

Central America (NASA Visible Earth)

CLIMATE PROTECTION IN GUATEMALA:
THE DEVELOPMENT POTENTIAL OF GREEN ENERGIES

Nelson Rafael Olivero García

The Weatherhead Center for International Affairs

Fellows Program

Harvard University

61 Kirkland Street

Cambridge, Massachusetts

April 18, 2012

OUTLINE

<u>Part One: Introduction</u>	3
Searching for Green Energy	
1. Consequences of the Climate Crisis: Natural Disasters	4
2. To Move Towards Clean Energy: Hypothesis	7
<u>Part Two: The Reasons to Implement Clean Energy</u>	9
Case Study Evidence of Two Individual Sectors in Central America	
1. Energy Sector: Reducing Prices	9
2. Ecological Sector: Promoting Ecotourism	16
<u>Part Three: The Results of Fighting Climate Change</u>	20
“Visionary Guatemala”	
1. Conclusions and Recommendations: Knowledge	20
2. New Perspectives: Developing Projects and Capacity-Building	22
References	26
Acknowledgements	27
Remarks	28

PART ONE:

Introduction

Searching for Green Energy

“Of the environmental problems that have arisen since the beginning of the industrial revolution, few have posed greater uncertainties or greater potential threats than the possibility of global change due to the greenhouse effect.”¹

Climate change, together with its causes, economic and social consequences, and its environmental impacts—natural disasters such as hurricanes, floods, landslides, droughts—makes up one of the principal global challenges facing our century and is the focus of the present research paper.

Even though some members of the international community have undertaken climate protection measures in recent decades, CO₂ emissions continue to increase and global warming is expected to accelerate. It is argued that the current promises made by the international community to reduce greenhouse gas emissions are insufficient if the rise in the earth’s warming due to these gases is to be limited to two degrees Celsius.

“Global environmental changes and scientific assessments of those changes have become increasingly common elements in international, national, and even local policymaking and decision making.”²

This is a matter of concern because the impact of climate change is already significant and measurable. It is necessary that everyone be conscious that the adverse effects of global climatic change will increase during the course of this century, especially if the international

¹ Henry Lee, Richard G. Newell, and Robert N. Stavins “Developments at the Interface of U.S Energy and Environmental Policy 1933,” *Energy and the Environment: Evolving Challenges And Opportunities*, (Cambridge, Mass: Center for Business and Government, John F. Kennedy School of Government, Harvard University, 1994) p. 5.

² William Clark, Ronald B. Mitchell, and David W. Cash “Evaluating the Influence of Global Environmental Assessments,” *Information as Influence: How Institutions Mediate the Impact of Scientific Assessments on Global Environmental Affairs*, (Cambridge, Mass.: John F. Kennedy School of Government, Harvard University, 2002), p.1

community fails to take joint and concrete action to reverse the trend of greenhouse gas emissions.

Greenhouse gas emissions from Guatemala (as well as other countries in Central America) are minor in relation to the climate change impacts the nation has suffered. Although it is affected most violently by the increased intensity of tropical storms, the measures it can adopt to reduce its own greenhouse emissions are arguably negligible within the global levels of greenhouse pollution. Nevertheless, it is my deepening concern for this global challenge that has led me to explore the ways in which alternative energies contribute not only to reduce greenhouse gas emissions and mitigate climate change, but also to support sustainable development and encourage more robust economic growth.

“The number of people inside and outside governments today who know what the rest of the world must do about the greenhouse problem is remarkable.”³

In this research paper, I will present some of the reasons why it is beneficial for Guatemala to implement clean energies, apart from the globally acknowledged benefit of reducing greenhouse gases. Based on case study evidence of what has been done in the area—in particular in Costa Rica—as well as data predictions from leading research institutions, I will argue that the development of renewable energies would not only demonstrate Guatemala’s commitment to this pressing issue, but will reduce electricity prices, increase national electrification, and potentially attract a greater volume of ecotourism to the country.

1. Consequences of the Climate Crisis: Natural Disasters

“The warnings about global warming have been extremely clear for a long time. We are facing a global climate crisis. It is deepening. We are entering a period of consequences.”⁴

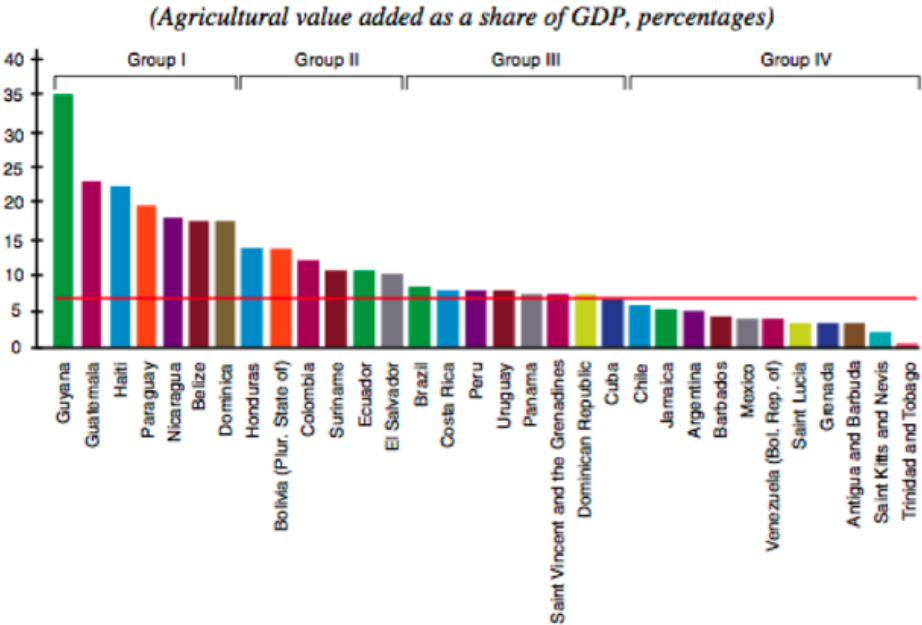
³ William Clark, *Usable Knowledge for Managing Global Climatic Change* (Stockholm: The Stockholm Environmental Institute 1990), p ii.

⁴ Al Gore, speech at National Sierra Club Convention, September 9, 2005.

Historical studies have shown that global climate change in the last several decades has not increased the number of hurricanes, but has drastically increased their intensity.⁵ The damage caused by hurricanes in the region has made them one of the main threats for Guatemala.

Within its 108,889 km², Guatemala is a natural bridge for biodiversity between North and South America, and has various well-defined ecosystems. Guatemala is mainly an agricultural country characterized as having two seasons: the dry season from November to April and the wet season from May to October. But if the effects of climate change alter one or the other, severe damages can result—especially in the agricultural sector—and can affect thousands of families. Further, considering the vital role of agriculture for the country’s growth (see Figure 1), climate change has and will affect the export development of the entire country.

Figure 1: Contribution of Agriculture to Growth in Latin America and the Caribbean, 2005 CEPAL



Although the gas emissions from Guatemala (and the entire region of Central America) are very insignificant in comparison to global outputs, the disproportionate impacts of climate change for the approximately 14.5 million inhabitants of the country have been devastating in recent

⁵ *La economía del cambio climático en Centroamérica*, United Nations’ Economic Commission for Latin America and the Caribbean, 2011, p. 193.

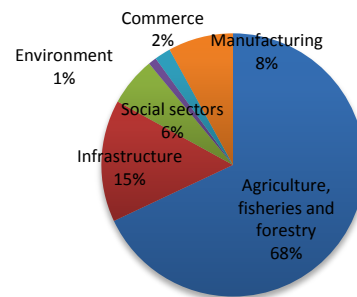
years. And it is clear that the poor living in vulnerable areas of Guatemala are more liable to the impacts of climate change.

“There is no greater threat to human freedom today than climate change.”⁶

Of all recent natural disasters, Hurricane Mitch in 1998 caused the greatest damages, close to \$8,000 million’s worth. The next in severity were Hurricane Joan (1988), which produced \$1,412 million in damages, and tropical Storm Stan (2005), which resulted in \$1,361 million in damages.⁷

In 1998, Hurricane Mitch, which destroyed crucial transport infrastructure in Central America and significantly damaged the ecology of the region, also exposed the populations to new, intensified infectious diseases. Furthermore, with climate change, dengue fever and malaria are likely to spread as mosquitoes and other vectors move into areas that were previously too cold or dry. In 2001, the Intergovernmental Panel on Climate Change (IPCC), which reported on the impacts of, and vulnerability and adaptation to, climate change, found that the incidence of water-borne diseases such as cholera will increase. Furthermore, vulnerable groups such as the elderly and the very young are likely to experience higher heat-related morbidity and mortality and will be disproportionately affected by increased ozone and smog formation at higher temperatures.⁸

Figure 2: Sectoral Distribution of Losses Caused by Hurricane Mitch



Source: *Climate Change and Development in Latin America and the Caribbean* (2009), United Nations’ Economic Commission for Latin America and the Caribbean

⁶ Wen Stephensen, “Why Walden Matters Now,” *The Boston Globe*, (Editorial) September 22, 2011.

⁷ *La economía de cambio climático en Centroamérica*, CEPAL 2011.

⁸ “Guatemala,” World Food Program, www.wfp.org.

Tropical Storm Stan of 2005 heavily damaged the entire country, especially in the field of food supply. Food production is a major source of employment and export earnings. The adverse effects of climate change on agriculture will thus disproportionately exacerbate the index of poverty. The most vulnerable groups are indigenous women, girls, and boys living in the highlands and the “dry corridor” (a semi-arid zone with periods of drought, degraded soils, and low agricultural yields).⁹ The destruction of the tropical rain storm Stan caused the deaths of almost 1,500 people,¹⁰ and more than 200,000 were displaced by hundreds of landslides and widespread flooding.¹¹

“People tend to focus on the here and now. The problem is that, once global warming is something that most people can feel of their daily lives, it will be too late to prevent much larger, potentially catastrophic changes.”¹²

The recent tropical rainstorm Agatha of 2010 caused the deaths of more than 150 people from flooding and landslides. Thousands were displaced and over 110,000 evacuated. Severe damages also affected the infrastructure of the country. In 2011, another climate phenomenon—Rainstorm EF13—devastated a great portion of land. The principal consequences of these impacts are in the ecological sector such as clean water supplies and soil retention and fertility.

2. To Move Towards Clean Energy: Hypothesis

After having presented some of the impacts of climate change in Guatemala during the last two decades, I will now show some of the reasons why it is profitable for Guatemala to implement green energies even though its own contribution to global climate change is relatively small.

⁹ World Food Program.

¹⁰ “Guatemala: Swept Away: Rebuilding after Hurricane Stan” *The Economist*, Volume 337, Issue 8451, October 5, 2005

¹¹ “Guatemala: Floods/Landslides” *Feminist Studies*, Volume 31, Issue 3, Fall 2005.

¹² Elizabeth Kolbert, *The New Yorker*, April 25, 2005.

The biodiversity and different ecosystems of Guatemala, which are under threat by the impacts of the global climate change of the last few decades, should be consciously preserved to promote sustainable development in Guatemala, similar to what has been done in other countries in the region such as Costa Rica.

In Central America, Costa Rica, with almost the same climatic characteristics as Guatemala, but with a smaller population and area, a lower percentage of the population living below the poverty line, and a lower index of criminality, is moving much faster to green energy policy.

Costa Rica has already taken serious measures to reduce the use of fossil fuels and move progressively to the promotion and establishment of the knowledge of renewable energies with effective and credible results. Thus, I argue that Guatemala should move towards clean energy taking into consideration the steps implemented by Costa Rica.

The conservation of the biodiversity of Guatemala would potentially bring in greater tourist revenues from ecotourists who come to Guatemala to experience its natural beauty. Furthermore, in comparison to what has been done in Costa Rica, I suggest that the electricity prices of Guatemala would be reduced by the use of sustainable alternative energies.

PART TWO:

The Reasons to Implement Clean Energy

Case Study Evidence of Two Individual Sectors in Central America

1. Energy Sector: Reducing Prices

“Energy is the lifeblood of the global economy, a crucial input to nearly all the goods and services of the modern world. Policy makers, especially in countries with energy-producing potential, now increasingly see another role the energy sector can play: job creator and engine of economic growth.”¹³

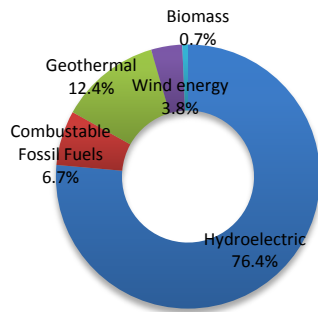
The energy sector has a crucial part to play in an economic and financial policy strategy committed to sustainable economic development. One of its fundamental goals is to design a strategy to fight climate change.

It is important to note that energy is consumed by a wide variety of economic sectors and activities, such as industry and transport, as well as by households and various buildings. To bring down the consumption of fossil fuels, a solution can be obtained by comparing how Costa Rica has implemented and promoted the use of renewable energy.

It is also important to mention that the inadequate improvement in energy efficiency in Guatemala is attributable to a number of factors, such as policy instruments and the absence of significant economic incentives for the implementation of renewable energies. What follows is a case study comparing the data from Costa Rica and Guatemala in the energy sector to obtain evidence of how it can be profitable to reduce the prices of energy consumption and to increase sustainable economic development.

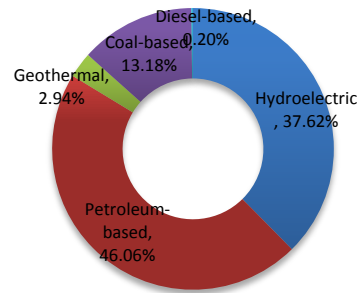
¹³ Roberto Bocca and Samantha Gross, “Energy, Jobs and Economic Growth,” *The Wall Street Journal*, March 6, 2012.

Figure 3: Costa Rica Energy Matrix



Ministerio de Ambiente, Energía y Tecnología

Figure 4: Guatemala Energy Matrix



Comisión Nacional de Energía Eléctrica

Costa Rica: Is a small country (51,100 km²) with a population of 4 million inhabitants. It promotes the use of renewable sources like hydro, mini hydro, wind, geothermal, and solar, mainly for electricity generation (see Figure 3).

Electricity generated by private plants in Costa Rica goes to the national electric grid and is finally sold by the Costa Rican Institute of Electricity (ICE) and/or their distributors. Distribution of electricity is still not allowed by the private companies. A great number of industrialists are generating electricity through hydro, wind, and geothermal plants, whereas in the case of solar, so far, there is no centralized plant, but there is a government subsidy program.¹⁴

In November 1996, the Ministry of Energy of Costa Rica approved Law 747 “Rational Use of Energy,” according to which it promotes renewable sources and energy-efficient devices and materials¹⁵.

Almost 90 percent of the electricity is produced from these renewable sources with profitable results. One of them, geothermal energy can play a significant role especially in the developing countries of Central America, for example, 12.4 percent in Costa Rica.¹⁶ Through different

¹⁴ Shyam S. Nandwani, “Uses of Solar Energy in Costa Rica,” *Renewable Energy*, 32 (2006), page 700.

¹⁵ Ibid.

¹⁶ Enrico Barbier, “Geothermal Energy Technology and Current Status: An Overview,” *Renewable and Sustainable Energy Review* 6 (2002) 3-65, page.3

policies and some incentives, private generation is also encouraged and there are some decentralized systems like solar water heaters, swimming pool heaters, cookers, dryers, solar stills, and also photo voltaic panels. The latter are mostly for populations where there is no electric grid. Depending on the province, 91-99.5 percent of the population is electrified. The government also encourages the use of energy-saving devices especially in the domestic and industrial sectors.¹⁷

Finally, in 2008, the nation moved further towards clean energy, pledging to go carbon-neutral by 2021. The next step is to offset the carbon dioxide produced by the farming and packaging of its main exports, bananas and pineapples.¹⁸

Guatemala: The Constitution of the Republic of Guatemala establishes that a fundamental duty of the state is to guide the national economy using natural resources and adopting the necessary measures to use them efficiently.

The Ministry of Energy and Mines (MEM), through the Comisión Nacional de Energía Eléctrica (CNEE), is in charge of formulating the energy policy and of developing the indicated power expansion plan. MEM's main objectives are:

1. Diversify the energy matrix, including electricity generation, with renewable sources and the optimal use of natural resources.
2. Promote efficient power investments.
3. Reduce generation costs.
4. Reduce CO₂ emissions.

¹⁷ Nandwani, 689.

¹⁸ "Global Green Heroes," *New Scientist*, 02624079, 9/26/2009, Vol. 203, Issue 2727

Like many other countries in Latin American and the Caribbean, Guatemala implemented a market-oriented reform of the power sector in the late 1990s to develop the quality, reliability, and efficiency of electricity services, to improve the government's fiscal position, and to increase affordable access to energy services for consumers, especially in marginal areas.¹⁹

A critical point is that Guatemala has a stronger dependency on imported sources of energy for its electricity, mainly fossil fuels, than Costa Rica. Even today, the main source of energy in Guatemala remains imported oil products. Also, firewood accounts for a large portion of the total primary energy supply in Guatemala, an excess of 35 percent.²⁰

In Guatemala, there are three transmission companies but ETCEE (Empresa de Transporte y Control de Energía Eléctrica), a subsidiary of the state-owned generation company INDE (Instituto Nacional de Electrificación), controls more than 95 percent of the transmission grid. Guatemala maintains a state-owned generation company that controls approximately 38 percent of generation capacity, primarily through hydroelectric plants.

“The government is aware of how important it is to seek new renewable energy sources that make it possible for us to reduce costs and make Guatemala a more competitive economy in the region,” says Guatemala’s Energy and Mines Minister, Carmen Urizar.²¹

It is highly recommended to call the attention of those in charge of the planning and execution of the energy policy in Guatemala as to why it is convenient for the country to move towards clean energy. Despite the fact that the low greenhouse gas emissions from Guatemala make essentially zero impact in the global climate crisis, the development potential of renewable energy will enhance energy security, alleviate energy poverty, and contribute to economic growth and sustainable development.

¹⁹ World Bank’s Central American Regional Programmatic Study for the Energy Sector, 57.

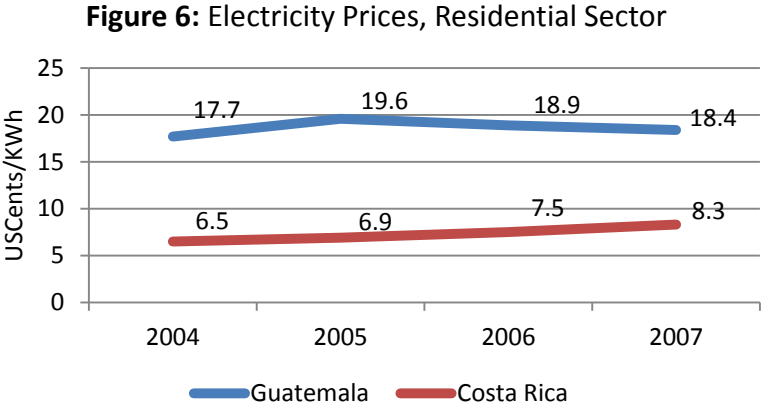
²⁰ Ibid, 29.

²¹ Marta Rivera, “Sustainable Energy for Guatemala” *The Renewable Energy and Efficiency Partnership*, 27.03.2007.

It is clear that the reason why Guatemala would be moving to the implementation of clean energy would not be so much to reduce the climatic disasters of recent years in the country, but because it can profit from the immediate and local benefits of alternative energies.

Some of the profitable reasons deduced from the previous evidence is that, by implementing clean energy, Guatemala could reduce the costs to consumers by lowering central operating costs in the long run.

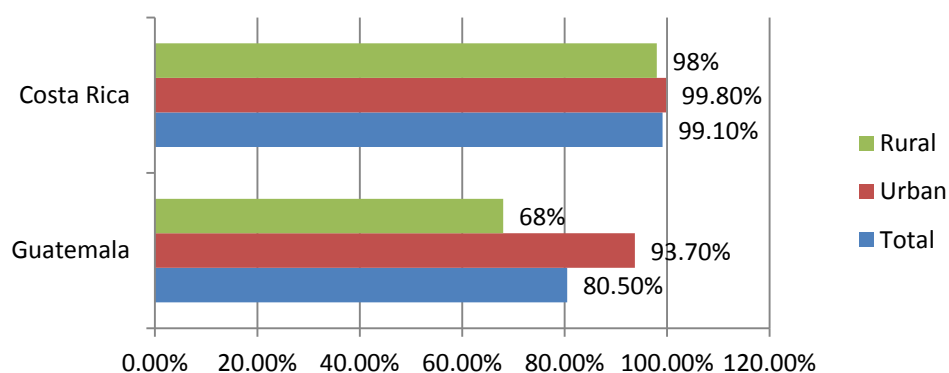
Guatemala’s energy matrix remains highly dependent on fossil fuels. Prices are dictated by the global market, and Guatemala has no control over them. The supply and delivery of oil creates vulnerability. Diversifying energy resources adds to increased security and lower prices on a long-term basis. Costa Rica has much lower and more stable energy prices, mainly because of the reduced dependency on oil consumption through the implementation and promotion of renewable energies. Some evidence provided by the World Bank will prove this:



Source: World Bank’s Central American Regional Programmatic Study for the Energy Sector

Guatemala has the potential quantity and quality of natural resources that could generate and supply energy to the entire country. In sum, it is crucial for Guatemala to bring down the consumption of fossil fuels through the use of renewable energies to obtain profitable results. Costa Rica promotes the use of renewable sources mainly for electricity generation. Almost the entire population of Costa Rica is electrified (see Figure 6), and the consumers pay significantly reduced prices for the consumption of energy.

Figure 6: Electrification Rates



Source: World Bank's Central American Regional Programmatic Study for the Energy Sector

The results of the national expansion plans show that, in Costa Rica and in Guatemala, the expansion of supply is based on renewable resources with a much higher percentage in Costa Rica as shown in the following figure.

Figure 7: National Generation Expansion Plans

	Hydroelectric		Geothermal		Other renewable		Conventional Thermal		Imports	
	MW	%	MW	%	MW	%	MW	%	MW	%
Costa Rica	1,519	65%	175	7%	335	14%	308	13%		
Guatemala	1,464	58%	44	2%	80	3%	717	29%	200	8%

Source: World Bank's Central American Programmatic Study for the Energy Sector.

It is possible for Guatemala to generate 13,800 MW from “hydro, wind, biogas, biodiesel, bioethanol, fast-growing energy crops, sustainable forestry, and industrial and agroforestry waste.” Furthermore, its water, sun, wind, biomass, and geothermal sources are enough to supply all of the energy needs of Central America. Though the available water sources are limited, hydroelectric projects have the potential of about 10,000 MW, although only 7 percent of this is currently used. The sun over Guatemala could generate up to 5kWh per square kilometer—which would satisfy the region’s energy needs for the next five or six years.²²

²² Marta Rivera, *ibid.*

Costa Rica and Guatemala both have about 55 percent of the hydro potential in the region. Geothermal and solar sources are used successfully in Costa Rica and are potentially useable in Guatemala.²³

It is also very important to mention that Guatemala is the only oil-producing country in Central America. That means that all of the countries in the region are still dependent on imported oil to supply their energy needs. Guatemala alone can provide itself a small percent of its energy demand from its own oil production. Guatemala is situated on a geological belt across which 75 percent of the world's oil reserves are located.

Five regions in Guatemala are currently being explored for oil deposits, mainly by four oil companies exporting mainly to the United States of America that operate within favorable business conditions with little concern for the environment.²⁴ Regarding the foreign oil companies, Guatemala could analyze the convenience of stronger taxation and the dissolution of privileges for the extraction of this "black gold."

In conclusion, Guatemala has the capacity to generate all its own energy using renewable and non-renewable sources. Ironically, however, the nation still imports a high percent of fossil fuels for of its electric energy generation needs, contributing to the high prices of electricity in the country.

Doubtless, Guatemala should take more advantage of its natural resources with the objective of supporting sustainable development and boosting economic growth.

²³ "Renewable Energy Potential of Latin America," Global Energy Network Institute, December 2009.

²⁴ Emma Volonté, "Guatemala: Oil Companies and the Subservience of the Government," *Upside Down World*, June 15, 2011.

2. Ecological sector: Promoting Ecotourism

“As we enter the 21st century, the climate is warming around the globe at an alarming rate. This unprecedented warming may have harmful consequences to the environment. Indeed, at higher latitudes and altitudes, where the pace of warming is greater, indigenous people and wildlife are already feeling its effect.”²⁵

Regarding the principle of “common but differentiated responsibilities,”²⁶ the greenhouse gas emissions from Guatemala and the Central American region are still very small in comparison to the climate change impacts and effects on the environment and human societies.

Guatemala and Costa Rica have a privileged location. Both countries situated in the Central American Isthmus are a bridge between North and South America for biodiversity. The second case study as follows compares the data from Costa Rica and Guatemala in the tourism sector to obtain evidence of how it can be profitable to increase the number of tourists and promote ecotourism through the implementation of green energy in the country.

Costa Rica: This Central American country already generates around two-thirds of its energy as a result of implementing renewable sources. Consequently, more than a third of its land has been designated as national park sites, successfully promoted by the ecotourism industry.

Around 12 million trees have been planted in recent years, funded in part by a tax on gasoline. Costa Rica has also opened up opportunities for foreign investment, having as an incentive to be proud of keeping its environment clean and protected.²⁷ This success brings in a high yearly income which, apart from the decrease in tourism worldwide after the 2008 financial crisis, is

²⁵ *Climate Change: Our Global Experiment*, Special Exhibit, Harvard Museum of Natural History 2012, www.hmnh.com

²⁶ *United Nations Framework Convention on Climate Change*, United Nations 1992, page 4.

²⁷ “Global Green Heroes.”

generally increasing as tourists from all over the world come to discover the beauty of its nature, as shown below.

Figure 8: Tourism Revenues; United Nations World Tourism Organization 2011

	International Tourist Arrivals						International Tourism Receipts			
	(1000)			Change (%)		Share (%)	(US\$ million)			Share (%)
	2008	2009	2010	09/08	10/09	2010	2008	2009	2010	2010
Guatemala	1,527	1,392	1,219	-8.8	-12.4	0.8	1,068	1,298	1,378	0.8
Costa Rica	2,089	1,923	2,100	-8.0	9.2	1.4	2,283	1,815	2,111	1.2

Guatemala: Located in the heart of the Maya World, Guatemala is recognized as a multicultural country formed by diverse ethnic groups. Because of its geological history and its climatic evolution, Guatemala is one of the countries with the greatest climatic and topographic variability and the largest biological and cultural diversity. The country has about fifteen well-defined ecosystems and a great potential in renewable resources.

Wetlands and their wildlife are a key part of the global ecotourism experience. In this specific sense, Guatemala has seven wetlands according to The Ramsar Convention on Wetlands.²⁸ CONAP—Consejo Nacional de Areas Protegidas—recently claimed that mangrove trees were being cut down at a very rapid rate in Manchón Guamuchal. This is one of the seven Guatemalan Protected Areas, which forms part of the list of the Ramsar Convention for its importance in ecological, botanic, zoological, and hydrological terms.

Manchón Guamuchal, located in Retalhuleu, in the southwest of Guatemala, is a migratory corridor for birds that travel from Canada and the United States in the winter season, particularly from November to March. But unfortunately, this protected area is in danger.²⁹ Thus, this represents a negative image for the promotion of the ecotourism.

²⁸ www.ramsar.org

²⁹ Redacción Big, "Se mueren los árboles de mangle," *El Periódico*, www.elperiodico.com.gt March 3, 2012

Guatemala is still a country that buys oil from abroad and cuts down trees for its primary energy supply, the latter unfortunately in excess. Eighty percent of the inhabitants of Guatemala still use firewood to cook, causing the loss of more than 50,000 hectares of forest a year. Public and private reforestation currently recovers only about half of this.³⁰

It is strongly recommended that the environment of Guatemala be saved by promoting the idea of thinking environmentally and looking at the serious ecological consequences of eliminating trees and vegetation. Landscape ecology, conservation and land-use planning, and building green spaces are increasingly taking environmental issues into consideration.³¹

The effect of the rise of the sea level due to global climate change may furthermore threaten natural barriers such as mangroves. Valuable estuarine fisheries and coral reefs may be lost, threatening tourism.³² As a natural bridge between the Caribbean Sea and the Pacific Ocean, Guatemala should protect and restore lowlands and mangroves of both as an attraction to invite ecotourists to admire the beauty of its nature.

The current use of the ecology in Guatemala is not as attractive to the ecotourism industry as in Costa Rica. In this regard, it is very important to mention that there is considerable deforestation in protected areas. Furthermore, problems of domestic security in Guatemala can be said to not only deter tourism, but also foreign investment in alternative energies.

The Guatemalan press, however, just published news that the President of the Commission of Tourism of Guatemala announced that his commission will go on working with INGUAT—Instituto Nacional Guatemalteco de Turismo—and the Ministry of the Interior to strengthen the security for tourists and to promote Guatemala as a tourism destination.³³

³⁰ Rivera, *ibid.*

³¹ Richard T.T. Forman is the PAES Professor of Landscape Ecology at Harvard University. Video: "Ecological Issues in Guatemala Landscapes." January 19, 2010, Universidad Francisco Marroquín, Guatemala.

³² "Climate Change Impacts in Latin America," CANA-Social Impacts of Climate Change

³³ www.prensalibre.com.gt February 27, 2012

The Minister of Foreign Affairs, through their diplomatic missions, consulates, and commercial offices, is working to promote the image of Guatemala as an ecotourism destination abroad.

In conclusion, Guatemala has a challenge to preserve its energy and ecological sectors for future generations. It will be extremely useful and highly recommended if Guatemala moves forward by making a pledge to reduce its carbon footprint in coming years, and it is very desirable for the nation to reduce its dependency on fossil fuels and implement concrete measures towards investment in clean energy resources. Only when this goal is achieved will Guatemala have the capacity to obtain profitable results in the energy and ecological spheres. This is evident in the following summary of data used to argue this case. Costa Rica is operating at a much more efficient and sustainable level of development than Guatemala.

Figure 9: Energy and the environment; United Nations Human Development Report 2007/2008

	Electricity Consumption per capita		Electrification rate (%) 2000-2005	Population without electricity (millions) 2005	GDP per unit of energy use		% of total land area (%) 2005	Forest Area		
	(kw hours) 2004	(% change 1990-2004)			(2000PPP US\$ per kg of oil equivalent) 2004	(% change) 1990-2004		Total (thousand sq km) 2005	Total Change (thousand sq km) 2005	Average annual change (%) 1990-2005
	Guatemala	532			100.00	79		2.7	6.4	-3.6
Costa Rica	1,876	54.4	99	0.1	10.0	2.9	46.8	23.9	-1.7	-0.4

PART THREE:

The Results of Fighting Climate Change



“Visionary Guatemala”³⁴

1. Conclusions and Recommendations: Knowledge

“Climate is a condition of life. We are all a product of its vagaries. When it changes, so must we. Yet until recently most people refused to allow a climatic variable into their calculations of past, present, and future.”³⁵

Fighting climate change should be a prompt action especially to mitigate its negative impacts. It is necessary to make a substantial investment in the search for and implementation of clean energies and in environmentally new technologies.

This can be achieved when the international community ascertains the right incentives to steer development towards clean energy societies. No individual state can succeed in achieving this objective without the involvement of the commercial and industrial sectors and of a civil society.

³⁴ Alexis Batres, “Parque Eólico en San Vicente Pacaya, sobre el Cañon de Palín,” *El Periodico de Guatemala*, Feb.11, 2012.

³⁵ Sir Crispin Tickell, “Climatic Change and World Affairs” Revised Edition, Copyright 1986 by the The President and Fellows of Harvard College. Page 1.

Addressing climate change presents a whole series of challenges to governments, parliaments, and the private energy sectors of society, especially in climate protection policy measures, which must be identified, taken into consideration, and implemented effectively and credibly.

The territorial vulnerability and agricultural and socio-environmental degradation of Guatemala increase poverty, especially among the population living in rural areas. This particular vulnerability makes the Guatemalan population very close to the negative consequences of climate change. Therefore, it is required that countries with higher levels of greenhouse gas emissions seriously commit and support the creation of mechanisms that may reduce the vulnerability of the developing countries, such as Guatemala.

Only knowledge will shed light on the complex global environmental change. It is necessary to teach new generations, through educational institutions, the knowledge that combines concepts and methods of social and natural sciences. This will help in the better understanding of climate change—especially the negative impacts on agricultural productivity, land-use, and biodiversity—and the main changes in the economic and ecological sector.

It will be extremely useful and highly recommended that Guatemala reduce its dependency on fossil fuels, increase the development of green energy, and implement concrete measures towards the conservation of its environment for the promotion of ecotourism. When Guatemala achieves these goals, this could certainly be the base for its economic growth and sustainable development.

“We need decisive government action—which means a political movement that transcends ‘environmentalism.’ Because the climate crisis is more than an environmental crisis, it’s a human crisis, and we need a new politics to address it on those terms.”³⁶

³⁶ Stephensen.

This is why it is especially important to have political vision with the goal of mitigating the threat of climate change and to preserve a livable planet for our future generations. In this regard, a valuable recommendation is the innovation and implementation in renewable energies.

2. New Perspectives: Developing Projects and Capacity-Building

“What we need in the long run, however, is the equivalent of a new economic paradigm—that is, a systemic change in the way we organize economic life— to move beyond carbon and nuclear energy. And here I believe we are on the cusp of a third industrial revolution, in which internet technologies and renewable energies merge to create a powerful, new energy infrastructure.”³⁷

SIEPAC—Sistema de Interconexión Eléctrica de los Países de América Central—is a plan to connect the power grids of Panama, Costa Rica, Honduras, Nicaragua, El Salvador, and Guatemala. This plan is expected to alleviate periodic shortages in the region, reduce operating costs, optimize shared use of hydroelectric power, and create a competitive energy market in the region, with particular emphasis on using hydroelectric power.³⁸ Other investments are the construction of new hydroelectric plants that would tap into the unused potential in Central America.³⁹

A project for wind energy has been proposed for San Vicente Pacaya, one of the best places for wind energy in the county, with a generating potential of 21 MW. This plan, though it would initially cost \$47–50 million to set up, would save 77,891 barrels of petroleum per year.⁴⁰

³⁷ Jeremy Rifkin, “Only an ‘Energy Internet’ Can Ward Off Disaster” *Financial Times*, May 20, 2011.

³⁸ Jeremy Martin, “Central America Electric Integration and SIEPAC Project: From a Fragmented Market Toward a New Reality,” *Energy Cooperation and Security in the Hemisphere Task Force*, May 6, 2010.

³⁹ Rosa María Bolaños, “Inversión para el future,” *Prensa Libre*, 4/9/2011.

⁴⁰ Batres.

A Harvard graduate from Guatemala is providing solar-powered lights for people living off the grid. He states that the biggest problem for Guatemala is the “lack of electricity” and people living off the grid. Currently, he is working on a project to create auto-sustaining urban living centers that have little impact on the environment.⁴¹

Founded in 2001, the German Association, *Solar-Forum Schleswig-Holstein*, has installed a solar system in a medical center in Chicacao, a town located in southwest Guatemala. Each year this center receives about 40,000 inhabitants from Chicacao and other neighboring communities. This area has a major lack of electricity and the little electricity that they may be accessed is sometimes disconnected from 12 to 24 hours at a time. Through the installation of the solar system, the program has allowed for the refrigeration of vaccines. In these communities, vaccines are highly necessary against *Kriebel* mosquito (simuliidae) bites that cause onchocerciasis. This roundworm-borne disease is the second-most frequent cause of blindness worldwide.⁴²

Last year, the Embassy of the Federal Republic of Germany in Guatemala and the Guatemalan-German Chamber of Commerce and Industry sponsored the energy efficiency exhibition “*La casa alemana*,” which showed new and innovative German technology for the construction of new homes. This exhibition promoted profitable investment in Guatemalan solar energy for the sustainable development of the population. This project also aimed to prove that there could be harmony between the esthetics and comfort of green buildings and the potential use for solar energy.⁴³

The Renewable Energy and Energy Efficiency Partnership – REEP – has organized the Fundación Solar, a private development organization which assists Guatemalan policy makers in

⁴¹ Omar Marroquín Pacheco, “Se reduce casi a cero la huella sobre el medio ambiente,” *La Hora*, 3 March 2012. For more information refer to: www.quetsol.com

⁴² For more information refer to: www.solarforum-sh.org

⁴³ Axel Vicente, “La casa del future,” *Prensa Libre*, May 3, 2011.

developing new energy frameworks for the improvement of energy efficiency, sustainable development, and a competitive economy.⁴⁴

In the conservation of biological diversity and sustainable use of natural resources, I want to share with the Guatemalan authorities a very interesting project called ATREE—Ashoka Trust for Research in Ecology and the Environment—from which we may learn capacity-building for research and application. During a conference on Biodiversity, Ecology and Global Change in February 2012, Professor Kamaljit S. Bawa⁴⁵ showed the need to educate a new generation of scholars capable of generating interdisciplinary knowledge that combines concepts and methods of social and natural sciences.

IRENA (International Renewable Energy Agency) was established by its member states and signatories to facilitate the development and deployment of renewable energy worldwide. IRENA believes that renewable energy use must and will increase in the coming years because of its key role in enhancing energy security, reducing greenhouse gas emissions and mitigating climate change, alleviating energy poverty, supporting sustainable development, and boosting economic growth. It is highly recommended that Guatemala—currently a signatory—join this international organization as a full member to benefit from IRENA’s work programs in the fields of knowledge, capacity-building, innovation, and technology.⁴⁶

Most recently, on the 26th of March of this year, the Inter-American Development Bank (IDB) and the Japan International Cooperation Agency (JICA) came together in their decision to offer up to \$600 million in financing for renewable energy and efficiency projects in Central America and the Caribbean in the next five years. Specialists of JICA are considering potential projects in

⁴⁴ Rivera.

⁴⁵ Professor, Department of Biology, University of Massachusetts-Boston. For more information refer to www.environment.harvard.edu and www.atree.org

⁴⁶ www.irena.org Vision and Mission.

areas of hydroelectric power plant rehabilitation, photovoltaic power generation, and installation of energy saving facilities and equipment.⁴⁷

The future lies in climate protection. New environmental policies must be coordinated across a large number of departments and institutions inside the governmental sphere, in the energy productive sector and in private development organizations. Climate protection makes ecological and economic sense. It is the growth and development model of the future. This should be any country's aspiration for the sustainable development of its population, especially Guatemala.

Future generations should contribute voluntarily to a greener lifestyle for climate protection. This can be in accordance with Mrs. Wangari Maathai's⁴⁸ words: *"It's the little things citizens do. That's what will make the difference. My little thing is planting trees."* One can always plant a tree: it is never too late!

⁴⁷ "IDB and JICA to invest up to \$600 million in green energy in Central America and the Caribbean," Inter-American Development Bank, May 16, 2012.

⁴⁸ Professor Wangari Muta Maathai was the first African woman to receive the Nobel Peace Prize, in 2004. She introduced the idea of planting trees with women's groups in order to conserve the environment and improve their quality of life. She passed away in 2011.

REFERENCES

- Clark, William C. *Usable Knowledge for Managing Global Climatic Change*. Stockholm: Stockholm Environmental Institute, 1990.
- Climate Change and Development in Latin America: Overview 2009*. Coordinated by Joseluis Samaniego. Santiago, Chile: United Nations Publication, 2009.
- Global Environmental Assessments: Information and Influence*. Edited by Ronald B. Mitchell et al. Cambridge, MA: MIT Press, 2006.
- Hogan, William W. et al. *Energy and the Environment: Evolving Challenges and Opportunities*. Cambridge, MA: Center for Business and Government, John F. Kennedy School of Government, Harvard University, 1994.
- La economía del cambio climático en Centroamérica: Reporte técnico 2011*. Coordinated by Julie Lennox. Santiago, Chile: United Nations Publication, 2011.
- Learning to Manage Global Environmental Risks*. The Social Learning Group. Cambridge, MA: MIT Press, 2001.
- Lee, Henry. *Energy at the State and Local Level*. Cambridge, MA: Energy and Environment Policy Center, John F. Kennedy School of Government, Harvard University, 1982.
- The Role of Local Governments in Promoting Energy Efficiency*. Cambridge, MA: Energy and Environment Policy Center, John F. Kennedy School of Government, Harvard University, 1982.
- Rifkin, Jeremy. *The Third Industrial Revolution: How Lateral Power is Transforming Energy, the Economy, and the World*. New York: Pelgrave, 2011
- Tickell, Crispin. *Climatic Change and World Affairs: Revised Edition*. Cambridge, MA: Center for International Affairs Harvard University and University Press of America, 1986.

ACKNOWLEDGEMENTS

My recent academic year at the Weatherhead Center for International Affairs (WFCIA) Fellows Program at Harvard University has been a great experience to further my research in environmental and sustainable development.

Writing my paper in these last months has been a good way for me to discover how to explain my deep concern. I also have shared my awareness with my fellow Fellows and faculty in the WCFIA. In turn, they have also enriched me with their comments and suggestions.

In particular, I want to express my thanks to Professor Jeff Frieden and Professor William Clark for their guidelines in my research paper.

My special thanks to Dr. Kathleen Molony and Mr. Steve Bloomfield who, since the beginning of my time at the Weatherhead Center, have been the principal guides to helping me in getting closer to Harvard University and showing me the multiple doors which are opened for a Fellow. I would also like to thank the Ministry of Foreign Affairs of Guatemala for having given me permission to spend one academic year at the Weatherhead Center Fellows Program at Harvard University.

My appreciation goes to Miss Lora Stoianova for her excellent research assistance. She always contributed with distinction, ideas, comments, and suggestions.

REMARKS

This research paper was prepared by the author during his 2011-2012 stay as a Fellow at the Weatherhead Center for International Affairs at Harvard University.

The views expressed in this report are solely those of the author.

About the author: Nelson Olivero LL.M.

Mr. Olivero is a Guatemalan lawyer and diplomat and has been working for 20 years in the Ministry of Foreign Affairs of Guatemala. He has served his country in several diplomatic missions, and his first assignment was Third Secretary in the Embassy of Guatemala in Paris. He was then appointed Second Secretary in the Permanent Mission of Guatemala to the United Nations in Geneva and afterwards as Counselor of Guatemala in Brussels and to the European Union. In recent years, Mr. Olivero has been in Bonn and Seoul as First Secretary and Consul and then he went to the headquarters of the Ministry of Foreign Affairs as the Under-General Director of Protocol. In 2005, he was appointed Minister Counselor of the Embassy of Guatemala in Berlin, where he was responsible for political and consular affairs and promotion of tourism to Guatemala in the Federal Republic of Germany and in the Republic of Poland. Mr. Olivero has been dealing in recent years with environmental issues, mainly in climate protection, and he has a special interest in the implementation of clean energy as a solution for fighting climate change effectively and credibly.

“For the first time in my life, I entered Harvard Yard on August 3rd 2011 using Dexter Gate on Mass. Avenue and I read at the top: ‘ENTER TO GROW IN WISDOM.’ Having ended my Fellows Program at the Weatherhead Center for International Affairs at Harvard University and having very frequently attended Morning Prayers in Appleton Chapel—The Memorial Church, Harvard University—I now walk out through the same gate with a much better understanding of the meaning of life.”

Nelson Olivero

-----*

*In memory of
Rodrigo Echeverria Olivero
(1989-2009).*

And to those who contribute to a much better understanding and meaning of how important climate protection is.

A special mention to SAFE PASSAGE

And to its founder
Hanley Denning

A young American woman born in Massachusetts, who worked on the project up to her passing to help many Guatemalan children living in hard conditions in one of the largest landfills in Central America, located in Guatemala City, to receive a better life, education and give them a chance to be part of a more integrated society.⁴⁹

-----*

⁴⁹ For more information refer to: www.safepassage.com and the short film "Recycled Life" which was presented to the WFCIA Fellows Program weekly breakfast, Harvard Faculty Club, September 2011.