

Sherry-Ann Rowland

"Tell me, I forget. Show me, I remember, Involve me, I understand."

-Ancient Chinese Proverb

Humans are curious by nature, so it isn't so hard to appreciate why we strive for explanation to things we don't understand or seek new ways of improving our lives. It is in the constant battle of progression through sustainability that we are in contention with our environment.

What is Biodiversity?

*It is the sum of all species living on earth-
Today there is an estimated 5 to 30 million species on earth.
All under threat-extinction by the human race
Urbanization, suburban sprawl cause habitat loss,
Air pollution, poaching, farming, grazing, clearing of land for
space
Water-Agriculture runoff destroys fish and amphibians, Is this the
cost?
The cut of tree, the sound of "timber," the burning invades
Rising, rising, still rising; black and gray,
The air polluted by Carbon Dioxide, this is not a game of spades!
Releasing and giving Carbon Dioxide, greenhouse gases are to stay.
Species: killed, for valuable parts; skins and bones
Poverty and rich collectors forward this
Dropping down, species' numbers fall like stones.
The people unaware and untrained, who are we to miss?
Benefits-benefits of Biodiversity!
Food security, tourism, and ethical obligations-
Finding medicines and drugs-Many in variety!
Seed banks-3000 plants found with cancer fighting chemicals are
negotiations,
A direct source of income and intrinsic value-Joy!
An inherent right to exist-who are we to destroy?
ESA, Endangered Species Act along with CITES.
The Convention on International Trade in Endangered Species;
These help prevent possible extinction and sale.
Captive breeding, reintroduction, and cloning-do not bail.
Preserving Biodiversity, in zoos, gardens, rainforests,
Schools teaching how to help in hot spots
Who are we to take, who are we to say?
Biodiversity is to stay!*

-Author Unknown

Defining Bioenergy

The preceding poem gives light to the urgent problematic dilemma facing our planet over the last twenty years. The author questions our right to destroy what does not belong to us, but that, which belongs the planet earth. The planets' global biodiversity is consistently morphing as it spins upon its axis. While its inhabitants are aggressively in combat with it to serve their selfish needs. Over the same time period bioenergy has become a trend by way of not only individuals, communities, and cities but countries. To examine bioenergy it is first important to define it. Bioenergy 's definition will vary based on who you're asking, for the purpose of this paper we will define it as; renewable energy derived from biological sources, to be used for heat, electricity, or vehicle fuel (USDA, 2010). These biological sources are often referred to as biomass which is the organic matter that layers the living ecosystems on earth. Therefore, biomass originates from numerous sources such as compressed waste from everyday household trash, remnants of farming activities, materials from sawmills and forestry operations and methane gas from landfills. Simply put bioenergy, is the multitude of ways in which biomass is converted into fuel to be used as energy. This renewable energy is meant to be consumed by organizations, companies' and individuals. Because of this ability to convert biomass to bioenergy many countries and its citizens are seeing waste disposal differently, not like many years ago, but, choosing to live consciously. In addition, most modernized nations have embarked on the some level of production and harvest of new types of clean or renewable energy sources.

Mother Nature

*Our world is always changing,
Constantly re-arranging.
From ocean depths to mountain peaks,
Mother Nature moves and speaks.
While telling stories of our past
She tries to teach us how to last.
Mankind, so smart, sometimes blind
Leaves common sense far behind.
We're moving fast and living large,
Forgetting she's the one in charge.
Amazed when she rings our bell,
Sending us through living hell.
She can twist our steel, shake any city,
If her wrath you feel, we shall pity.
Yet some who speak on her behalf,
I fear just seek the golden calf.
It's true, we must treat her right.
Or we will incur a deadly plight.
Treat her with distinction
Or surely face extinction!*

-Edith A. Phinazee

Energy Past and Present

For decades all principal energy sources were derived from what is known as "dirty energy" coal, oil, gas, and uranium and tar sands. This dirty energy that we have relied on for the past two hundred years can be attributed to various global devastations like climate change, dirty air, dirty water, endangered wildlife and change in land and ecosystems, in addition to public health with affects that are far reaching. As planet we concentrated a large percent of manufacturing and production on the use of this dirty energy. The vast land that is the United States made up of highways, remote communities was designed with the assumption that the energy sources were unending (Lerch, 2010). This echoes the repetitious story of the supply and demand. As we are in full

swing of the twenty-first century it has energy concerns are quickly become a reality and governments around the world are on the fast track to be the leader in the bioenergy production.

"I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait till oil and coal run out before we tackle that."

- Thomas Edison

Thomas Edison one of the most prolific inventors' in history prophesied that as the industrial revolution was ending that our greatest resources coal and oil may potentially be depleted. Edison saw the potential of the sun and solar energy more than eighty years ago. Still, in the twenty first century we are searching for ways to master capturing the sun's power. Solar energy has become one of the pivotal sources of clean energy. We have managed to incorporate solar energy into various aspect of daily life, with the invention of solar panels. Solar panels have become common place in a multitude of large metropolitan and small towns alike. They are placed on light post, roofs of shopping malls, schools, and even electric company vehicles as a supplemental power source. However, there is still a vast underutilization of solar energy. Other facets of sustainable or renewable energy are solar thermal, wind, wave, hydro, photovoltaic and geothermal. These sources are ultimately explored in addition to bioenergy in order to attain energy efficiency to help protect and sustain the environment and its inhabitants.

The claims made about bioenergy with regard to the migration from "dirty energy" to "clean or renewable energy" are similar to Charles Darwin's thesis on the theory of evolution. As we evolve and consume, our environment modifies

itself and by necessity we transform our behaviors and acclimatize to it.

Because oil is still very much essential to the industrialized world, there has to be a resilient push to the bioenergy movement. Oil as a raw material is necessary for gasoline, diesel, jet fuel, home heating oil, industrial oil, and most all chemicals and plastics. It is the main ingredient in the production and distribution of food, farming and transportation (Lerch, 2010). Not the mention that extracting the oil is a hefty process which places a strain on the physical environment and its ecosystems. As we know the side effect of this is higher prices.

Although there is much attention paid to the bioenergy movement globally there is still vast underutilization with regard to other sustainable or renewable energy sources as mentioned previously; solar thermal, wind, wave, hydro, photovoltaic and geothermal. With changing technology and innovation nations have embarked upon a shift to energy independence. The allocation of enormous amounts of financial resources towards the science and development of the above mentioned "clean energy sources". All of this in the effort to drive sustainability with regards to food, transportation and the environment.

With the current ecology of the planet there is an underlying truth about the production and consumption of reliable bioenergy, in that it significantly reduces greenhouse gas emissions. These emission levels are tracked and regulated by the Department of Environment, Climate Change and Water.

As the pressure and demand from global citizens and the planet heightens countries are reacting and taking action. As time passes we will continue to see new innovation within all

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clean energy sources mainly solar thermal, wind, hydro and geothermal. As mankind and technology evolve we will move into a realm that is no longer reliant on dirty energy sources of any kind to sustain our energy demand.

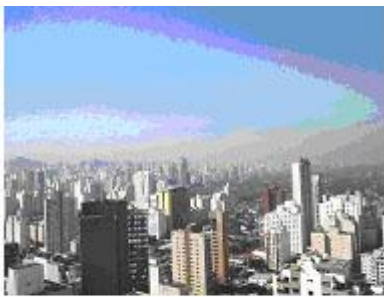
Some arguments made in favor of bioenergy are that capturing methane gas from landfills prohibits it from being released into the atmosphere, and the more energy derived from these sources means less energy derived from coal. However, this is minute in comparison to that which is emitted from the innumerable vehicles that populate the streets of major cities on any given day. Most if not all large cities on the world are plague by this predicament from; Shanghai, Mumbai, Beijing, Sao Paulo, and Seoul to Moscow, on order of most populous cities with New York City at number 15.

It is important to understand the layered dynamics of a nation or state in order to appreciate the complexity of the initiatives it embarks upon. We will examine closely Brazil's San Paulo and United States Greater New York area in the production of bioenergy and its contribution to the sustainability movement within each region respectively. Thus I believe that citizen contribution and commitment is where larger cities are going to benefit the most from bioenergy. If each individual, each family, each community is held answerable for their contribution. This can only be realized if there is a required shift in economics and better public understanding of the connection between the thing we consume and their place of origins, and the consequences of their extraction and production (Heinberg, 2010).

This is a challenge for the two cities that I will focus on; San Paulo which ranked the 4th largest city in the world and number one in Brazil with a population of 11.4 million people. Also New York City which is ranked number 15th in the

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world, ranked 1st in the United States (US Census, 2010) with 8.3 million, and 3rd at 19.4 million when combined with New York State as a whole (US Census, 2010). Both of these vibrant metropolises are ideal candidates for bioenergy initiatives, to propel them both to the next level of energy consumption (by means of lower or maximizing the reduction in output). In order for this to happen there has to be long term plans for both cities that prognosticates a vision where not only the citizens can benefit, but the comprehensive environment.



City of Sao Paulo
Photo Edina Campos Ribeiro

Sao Paulo Geography/Demography

Understanding the layers of large cities is key to appreciating the initiatives it embarks upon. Sao Paulo, Brazil from 2000 to present will be the focus of my research: bioenergy and its contribution to the sustainability movement and reduction of carbon emissions.

Brazil is the largest country in Latin America boasting a population of 192 million. Their main export is oil one of the dirty energy sources. Agriculture is another of the country's major sectors makes up 25% of the national GDP. Brazil is also the largest producer of coffee and sugarcane in the world, and second largest to the USA in soybean production. Even though their main export is oil, they are the world leader in the farming of crops used in bioenergy production. With a land mass is 8.5 million square kilometers, half of the entire land mass of South America. And respectively the amazon rain-forest makes up almost fifty percent of Brazil's total land mass.

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However, this number is dwindling drastically each year, by thousands of acres, due to deforestation. Approximately 47 % of Brazil's' energy generated stems from renewable energy sources, compared to the rest of the industrialize world at 13-14%. It is distributed between various sources, sugarcane at 18.2%, hydropower at 15.2%, biomass at 13.95%, natural gas at 8.7%, and uranium at 1.4%.

Brazil is the world's leading producer of ethanol from sugarcane. This ethanol production is used to supply up to 15% of the country's energy, mainly for their automobiles. Over 90% of the cars in Brazil have the flexibility to run off of the ethanol produced or petroleum. San Paulo, the largest city in Brazil is home to the main production of ethanol from sugarcane, around 60%. In conjunction with the production of ethanol, the country has explored biodiesel as part of their national energy push to self-sustainability. Currently biodiesel accounts for a mere 5% of the mixture in the country's diesel.

Sao Paulo is located in southwestern Brazil, where more than 7 million vehicles can be found on any given day. The city of Sao Paulo is 1575 square kilometers in area, it experience large amounts of rainfall a year. Sao Paulo consumes a larger portion of Brazil's overall 421 billion kWh per year. A diverse city that is comprised numerous ethnicities such as Italians, Japanese, Arab, Lebanese and Afro-Brazilians which add to the cities flavor (CIA World Fact Book, 2009).

*"Speed is irrelevant if you are going in the wrong direction."
- M. Gandhi*

**The short and long term impact on the
Environment, Humans and Animals**

In the last decade the environment concerns and energy consumption patterns have added pressure to hurry national energy plans to reduce the reliance on fossil fuel. So, it is clear that sustainability in Sao Paulo is a main focus of not only the private sector but the government as well. The government is charged with ensuring; that the world treasure that is the Amazon rainforest does not disappear entirely while they embark toward a state of self-sustainability which contributes to deforestation, but not the main culprit. The Amazon supplies a large portion of the biomass need to support the bioenergy initiative in Sao Paulo, and it has been this way for much of the last ten years. This is great because it allows them the ability to stay on the forefront of bioenergy production, especially with ethanol. Brazil has recently been listed as one the main economic powerhouses of the 21st Century. It holds a prominent place as part of BRICS (Brazil, Russia, India, China and South Africa) which is the leading emerging global economies. Therefore, many are taking notice and paying close attention for the emergence of major initiatives in Sao Paulo and Brazil as a whole.

There is some backlash from environmental activist, that Brazil's bioenergy push is really having a reverse effect on the environment. Emissions released into the atmosphere from the burning of the forest which is converted to bioenergy. Just as with the over consumption of any natural resource, the Brazilian government has to implement policy the serves to protect the Amazon.

The citizens of Brazil are also dealing with fallout from bioenergy production, when crops that are diverted from

normal human and animal consumption, to be converted to biomass. In city where a large portion of its citizens live under the poverty level this is a hard fact for people to embrace. Sao Paulo has the highest number of favelas (slums) in the country at 612 (Britannica, 2009). I would imagine it is hard for these improvised Brazilians to grasp that crops are being grown, not for their consumption but for vehicles to operate. A very disheartening fact in the city is that there is a sense of entitlement among those with money. The hard truth is that one Brazilian citizen can have food for an entire year with the grains used to fill one tank of ethanol for a Sport Utility Vehicle. Again, bioenergy production is negatively affecting food prices and supplemental food programs that feed those in need. One eco-activist is quoted as saying "harvests are being plucked to fuel our cars instead of ourselves."

Consumption of Ethanol biofuel, derived from bioenergy production

Brazil is currently the world leading in the race for biofuel production and they boast that 90% of the cars have flex fuel engines. Allowing them to run off not only gasoline, but bioethanol, or a combination of the two and a large portion is derived from sugarcane based fuel. With more than 7 million cars in the City of Sao Paulo, these lower emissions, flex fuel cars will support the cities lower pollution initiative.

Senior motor industry executives claim that the flex engines are spreading faster than any previous innovation in the automobile sector (World Bioenergy News, 2006). It is catching on simply because "a barrel of bioethanol is currently half the price of a barrel of oil" (World Bioenergy

News, 2006).

New York Geography/Demography



Figure 1- NEW YORK CITY

New York's five boroughs overview				
Jurisdiction		Population	Land area	
Borough of	County of	1 April 2010 Census	square miles	square km
Manhattan	New York	1,585,873	23	59
The Bronx	Bronx	1,385,108	42	109
Brooklyn	Kings	2,504,700	71	183
Queens	Queens	2,230,722	109	283
Staten Island	Richmond	468,730	58	151
City of New York		8,175,133	303	786
State of New York		19,378,102	47,214	122,204

Table 1- NY Population Breakdown

New York a population of roughly 19.4 million and land mass of 47,517 thousand square miles. There are more the 800 languages spoken here, by more than 100 ethnicities making it the most linguistic city in the world (New York.gov, 2010). The metropolis is always at the forefront of culture, and the organic movement. However, they are trailing behind Sao Paul in the bioenergy initiatives. New York's governmental layers follows that of larger cities in the United States, State, Region, County, and the city or towns; with federal government looming somewhere over them all. New York fights to find balance between the production and consumption of clean and dirty energy sources. New York's acreage is substantially less than that of Brazil. So, New York has to be creative in their approach used to find sources of biomass to use for bioenergy production. A region of the world that is more service driven, consumers find comfort in knowing these efforts are taking place, even in the smallest of spaces. The state has created

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The "Renewable Energy Task Force" which constructed a plan to place the state on an attainable path toward greater energy independence. Their goals are actionable; first invest millions of dollars in renewable energy projects. Second, establish a review of wind-powered projects and other plants that emit low levels of carbon dioxide. Then the implement rigorous energy-related building codes and new appliance efficiency standards. The taskforce hopes that these steps will lead to the reduction in electricity use by 15% over the long term in the state.

The side-effects on the Environment, Humans and Animals

New York has embarked upon several initiatives that embodied the "green movement" with large and small scale projects.

The United States government is making provisions by way of policy change to support the clean energy initiatives. The Food, Conservation and Energy Act of 2008 aids agricultural and forest land owners financially in the collection, harvest, storage and transportation of all material deemed eligible for conversion at biomass facilities, to be transformed in to bioenergy. This 2008 Farm Bill as it is sometimes referred to supports sustainability.

Environment

What is the true state of the environment? You have the politicians on the left telling you that there is undeniable evidence of global warming. Thousands of species become extinct every day because we are cutting down the rain forests. All around the earth, environmentalists are pointing out devastation. On the other hand those on the right would have us believe that the earth is perfectly fine. They say that all of the changes that the earth is going through are perfectly OK and that we have nothing to worry about. Who is right?

- Family Friend Poems

Counter arguments to bioenergy and the Frankenstein Fuels dilemma

"Bioenergy is the way of the future" this sounds like a line out of a sci-fi movie maybe something Steven Spielberg imagined, a follow up to "I Robot." Some scientist and environmentalist begin to differ, they claim is that bioenergy is circumventing the purpose of renewable energy to emit less fossil fuels and move our society away from oil dependency. Michael Grunwald writes in his piece on "The Clean Energy Scan" "eco-friendly fuel, ethanol increases global warming destroys forests and inflates food prizes. So, why are we subsidizing? (Grunwald, 2008)

What is the most disturbing aspect of the bioenergy production from the forestry components is that 20% of the carbon emissions released into the atmosphere are from deforestation. The basic problem with the Amazon is that it is worth more deforested than intact (Condon, 2008).

"We won't have a society if we destroy the environment."

- Margaret Mead

Consumption

Over consumption is a term that is widely used in our culture today. Over consumption has led to a host of diseases, and societal problems.

Virtually every human threat to other species and their habitats is driven by economic growth and by our consumption, be it food, energy, products or even scenery (Heinberg, 2010). There is a laundry list of issues that have over consumption at its core. Most prevalent is obesity a disease that plagues New Yorkers of all ages. Melanoma that can be attributed to smoking, artificial tanning, and sun exposure plagues both Sao Paulo and New York.

How to power not only NY but also the country with renewable energy

The following maps give great insight into where the resources for the "clean energy sources" are located and the regions with the greatest potential. Biomass, Geothermal and Wind,

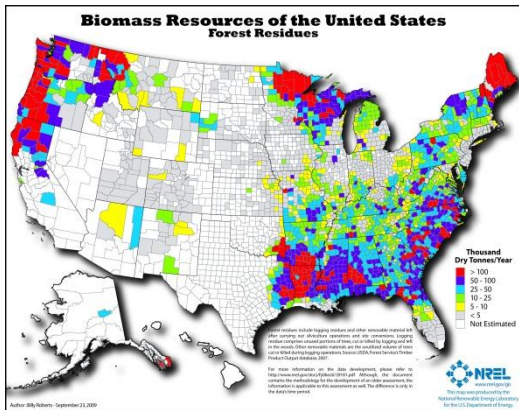


Figure 2-Forestry Residue

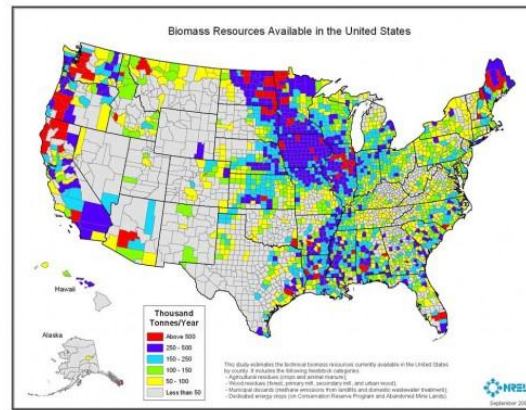


Figure 3-Biomass Resources in the US

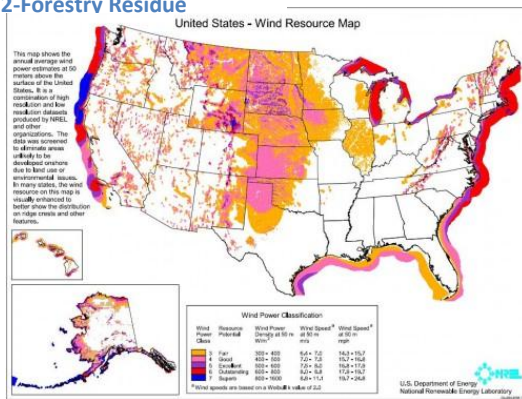


Figure 4-Wind Resource Map US

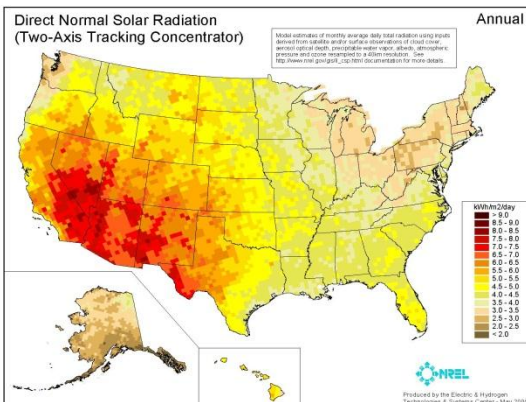


Figure 5- Solar Radiation Map US

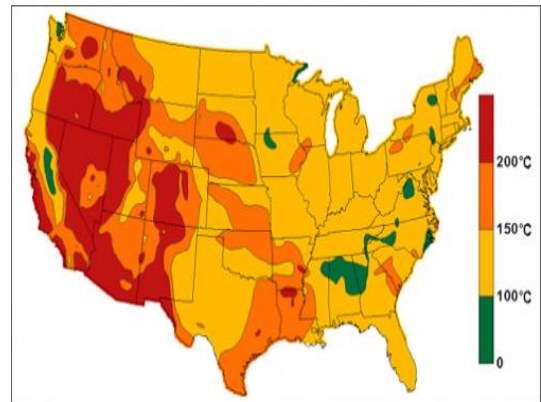


Figure 6-Geothermal Sources Map US

Recommendations/Conclusions/Projections

Clearly for both cities a major move away from fossil fuel is going to have resounding repercussions, which will hopefully drawing a larger international base for energy production and sources. With constant innovation in the way of technology we will continue to see clean energy sources become more prominent. If more attention is not paid to this balance the out will be a battle for land between crops (for human consumption) and energy production. Then the question becomes who are we benefiting with the objective of bioenergy production? As we now know Brazil, over the last five years has emerged as a major power house not only as an ambassador of bioenergy, but on the forefront of ethanol production. Whereas, New York focuses a larger portion of its resources on the densely populated areas such as New York City which houses 40% of the state's population. Both, cities have proved themselves to be major stakeholders in the pursuit of sustainability. As mankind and technology evolves it is inevitable that we will become less reliant on dirty energy sources to sustain our energy demand. In that pursuit we must ask ourselves is it worth it, if in the name of the environment, humans and animals that live in it. Thus, the research and innovation must continue at all levels for renewable energy to become the consumption demand that does not sacrifice our planet while trying to save the earth.

The global governments must do their part in the making sure that steps are taken to ensure the long-term virility of our planet. The UN (United Nations) has begun the process by the creation of the IBEP (International Bioenergy Platform), which will help both Sao Paulo and New York in keeping them on track. This agency was created to provide governments at

all levels to formulate bioenergy policies and strategies. The United Nations an independent entity from all nations is probably the ideal body of policy makers, because they seek to develop the tools that will help quantify bioenergy resources and implications for sustainable development on a country-by-country basis.

Even though there are larger scale efforts whose aim is the help the planet and the environment, I believe the each individual must do their part. As they have done their part unknowingly or not to the large scale issue of pollution. We need to move toward the concept of Walkable living. This is being seen in pockets of larger cities, where the residents in a seven block radius will have all they need to sustain day to day. If we follow Patrick Condon seven rules for sustainable living, it will be a start. Condon claims that the sustainable low-carbon communities which should operate under the following seven rules is where the larger metropolis cities should be moving toward:

- Rule # 1- Restore the streetcar
- Rule # 2- Design an interconnected street system
- Rule # 3- Locate commercial services, frequent transit,
And schools with a five-minute walk
- Rule # 4- Located good jobs close to affordable homes
- Rule # 5- Provide a diversity of housing types
- Rule # 6- Create a liked system of natural areas and
parks
- Rule # 7- Invest in lighter, greener, cheaper, and
smarter infrastructure

Condon did have an eight rule, "love one rule, love the all"(Condon, 2010). His concepts are great, and I think it would be great to implement a few of these in certain areas

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of large cities. It would be difficult to embark upon such a task all at the same time. This has to be done in waves for it to stick; simply because we have come such a long way from the street cars, which in super busy, mega cities, speed is everything. There has to be a change in the mindset of those that living in these integrated metropolises for the seven rules to begin accept or even work for that matter.

The Agricultural Revolution took thousands of years, and the Industrial Revolution took 200. We have so much less time to achieve the massive social changes needed for survival.

(Davies, 2009)

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