality of streams and rivers flowing in the Costa Rican coastline, by analysis of Faecal coliforms/100 mL (Fc/100 mL). After analyzing 56 streams and rivers, it was found that only 24 (42.9%) are suitable for swimming, protection of aquatic communities and irrigating vegetables or fruit trees that are eaten raw.

⁸⁸ La salud pública en Costa Rica. Análisis de los grandes problemas predominantes de Salud Pública en Costa Rica. Armando Moreira Mata. <http://www.saludpublica.ucr.ac.cr/Libro/13%20Agua%20potable.pdf>

⁸⁹ Calidad del agua potable en Costa Rica: situación actual y perspectivas. Espinoza, Morera, Mora y Torres. Organización Panamericana de la Salud, Ministerio de Salud . -- San José, C.R. : OPS, 2003. 40 p. ; 28 cm. – (Serie Análisis de Situación de Salud; no. 13)

⁹⁰ Darner Mora Alvarado. Director of the National Water Laboratory, AyA.

The analysis generally indicate that the Caribbean coast has the mouths more contaminated with fecal matter and the Pacific coast, most contamination is located in the province of Puntarenas and some foci in the Province of Guanacaste.⁹¹

Regulations

The following list of regulations on wastewater management is intended to summarize the purpose of each regulation.

General Health Law: The current General Health Law in articles 1° and 2° express that the health of the population is a well of public interest protected by the State and it is an essential role of the State to ensure it to the people. The Minister of Public Health is in charge of coordinating the public and private activities related to the health. Article 263, prohibits any action, practice, and operation that deteriorates the natural environment, specially elements such the air, water and soil.⁹²

General Rules for Granting Permits operation of the Ministry of Health: The function of the State to protect the health of the population and to ensure welfare of the citizens should not be an obstacle to the establishment of the conditions of competition that contributes to the development of economic activity in the country. The General Rules for Granting Permits operation of the Ministry of Health gives a Certification of Wastewater Manager Sewerage (EAAS) when the procedure performed by the person, before the administrator of a sanitary sewer system, is engaging in activity generating wastewater discharged directly to the sewer network.⁹³

Regulation of Discharge and Reuse Wastewater: The Regulation of Discharge and Reuse of Residual Water aims to protect the water resource to maintain the human health and life on Earth, because water resource is an essential element for achieving sustainable development. The regulation prioritizes control measures for the discharge of pollutants into springs, recharge areas, rivers, creeks, streams or permanent non-permanent lakes, ponds, marshes, natural or artificial reservoirs, estuaries, mangroves, swamps, marshes, freshwater, brackish or salt, and generally in national waters.⁹⁴

Regulation Approval and Operating Systems Wastewater Treatment: This Regulation aims to protect public health and the environment through a rational and environmentally appropriate wastewater management. It shall apply for the management of wastewater, regardless of their origin, and discharged or reused anywhere in the country.⁹⁵

General Rules for the Classification and Hazardous Waste Management: It aims to establish the conditions and requirements for the classification of hazardous waste as well as the rules and procedures for the management of these, from a health perspective and

⁹¹ Darner Mora. 2011. Calidad sanitaria de los esteros y/o desembocaduras de ríos en los litorales de Costa Rica: 1996-2011. AyA

⁹² La Ley General de la Salud – N° 5395

⁹³ Reglamento General para el Otorgamiento de Permisos de Funcionamiento del Ministerio de Salud N° 34728-S

⁹⁴ Reglamento de Vertido y Reúso de Aguas Residuales No 33601

⁹⁵ Reglamento de Aprobación y Operación de Sistemas de Tratamiento de Aguas Residuales N° 31545-S-MINAE

environmentally sustainable; specifically detailing in Articles 7, 8 and 9 the obligations of each of the participants in the process of waste management parts.⁹⁶

Regulation on the management of contagious infectious waste generated in facilities that provide health care: This Regulation establishes the requirements for separation, packaging, storage, collection, transportation, treatment and final disposal of the infectious waste generated in public and private facilities that provide health care, how to treat infectious waste contagious mentioned in Articles 20 to 24 within this regulation.⁹⁷

Statement of public interest and social need of design, financing, implementation, operation and maintenance of works for the collection, treatment and disposal of wastewater generated in urban center: Due to the short time remaining in the life of the sewer system wastewater centers in urban areas, the State as the body must ensure the greatest welfare of citizens, as a public interest, in their environment and ecology, complete remodeling systems management of wastewater generated in urban areas through delegated to the Ministry of Health and the Ministry of Environment and Energy responsibilities. For this process to take place, the articles written in this document specifies the process to be followed by the authorities.⁹⁸

Exemption from taxation systems wastewater treatment to help mitigate pollution of water resources and improve water quality: The treatment of all wastewater in the country has been declared a social and public interest, therefore the state has waived the payment of taxes relating to this action to comply with the requirements in the Act carrying out the processes set out in the various ministries, same as detailed in Articles 1 to 6 present in the resolution.⁹⁹

Financing Agreement between the European Communities and the Republics of Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama, and the Regional Program for collection and treatment of waste from Hospitals: This agreement processes and methods of management of wastes produced in hospitals, where they performed an established system in which the participants must know and comply fully, detailing step necessary in the actions set forth to make. This agreement includes the provisions entitled "General Provisions", which describe the general framework, "Terms and Conditions and Technical and Administrative Provisions" and "Arbitration." The particular terms and the technical and administrative provisions amending or supplementing the general conditions and in case of conflict, take precedence over the latter.¹⁰⁰

⁹⁶ Reglamento General para la Clasificación y Manejo de Residuos Peligrosos N° 37788-S-MINAE

⁹⁷ Reglamento sobre la gestión de los desechos infecto-contagiosos que se generan en establecimientos que prestan atención a la salud y afines N° 30965-S

⁹⁸ Declara de interés público y necesidad social el diseño, financiamiento, ejecución, operación y mantenimiento de obras para la recolección, tratamiento y disposición final de aguas residuales, generados en centros urbanos N° 32133

⁹⁹ Exoneración del pago de tributos de sistemas de tratamiento de aguas residuales para contribuir a mitigar la contaminación del recurso hídrico y mejorar la calidad del agua N° 8932

¹⁰⁰ Convenio de Financiación entre las Comunidades Europeas y las Repúblicas de Costa Rica El Salvador Guatemala Honduras Nicaragua y Panamá para el Programa Regional de Recogida y Tratamiento de Desechos Procedentes de Hospitales N° 23709-RE

The Indigenous People of Costa Rica

Costa Rica covers an area of 51,100 square kilometers, and only 6 percent (3,344 square kilometers) of that area is recognized as indigenous territories.¹⁰¹ There are 24 indigenous territories in the country, with an indigenous population of a little over 60,000 people (less than 1.5% of the population).¹⁰² Although 3,344 square kilometers for 60,000 people seems sufficient, it is not when considering that indigenous peoples' territorial rights have not been respected by the law. Land described as "indigenous reserves" were established in the mid-1950s, and were located mostly in the south of Costa Rica.¹⁰³ In 1977, the government passed the Indigenous Law, which created the indigenous reserves (territories) to improve the legal status of the land. Article 3 of the law provides that land located within indigenous territories were reserved for the indigenous and such land could only be traded amongst the indigenous.¹⁰⁴ However, indigenous people are still fighting for their rights because they were not granted title to the land, and they continually face non-indigenous people and the government taking over their land.¹⁰⁵ An example of government taking is found in a national decree, which provides that indigenous people have an inalienable right to occupy indigenous territory with exception to land used for the Inter-American Highway.¹⁰⁶ Costa Rica ratified the ILO Convention 169 in 1992 and voted in favor of the UN Declaration on the Rights of Indigenous Peoples in 2007. Yet, Costa Rica continues to be one of the countries with the lowest level of constitutional recognition of indigenous rights in Central and South America. The indigenous people of Costa Rica continue to face the hardship of maintaining possession of indigenous territories, gaining access to healthcare and clean water, and balancing the need to preserve natural resources with the right to live off the natural resources.

According to Costa Rican Indigenous Law, the Indigenous or Indians are people who are the direct descendants of pre-Columbian civilizations who retained their identity.¹⁰⁷ Historically, most indigenous groups lived on a simple subsistence economy and were ruled by a chief called *cacique*. During the invasion of Costa Rica by Spain, many tribes moved into the mountains to avoid slavery, disease, and taxation. The death of many indigenous people of Costa Rica was caused by disease. But unlike other Indian cultures, Costa Rican Indians did not leave behind

¹⁰¹ "COSTA RICA." Yearbook article on indigenous people(2013): 97-104. *International Work Group for Indigenous Affairs*. 2013. < <http://bit.ly/1yXHRnU> >. p.97

¹⁰² Zuera, Daniel. "INTER PRESS SERVICE." *INDÍGENAS-COSTA RICA: Una Comunidad Invisible*. Web. <<http://www.ipsnoticias.net/2008/10/indigenas-costa-rica-una-comunidad-invisible/>>.

¹⁰³ "Reservas Indígenas." *SEXTO ESTUDIO DE CASO*

<http://www.interfazweb.net/ifzclientes/CAG/Agenda%2021/doc/126caso_reservasindigenas.pdf>. P.2.

¹⁰⁴ Ley Indígena No. 6172 de 29 de noviembre de 1977, Últimas Reformas: Ley No. 7495 de 3 de Mayo de 1995. Article 3.

¹⁰⁵ "Indigenous People." *Costa Rica - Indigenous People*. Infocostarica Staff, Web. 27 June 2014.

<<http://www.infocostarica.com/people/indigenous.html>>.

¹⁰⁶ Decreto núm. 45 de 1945. Reglamentación del artículo 8 de la Ley General de Terrenos Baldíos de 1939.

Artículo 1.

¹⁰⁷ Ley Indígena No. 6172 de 29 de noviembre de 1977, Últimas Reformas: Ley No. 7495 de 3 de Mayo de 1995. Article 1.

many artifacts. The most prominent artifacts found are the stone spheres found in the Diquis Delta, in southern part of the country. Some of the spheres weigh over 10 tons, and archeologists are uncertain about how they were manufactured, transported, and what they were intended for.

Today, there are eight indigenous groups, located mostly in the southern part of the country.¹⁰⁸ The eight indigenous groups are: Guatusos or Malekus, Chorotegas, Huetares, Cabecares, Bribri, Térrabas (Teribes), Borucas, and Guaymies or Ngöbe.¹⁰⁹ These indigenous groups have the highest level of poverty in the country.¹¹⁰

Most indigenous groups are located in mountainous regions, allowing the people to live off the land, but the government provides subsidies to the groups to preserve the forests found on indigenous territory. The Malekus indigenous group is one of the smallest in Costa Rica. The Malekus territory has one of the highest percent (62%) of non-indigenous inhabitants.¹¹¹ The Malekus indigenous reserve is located in the Alajuela province, and the indigenous speak Spanish and their language Maleku. The Chorotegas indigenous territories are in the Guanacaste Province and Matambú indigenous reservation. The Huetares indigenous group is a small community located in San José, Canto de Puriscal, and the region of Cerrito Quepos. Since the group is so small their cultural identity and traditions have somewhat been lost, but their tradition of *Fiesta del Maíz* (Corn Celebration) has been preserved. On the other hand, the Cabécares, located in Chirripó and the Talamanca Reserve, have managed to preserve their language, natural medicine, and patrimonial culture (caciques are allowed to marry several women). The Bribri are located in the indigenous reservations of Salitre and Cabagra in the Canto of Buenos Aires. The Bribri continue to speak their native language and use the Latin alphabet.¹¹² There are only a few Térrabas in the Canton of Buenos Aires in the Reserve of Boruca-Térraba, Costa Rica. The indigenous Borucas, located in the Canton of Buenos Aires, continue their ancestral traditions specifically the *Fiesta de los Diablitos*, a three-day festival reenacting the fights between the native Boruca Indians and the Spanish conquistadores.

The Ngöbe territory occupies two countries, part of Costa Rica and part of Panama. When the Pan American highway was constructed, some of the Ngöbe territory was taken by the state and its natural resources were destroyed. The construction of the Pan American Highway provides just one example of how indigenous people were marginalized by the government. The construction of the Pan American Highway, made it possible for non-indigenous immigrants to more easily settle in and take indigenous land. Before and for a few years following the creation of the national borders many of the Ngöbes “migrated” from Panama to Costa Rica. The Ngöbe

¹⁰⁸ Attached Mapa 1

¹⁰⁹ Berger, Marcos. "Perfil De Los Pueblos Indígenas De Costa Rica."

<http://www.iidh.ed.cr/comunidades/diversidades/docs/div_enlinea/perfil%20costa%20rica.htm>.

¹¹⁰ "Reservas Indígenas." *SEXTO ESTUDIO DE CASO*

<http://www.interfazweb.net/ifzclientes/CAG/Agenda%2021/doc/126caso_reservasindigenas.pdf>. P.2.

¹¹¹ Gray, Andrew, and Elaine Bolton. *Indigenous Peoples and Biodiversity Conservation in Latin America: Proceedinds of the Pucallpa Conference, Pucallpa-Peru, 17-20 March 1997*. Copenhagen: IWGIA, 1998.

¹¹² "Native American Tribes of Costa Rica." *Costa Rica Indian Tribes and Languages*.

territory is located in the Province of Puntarenas, the Canton of Corredores, and Coto Brus. Today, Ngöbes maintain their cultural identity by wearing handmade traditional garments, speaking their native language Guaymí, and using the land for agriculture. Regarding healthcare, Ngöbes still use traditional medicine men, but when the traditional medicine does not work the people are willing to use modern medicine.

After visiting the indigenous territory of the Ngöbes and speaking to Dr. Xóchiti Quirós Sáenz, the doctor of *La Casona*, Coto Brus EBAIS, we learned that the Ngöbe healthcare system is different from other indigenous territories. *La Casona* EBAIS (medical clinic) is located within the indigenous territory, therefore those seeking treatment no longer had to walk over 14 kilometers to reach medical assistance.¹¹³ *La Casona* EBAIS serves a total of 3,000 people, about 1,700 indigenous people and 1,300 non-indigenous people. One major difference of this EBAIS from others is the design of the infrastructure or the social geometry. The structural design of the EBAIS was created by the indigenous. The clinic was organized into several small colorful native huts connected by a walkway. The green and yellow lines that trace the columns along the walkway symbolize a snake, meaning health and safety.¹¹⁴ Behind the clinic there is a medicinal garden that is operated by the traditional medicine men. Another difference between this EBAIS and others is that the modern medical leaders contracted with the traditional medicine leaders to ensure that both parties were respected, as well as the rights of the patient to choose which form of medical treatment to use.

The medicinal garden found behind *La Casona* EBAIS is operated by Ngöbe traditional medicine men and the doctor of the EBAIS does not know what the plants are used to treat. The traditional medicine men refuse to share their information regarding plants because they are fearful that “modern medicine” will use their knowledge to make a profit and not share with them. The fact that the medicinal garden is located behind the EBAIS shows the collective effort of the health system in this territory. From our interview of Dr. Xóchiti Quirós Sáenz we learned that the true success of *La Casona* EBAIS is the fact that “western” medicine is sensitive to the indigenous people. Under the direction of Dr. Pablo Ortiz, many EBAISs have been implementing policies that embody cultural sensitivity.¹¹⁵ Although there is no formal policy regarding indigenous public health in the *Caja*, Dr. Ortiz, through his leadership, has shown that proper functioning EBAIS considers the specific needs of the people served.

Although *La Casona* EBAIS is an example of a well-functioning health care center catering to indigenous people, EBAIS in general has a few shortcomings. First, since *Caja* now requires that patients present an insurance identification card before they are treated the policy is to treat patients with ID first except for emergencies. This becomes problematic when an indigenous person walks about 4 kilometers to receive care only to find out that she must wait a

¹¹³ Rodríguez, S. Irene. "Remedios Indígenas Y Medicina 'de Blancos' Se Alían En Zona Sur." *La Nación.*, 10 Nov. 2013. <http://www.nacion.com/vivir/bienestar/Remedios-indigenas-medicina-blancos-alian_0_1377462282.html>.

¹¹⁴ *Id.*

¹¹⁵ Interview of Dr. Pablo Ortiz.

long time for treatment. But this problem is systemic because it is a national policy. However in *La Casona*, Dr. Xóchiti Quirós Sáenz gives first priority to patients who traveled the farthest.¹¹⁶ Another problem that indigenous people face is the lack of emergency care services. For example in indigenous territories there are no ambulances that can be dispatched to emergencies. The *La Casona* EBAIS has a truck they use to transport emergency patients, but if the doctor is not on the truck bed with the patient, that patient does not get treated until he reaches the EBAIS.

Regarding healthcare access for the indigenous peoples of Costa Rica, the government pays for their insurance (Aseguros por el Estado). However, in 2011, only 84.5 percent of the indigenous population had healthcare insurance.¹¹⁷ Today there are services aimed at providing healthcare to the indigenous and populations in poverty, but there are no monitoring services in place to gauge whether those services are effective.¹¹⁸ Another healthcare issue that is effecting the indigenous is the limited access to prescription medication. Doctors in EBAIS are able to proscribe medication to patients but the EBAIS no longer has on-site pharmacies. Patients now must take their prescriptions to pharmacies or large hospitals to get them filled. Going to the pharmacy or hospital usually is a full day trip when access to transportation is limited, and many prescriptions take more than one day to fill. Thus, there are many indigenous people who do not pick up their prescriptions because of the amount of effort and time needed.¹¹⁹

Generally the indigenous population has trouble accessing programs created by the health sector and the programs they do have access to do not cater to their specific needs.¹²⁰ However, the Costa Rican health care reform has reduced the deaths of indigenous people caused by infectious diseases. From 1970 to 1974, the rate of death by infectious disease was 63 people per 10,000 in seven districts with a high population of indigenous people. This rate dropped from 1995 to 1999 to 24 people per 10,000 in seven districts with a high population of indigenous people.¹²¹ However the death rate due to injury and violence has risen in those seven districts, which may be due to the fact that emergency care is almost non-existent in indigenous territories.

Another problem that indigenous people face is the lack of access to clean water.¹²² Costa Rica has thirty-four watersheds,¹²³ but most of the water in Costa Rica is contaminated. It

¹¹⁶ Interview of Dr. Xóchiti Quirós Sáenz.

¹¹⁷ *Reconocimiento Y Exigibilidad De Los Derechos De Los Pueblos Indígenas En Costa Rica: Estado De La Nación*. 297. 1-28. <http://www.estadonacion.or.cr/files/biblioteca_virtual/018/Cap-7-Reconocimiento-y-Exigibilidad-de-los-derechos-de-los-pu.pdf>. p.5

¹¹⁸ *Nombre Del Programa: Asegurados Por Cuenta Del Estado*. 1-6. Web.

<http://www.fodesaf.go.cr/Fichas_Tecnicas/Documentos/CCSS-Aseguramiento%20por%20cuenta%20del%20Estado.pdf>. p.4-5

¹¹⁹ Interview of Dr. Xóchiti Quirós Sáenz.

¹²⁰ Berger, Marcos. "Perfil De Los Pueblos Indígenas De Costa Rica."

<http://www.iidh.ed.cr/comunidades/diversidades/docs/div_enlinea/perfil%20costa%20rica.htm>.

¹²¹ *Aproximación a La Condición De Salud Los Pueblos Indígenas De Costa Rica*, <

<http://www.ministeriodesalud.go.cr/ops/documentos/docEpidemiologi%20del%20Pueblos%20Indigenas%20de%20Costa%20Rica.pdf>>

¹²² *Id.*

¹²³ Attached Mapa 2- Watersheds of Costa Rica.

is estimated that only 5% of the total 6,279 liters per second of wastewater discharged receives any treatment before being discharged;¹²⁴ thus, a large majority of untreated wastewater is reintroduced into clean water sources creating polluted water. In Costa Rica there are 523 rural communities that do not have access to potable water nor aqueduct systems. There are It would cost the state about \$424 million to provide access to potable water to these rural communities, however as of 2013 AyA provides potable water to 93% of Costa Rica with a budget of \$3.4 million for new projects.¹²⁵

In conclusion, the indigenous people of Costa Rica make up less than 1.5% of the population, but their existence is marginalized by the government. The indigenous groups have the highest level of poverty in the country and it seems that no efforts are being taken to assist them. The indigenous people of Costa Rica continue to face the hardship of maintaining possession of indigenous territories, gaining access to healthcare and emergency care, accessing clean water, and balancing the need to preserve natural resources with the right to live off the natural resources.

Conclusion

In conclusion, Costa Rica has one of the best healthcare systems in Latin America. Today, Costa Rica provides all of its inhabitants with access to universal healthcare. However, an individual's access to care ends when he or she does not have the means to get to a location providing healthcare. Although the healthcare system of Costa Rica has been reformed, the goals of the health reforms will not reach the endpoint of decentralization originally envisioned.

Reducing reliance on agrochemicals is economically in Costa Rica's best interest since virtually all pesticides are imported from foreign countries resulting in increasing foreign debt.¹²⁶ Additionally, the cost of pesticides represents a large portion of the production costs for farmers that would be economically beneficial to reduce. For example, pesticide costs represent about 55% of the material production costs for banana farmers in Costa Rica.¹²⁷ Reduction in these initial costs would serve as an offset to the losses incurred by lower crop yield expected by farmers if they reduced pesticide application.

Sustainable utilization of pesticides will ultimately be the result of a balancing of social, economic, political, and environmental factors taking into account the interests of a variety of stakeholders including both large and small scale farmers, pesticide producers, government agencies, and the citizens of Costa Rica both in their capacities as agricultural consumers and as

¹²⁴ "Division De Fiscalizacion Opeerativa Y Evaluativa." *ÁREA DE SERVICIOS AMBIENTALES Y DE ENERGÍA*. Informe Nro. DFOE-AE-IF-01-2013. P.10

¹²⁵ Calderon Solano, Ingra. Yesenia. *Informe De Rendicion De Cuentas*. Rep. 2014. Print. 2011-2014.

¹²⁶ "Pesticides and Policies" at 42.

¹²⁷ *Id.*

people exercising the right to a healthy environment and a quality of life uninhibited by pesticide pollution. The current legislation in place regulating utilization of pesticides is comprehensive and therefore the focus area for improvement is mainly enforcement mechanisms.

Despite the ample water availability, poor national and local resource management has affected the status of groundwater and surface water quality of the water supplied by aqueducts. The increasing vulnerability of water supply, particularly in the GAM, is one of the major health threats to Costa Ricans. This deterioration is due to a dispersed institutional framework in several organizations and in the disjointed practices, leading to problems of overlapping competencies, gaps, and duplication. Water rationing in summer time is a reality for many rural and urban communities. However, the absence of a clear, strong, and oriented policy protecting the health of citizens, affects the possibility of making efficient use of this important resource.

Of concern is the increase in the deterioration of the quality of raw surface water in watersheds that supply water treatment plants. Inappropriate agricultural practices and poorly planned urban development is beginning to affect the supply of water in the upper parts of the metropolitan area. Regarding the state of the infrastructure of water supply systems and sewerage (infrastructure that conveys sewage) in the country, in general are at a good level, but more can be done to improve water quality. Infrastructure and technologies of aqueducts are good on average, being most notable in the collection and production systems. The quality of drinking water is monitored throughout the process by AyA through the LNA, achieving significant levels of purification.

Rights of the indigenous peoples of Costa Rica should be better protected to prevent marginalization by the government. The indigenous groups have the highest level of poverty in the country and no efforts are being taken to assist them. The indigenous people of Costa Rica continue to face the hardship of maintaining possession of indigenous territories, gaining access to healthcare and emergency care, accessing clean water, and balancing the need to preserve natural resources with the right to live off the natural resources.

Recommendations

- Regarding the healthcare system:
 - The government should turn its focus to the needs of the marginalized populations and the specific challenges they face because of their status.
 - Implement services to monitor the effectiveness of healthcare programs directed at indigenous communities.
 - Create emergency care locations closer to indigenous territories.
 - Reforming healthcare policies regarding EBAIS Doctor's ability to provide patients with medication and not just prescriptions.

- Put in place a team to conduct medical surveys of the indigenous. Current reports on the health conditions of the indigenous are outdated (10 years old).
- Regarding water quality and wastewater management:
 - It is essential to continue and enhance the protection of the water fountains located throughout the country, which is necessary to create the will in the different operators by implementing national programs to protect water sources and disinfection of the water supply, mainly supplying small populations.
 - The different actors, including the AyA, tasked with the management of water and wastewater treatment should apply greater willingness, to gradually and sustainably achieve the objectives in their programs and thus ensure safe drinking water to the population in general and minimize environmental damage directly or indirectly affecting the health of people.
- Regarding pesticide use:
 - Imposition of stricter standards on pesticide companies including:
 - More detailed labeling requirements specifically listing potential health hazards associated with products and pictographic representations that could be easily understood by illiterate workers
 - Safer storage containers and conditions
 - Regulation of advertising
 - Requirements that pesticide manufacturing companies fund training programs to educate agricultural workers in safety measures regarding handling and application of their products
 - Changes in international import policy that disallows the import of agrochemicals that have been banned for health reasons in foreign countries
 - Separate, delineate, and delegate specific aspects of enforcement of regulatory functions to certain agencies taking into consideration common policy objectives
 - Creation of a national agency (or delegation to the National Pesticide Commission) whose sole responsibility is researching, testing, selecting, purchasing and distributing all pesticides imported into the country (similar to the Empresa Nacional Para Insumos Agropecuarios in Nicaragua)
 - Charging an agency with physical product quality testing and creating a database of product registration
 - Charging a specific agency (most likely the Ministry of Agriculture) with conducting comprehensive pesticide studies including consumption rates of certain products in certain areas, crop yields, associated health and environmental effects
 - Secure funding (possibly from import taxes on pesticides) to ensure that agencies have adequate means to conduct quality testing in a laboratory setting and that complete, organized records are kept

- Implementation of incentive programs (including payments for environmental services or tax incentives) for farms that utilize Integrated Pest Management Practices (IPM)¹²⁸ including:
 - Reducing usage of pesticides and accepting compensation for difference in profit margin that results from reduced crop yield
 - Crop rotation
 - Natural predation practices in lieu of insecticide application
 - Utilization of natural organic products in lieu of harmful agrochemicals
 - Planting cover crops

¹²⁸ Integrated Pest Management is defined as a decision support system for the selection and use of pest control tactics singly or harmoniously coordinated into a management strategy based on cost/ benefit analyses that take into account the interests of and impacts on producers, society and the environment. Rodriguez & Niemeyer. "Integrated Pest Management, Semiochemicals, and Microbial Pest-Control Agents, in Latin American Agriculture." *Elsevier - Crop Protection* at 616.

Appendix

List of all interviews

1. Dr. Esteban Avandaño, M.PH.

Medical Doctor, June 5th, 2014

Lecture: Costa Rican Social Security Administration – Public Health: The Costa Rica Context
Overview of the Local Health Care Management System in Costa Rica including general information about Costa Rica, a brief history of the Costa Rican health care system, and local information about health care teams and an integrated health care situational analysis.

2. Dr. Xóchiti Quirós Sáenz.

Coordinator Physician - La Casona EBAIS, June 19th, 2014

Interview: Dr. Quirós gave the group an overview of the situation and Health Care System Services provided to the Guaymí Indigenous Community, which is pretty particular and interesting. She has been working at La Casona EBAIS for 5 years. The Community Population is around 3,000 people just half of them are indigenous. Some of the peculiarities of the EBAIS are: a) the infrastructure, because the design was developed by the Guaymíes community; b) There is a contractual agreement between the EBAIS and the Community, which consists of the right to refer patients both ways, from the Traditional Medicine to the EBAIS or vice versa; and c) Priority service, which consists on giving priority attention to the patients whom come to the EBAIS from long distances, some of this people walk hours. This particularly important, because in any other EBAIS or Hospital around the country, the service is given by the concept of the first come first served.

3. Dr. Pablo Ortíz

Medical Doctor, June 20th, 2014

Presentation at Las Cruces Biological Station: Overview of the problems that affects the Guaymí Indigenous Community; he focused especially on the problems presented with public entities such as AyA. Also, he explained how the indigenous have serious problems with land tenure and human rights.

4. Valentín González Palacios

Cultural Promoter - Guaymí Indigenous Community, June 20th, 2014

Interview at La Casona EBAIS: Valentín explained to the group about the traditions (rituals, ceremonies) and cultural activities of the indigenous community. Also, he took the group to the Medicinal Garden and explained some functions of the plants and the design of the garden, which was pretty interesting because they believe that the God of Medicine is a snake so the garden shape is as a snake.

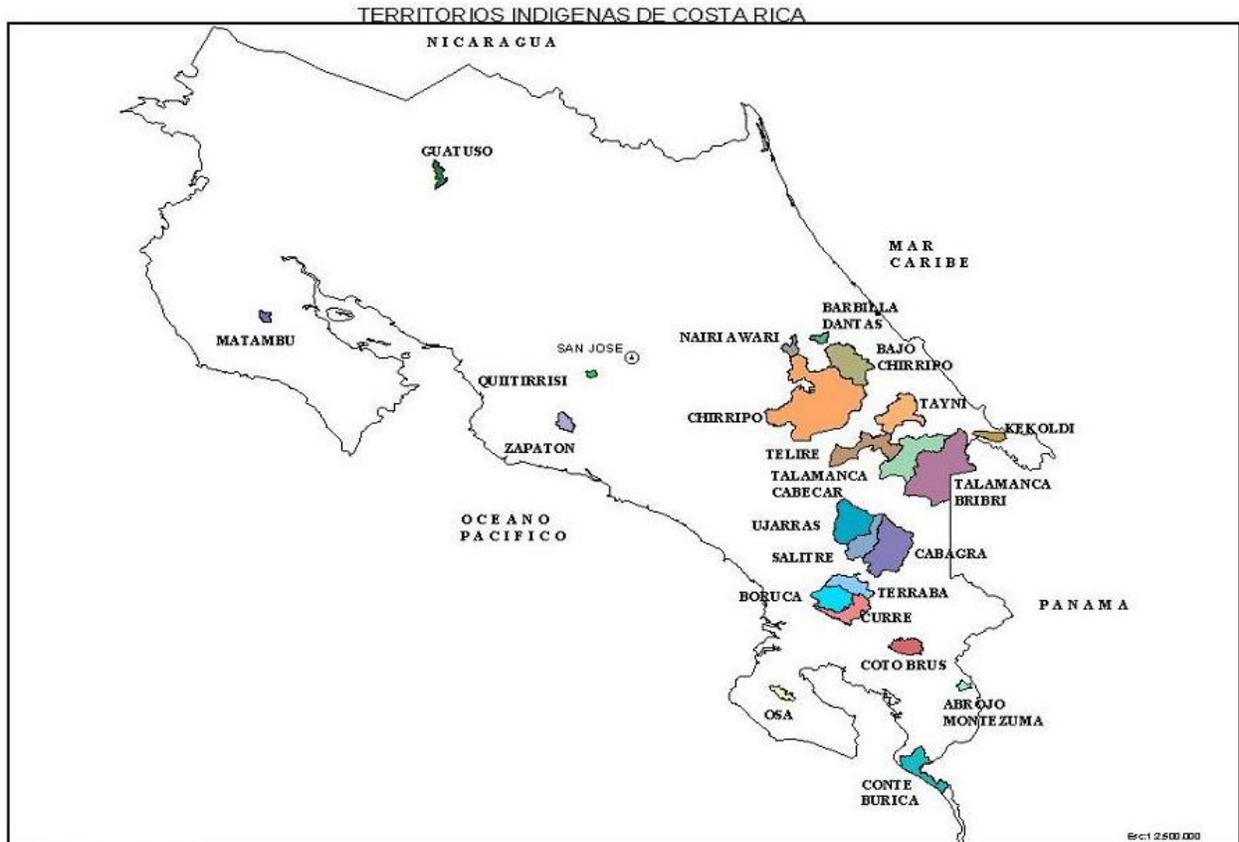
5. Daniel Montero, J.D.

Attorney and Substitute Judge for the Tribunal Ambiental Administrativo, June 26th, 2014

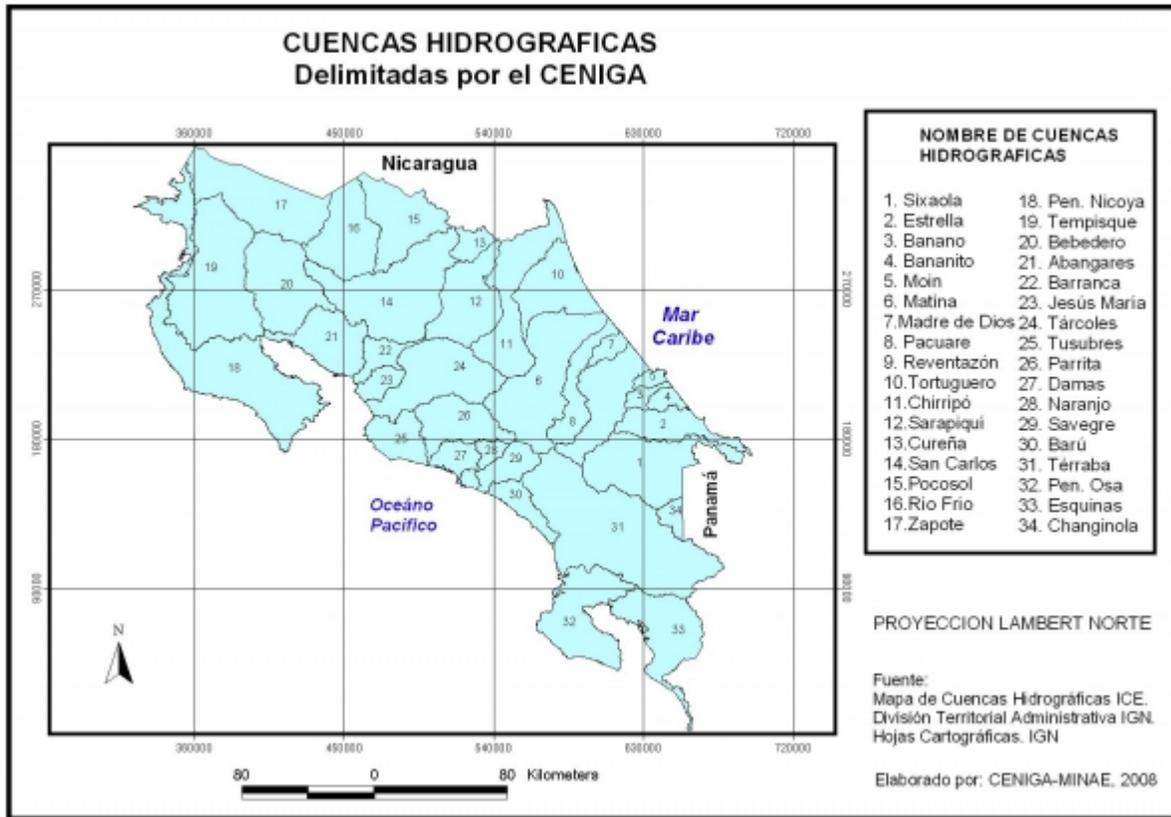
Mr. Montero outlined the responsibilities and functions of the Tribunal Ambiental Administrativo including the legal procedures involved in their system, relevant legislation, and the most common environmental issues dealt with. He also outlined the inefficiencies in the system (such as insufficient manpower and funding) and potential advancements going forward (making the tribunal more accessible to more people). Mr. Montero's lecture ended with a

lengthy discussion on pesticide pollution and Costa Rica noting common issues and areas of potential improvement.

Mapa 1: Indigenous Territories of Costa Rica



Mapa 2: Watersheds of Costa Rica



Source: CENIGA-MINAE 2008.

Table 1: Scheme of Contributive Insuring, CCSS, Costa Rica

Table 1. Scheme of contributive insuring, CCSS, Costa Rica

Scheme of contributive scheme*		SEM	IVM	Non-contributive	Accumulation
Wage-earning worker	Employers	9,25%	4,91%		14,16%
	Workers	5,50%	2,75%		8,25%
	State	0,25%	0,25%		0,50%
Independent worker	Worker with an income lower than US\$885	10,50%			10,50%
	Worker with an income higher than US\$885	13,50%			13,50%
	State	0,25%	0,25%		0,50%
State-insured beneficiary	<i>Junta de Protección Social</i> (Social Protection Board) JPS Law 7395 ¹			95% of the net utilities of the electronic lottery ²	
	Law 7972 of tax charges on liquor, beer and cigarettes			Annual amount of ₡1000 million (US\$1,7 million)	
	Direction of Social Development and Family Welfare			20% of the FODESAF ³ (Aprox. 0,3% of the GDP)	
<p>* The insured relatives are covered indirectly by the contribution of a direct insured (wage-earning, independent, or pensioner), who bears the contributive responsibility. In the case of the pensioner, his/her contribution stops when he/she stops working, but the coverage of rights continues for himself/herself and his/her relatives.</p> <p>¹ The <i>Junta de Protección Social</i> (Social Protection Board) is Costa Rica's oldest public institution, and its mission is to contribute to the strengthening of the country's social security and social welfare by generating resources for state and non-state social institutions and organizations. This is achieved through the efficient administration of national lotteries, under an exclusivity regime for such economic activity.</p> <p>² The Law of Protection for the Worker No. 7983 of the year 2000, in its Art. 77, established that, when the amount of annual utilities is lower than ₡3,000 million (aprox. US\$5,3 million), the Executive Power shall have to include in the National Budget the transference to the Non-contributive Regime of the CCSS, in order to cover for the difference between what was drawn by the <i>Junta de Protección Social</i> (Social Protection Board) of San José and the amount herein established.</p> <p>³ This was established in Art. 4 of the Law 5662 of 1974, which created the <i>Fondo de Desarrollo Social y Asignaciones Familiares</i> (FODESAF). It is financed by contributions from the Law of Sale Taxes No. 3914, as well as a 5% surcharge on the total salaries and wages that public and private employers must pay monthly to their workers, except for the Executive Power, the Legislative Power and the Tribunal.</p>					