21st Century Influences

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Introduction

Overview

Our natural environment is a fascinating ecosystem, rich with history, diversity and opportunity. Human nature has organically constructed an extremely complex multi-dimensional infinite growth paradigm abstracting us away from this environment. Naturally, the motivations for these constructs have been to improve life and to address problems arising from current affairs / conditions. Given an unlimited playing field, this approach would likely be sufficient but unfortunately we are dealing with a very real limit: Earth.

I assert that in the timeline of mankind a precipice for our society and standard of living is about to unfold. The stage for this mile stone event was set long ago and the story involves our planet, its resources, and society. While this event is a footnote on Earth's radar, it will be epic for mankind and central for those of us alive today.

Background

The dramatic fluctuation in oil prices and associated financial crisis of 2008 sparked my interest in resources, society and macro economics. Since then, I have researched and sponsored the study of these topics in an effort to understand what is in store for mankind going forward.

As I began to explore the underlying principles that influence our lives I found certain core concepts kept reemerging. After many informal conversations with friends and colleagues in reference to the freelance research I have done I've decided to capture all of my thoughts in writing. I hope this sparks interest and maybe serves as a catalyst for further research as well.

Disclaimer

I have made every effort to conduct my research in a politically, temporally, economically and ethnically unbiased manner. I believe this cold and calculated approach is necessary to appropriately predict upcoming events. To the best of my ability, all findings are based on peer-reviewed science but at this time I have not included citations and references. As such, please approach this writing as one guy's opinion. I am not an investment advisor. Please work with a certified investment advisor before making any investment decisions.

The topics I have covered each warrant an in depth discussion but for sake of brevity I have reduced the coverage to just key points. This document is taken from the perspective of relative importance to us today and as a result is intended to be practical at the cost of scientific precision.

Thermodynamics

Thermodynamics is the set of principles that dictate the conversion of energy within a system. The origins of thermodynamics were to study steam hence the prefix 'Thermo'. Unfortunately this can deceptively imply that thermodynamics only addresses temperature. In fact this body of science covers other conversions of energy, including mechanical work. There are 4 laws, 2 of which I feel are particularly relevant to this paper.

System

A system is a set of interdependent components which form an integrated whole. A system operates in a contiguous fashion, meaning that the state of the system evolves over time.

An open system is the most liberal type of system as it allows matter and energy to enter and exit the system. A closed system is a more restrictive form of a system because matter cannot be exchanged with the surroundings external to the system. An isolated system is yet even more restrictive in that neither matter nor energy can be exchanged with its surroundings.

Laws

The first law expresses the conservation of energy. This simple principle states that for an isolated system net energy cannot be created nor destroyed.

The second law is less obvious as it addresses the usefulness of energy. The usefulness of energy in a system can be expressed as a measure of the imbalance in concentration of energy. In a system, the usefulness of energy can only decrease over time and cannot be reversed without externalities.

As an example, let's explore an analogy involving water and gravity. Assume an isolated system containing two water tanks connected at the bottom by a pipe for water, and another pipe connecting the two tanks at the top for air. The first tank is initially full of water and the second tank is full of air. At this point, there is a good deal of useful energy because of the imbalance in the tanks. Over time gravity will pull the water from the first tank to the second tank until both tanks approach half full. Once the two tanks are in equilibrium the usefulness of energy in the system has decreased. The only way to reverse this would be to apply external work to move the water back to the first tank.

In summary, for a system to be mechanically "active" there must either be pockets of higher levels of energy or energy entered into the system.

Earth

For sake of discussion, let's describe the earth from mankind's perspective. The earth is an approximately 4.5 billion year old system, but has only been habitable by humans a few percentiles of that time and has only actually been inhabited by mankind for a few million years. This world has been a relatively closed (but not isolated) system. It is comprised of several concentric spherical layers. At a high level, these layers are the core, mantle, crust and atmosphere.

Core

The core contains a relatively endless supply of energy in the form of heat (~7000C+) and heavy elements such as uranium. Unfortunately, it's several thousand kilometers deep and is also encapsulated by the mantle and crust. This makes its accessibility impossible given current technology.

Mantle

The mantle makes up a majority of the earth's mass and is the passage way for the core's convection. This too is a great store of energy because of its relatively high temperature (~1000C+). Its depth is still 35km deep, which might seem an attainable distance, but the pressures and temperatures make such an excavation logistically unrealistic. An important characteristic of the mantle is its high viscosity.

Crust

The crust is a solid layer 'sitting' on top of the mantle. I say 'Sitting' because the core and mantle are both much denser and provide well over 99% of the mass and gravity of the system which pulls 'down' on the crust. This layer is obviously important to us because we inhabit it, and the resources near the surface are relatively accessible. It is much less dense and composed of lighter elements. It is also cooler than the rest of the planet and relatively void of high concentrations of energy which is unfortunate.

The crust is a fraction of a percent of the earth's radius. It is similar to the crust of a 1 inch thick piece of pie if the crust was about the thickness of a human hair. The interactions between the upper mantle and crust (in combination known as the lithosphere) provide for a dynamic surface. The crust's density and thickness vary which create weak barriers that segment off sections known as tectonic plates. The tectonic plates slide around on the mantle in a macro-human time scale, perhaps up to a few centimeters per year.

Because the earth is the result of a chaotic planetary formation process the initial crust was by chance originally lopsided in shape. All exposed land (not covered by oceans) formed in one spot we call Pangaea. This uneven 'bump' broke into segments and these tectonic plates have been redistributed in a more uniform fashion around the planet over time. During this process tectonic plates have occasionally slid over each other. This process yields everything on the surface of the overcome plate 'trapped' for posterity between the two plates.

The atmosphere absorbs and reflects about half of all sun light. As sun light permeates through the atmosphere it provides the natural power that fuels most of the physical and biological processes important to life. These processes include the movement of the atmosphere and oceanic circulation.

Life & Atmosphere

We believe life has existed on earth for about 3.5 billion years. Life has played a significant role in shaping the atmosphere and in turn the atmosphere has played a significant role in shaping life. This symbiotic relationship along with key natural events has led to a somewhat volatile ecosystem.

The key contributor to earth's atmosphere over the last 3.5 million years has been algae. Algae are the masters of energy conversion; their versatility has enabled them to draw energy from heat, chemical reactions and photons. For the first 1 billion years algae produced the oxides which shaped many of the resources we use today such as iron oxides. After the oxidation period, the surplus of oxygen produced a rich atmosphere. Less than 1 billion years ago algae migrated onto the land. This greatly improved the efficiency of photosynthesis and spelled the beginning of diverse life on land. In short, all life is still dependent on algae and their offspring today.

Gas levels in the atmosphere have fluctuated throughout the last 2 billion years. Because CO_2 absorbs and emits radiation, periods of high CO_2 levels have been linked to an increase in land and sea temperatures. Algae are consumers of CO_2 so periods of high carbon dioxide levels are succeeded by periods of high concentrations of Algae. Unfortunately, similar to many life forms, algae will over multiply in favorable conditions. This results in over consumption and depletion of CO_2. This, in turn, restores a cooling of land temperatures and reduction in the algae population. Reflective conditions of ice and water vapor help to compound this oscillation as well. In short, there have been 5 major glacier ages with extraordinary hot spells in between where we believe in some cases the earth may have been completely void of ice.

Fossilized Energy

A key step in this cycle is the sequestering of CO_2 from the atmosphere by Algae. When an alga dies it still contains the carbon it consumed. As blooms of dead algae fall to the ocean floor in mass they create vast dead zones of highly concentrated carbon. Over time, these energy rich pockets get buried and are captured deep in the earth through the tectonic plate shifts discussed above. These pockets of fossilized algae combined with pressure and heat over deep time form a fossilized carbon-rich fuel. A majority of fossil fuels we use today were produced over just two periods of severe global warning.

Resources

Resources are the fundamental component in the complex ecosystem which we live in. Humans are themselves the result of resource consumption. Resources provide the quantity and quality of life. As such, the number of humans and the average quality of life is loosely a function of resource consumption (efficiencies aside).

Uses for Resources

Resources can either be used 'as is' or can be used for the energy they contain. For example, trees can be utilized to build a house or burned to warm a house. Thermodynamics dictates that energy cannot be destroyed but the usefulness of energy is always reduced during the conversion process. As such the use of a resource for energy has a net loss of 'usefulness'.

Types of Resources

From our perspective resources can generally be broken into two broad categories, renewable and nonrenewable. Renewable resources are those which can be replenished through a source of energy external to our system in a meaningful quantity over a humanistic time scale. For us, the two significant external resources are the earth's core delivered as geo-thermal power and the sun as solar/wind power. Any resource not meeting the renewable energy specification can be classified as non-renewable.

From an energy standpoint, renewable resources will be found in proximity to their source. For example, the sun provides warmth and life on land and the ocean's surface while volcanoes and thermal fissures provide heat and life through access to the earth's core. In contrast, because non-renewable resources need to 'stand the test of time' they will tend to be relatively difficult to access or difficult to use.

The more time that an equal amount of work is used to make a resource, the more energy that resource will contain. Recall that renewable resources by definition are time-sensitive; hence less time is necessary for their renewal relative to their non-renewable constituents. All things being equal, namely concentration of work required, non-renewable resources will provide a higher concentration of energy.

Phases of Resource Usage

First, recall that renewable resources will tend to be near their source and non-renewable resources will tend to be more difficult to access and/or use. Second, factor in the notion that non-renewable resources will tend to have more energy. Last, consider the paradox that energy comes from resources and to acquire resources we must expend energy. The immediate question of 'then how did all of this start?' is outside the scope of this document. The relevant point is to highlight the self-perpetuating nature of resource utilization as a form of energy.

These independent concepts in conjunction provide an interesting 3 phase scenario… First a gradual shift towards using renewable resources as energy until enough spare energy is available to discover non-renewable resources. Second, a much faster growth in resource consumption will arise as high energy concentrations of non-renewable resources are re-invested to find even more non-renewable resources. Third, the non-renewable resources will begin to deplete and become cost prohibitive compared to renewable resources and a return to renewable resources will occur. These phases are inevitable. Human ingenuity, natural events, the rate of renewable resources and the quantity of non-renewable resources are simply contributors to the timing of these phases.

Human History of Resource Usage

In reality, the majority of human history has subsided in the first phase. All resources were either renewable or used 'as is' with a vast majority of resources being both. Human / Animal labor and fire were the main sources of energy, but are both renewable. Stones, earth and metals were the major forms of non-renewable resources but were only used 'as is'. This modest resource paradigm provided for a very gradual expansion of the human population. While the growth is still exponential, the exponent is much lower. For example, from 0BC to 1750 the population grew from about 200 million to 700 million.

In the mid 1700s, the excavation of coal for use as a form of energy began. This seemingly trivial event marked the first time in human history that a relatively hard to access, non-renewable resource was used as energy. This hallmark event ignited the second phase.

This high concentration of energy facilitated an increase in the quantity of humans, an improvement in the average quality of life and an increase in spare capacity to find more non-renewable resources such as wells of oil and deposits of uranium. As a result the population between 1750 and today has gone from about 700 million to well over 6 billion.

In 1970, there were only a handful of regions significantly consuming oil including North America, Europe and a small amount in Japan. Since then, demand has soared and today every country around the world is an oil consumer with the exception of a few developing remote island nations.

Around 2008, the production of oil plateaued. This event is the first time in human history that a non-renewable resource has begun to decline. This event will likely mark the approximate middle of the second phase. The former Saudi Arabian oil minister Sheikh Zaki Yamani famously quoted "The Stone Age did not end for lack of stone, and the Oil Age will end long before the world runs out of oil". This promising analogy is unfortunately flawed; we used stones 'as is' and did not burn them for energy.

Please note that a key factor of the second phase is that the research and discovery of a resource is fueled by the surplus of resources from prior discoveries. While anything is possible for the moment, as time passes and surplus resources decline the likeliness of new discoveries will also decline.

Modeling Resource production

The process for limited resource utilization follows a research/discovery, extraction/production and consumption workflow. The self perpetuating nature of a non-renewable resource discovery can be coarsely modeled as a Gaussian function over time (bell curve).   Because it takes time to begin extracting a resource after it's discovered, there tends to be a significant lag between the discovery and extraction of a resource. As such, discoveries of a resource are an excellent leading indicator of future production.

This bell curve is present to some degree throughout resource extraction at every level. If you look at the extraction rate of a single oil well, a gold mine, a strip mine for uranium you will see a rough bell curve. If you look at the extraction rate of a field of wells you will see a bell curve. If the look at the extraction rate of a state or country you will see a bell curve. The beautiful symmetry of this is that the larger the scope, the smoother the bell curve's profile. With that in mind, predicting global peak is relatively the most reliable.

Substitution

Many resources are interchangeable, but at a cost. This interesting facet adds complication to an otherwise isolated model on a resource by resource basis. For example, coal instead of petroleum, can be converted to gasoline, but at a much higher cost in terms of useful energy lost in the conversion process. This can dampen the initial depletion of the replaced resource at the cost of faster depletion of the replacement resource in the future. This complication makes it very difficult to predict the depletion of all resources holistically.

<u>Fossil Fuels</u>

Fossil fuels are non-renewable resources and often referred to in the industry as 'Black Gold'. They can be subdivided into 3 categories: Petroleum, Coal and Gas. Most fossil fuels developed during the Paleozoic period, the time between 250 and 500 million years ago when life flourished until the mass Triassic extinction event.

<u>Petroleum</u>

Petroleum or "Crude oil" is an abundant and versatile resource with an incredibly high concentration of energy. In combination, it is unequivocally the most useful resource in Earth we know of to date. Several trillions of barrels have been discovered. Each barrel contains over 6 million BTUs of energy. It's liquid quality and relatively light weight lends itself well for transportation. Petroleum's hydrocarbon structure also lends itself well for 'as is' uses in many other products such as plastics, etc…

<u>Coal</u>

Coal in relation to crude oil has less usable energy in concentration but expected reserves put the quantity at approximately tenfold to crude oil. The solid nature makes it less versatile and less attractive for use as transportation.

<u>Gas</u>

The quantity of gas is still not fully explored but is considered satisfactory for some time into the future given current consumption rates. Liquefied natural gas (LNG) is also a high energy concentration fuel source. The advanced process of extraction, known as hydraulic fracturing, has questionable environmental impact but has increased technically accessible world reserves dramatically.

<u>History of Fossil Fuels in the USA</u>

The United States is one of the founding producers and consumers of fossil fuels. Even before its independence, the USA had started to consume coal. This form of energy was ideal for domestic heating and lighting which improved the quality of life. Coal also enabled the steam power necessary for early day locomotion. The rail system improved the mobility of populations and consumer goods, made the country more accessible, and was strategic in military expansion. Most importantly though, trains made coal more accessible. The outstanding significance of this cannot be over stated; coal made coal more accessible.

While coal could provide high amounts of energy enabling mankind to do previously unfathomable tasks, it didn't have the versatility necessary to replace manual labor. In the mid 1800s crude oil began to enter the limelight. One barrel of oil is equivalent in energy to well over 20,000 hours of manual slave labor. Its unmatched versatility and low price paved the way for its quick replacement of human and animal labor.

At the dawn of the 1900s, coal made a comeback as the feedstock for electricity. These combinations of relatively free energy enabled advancements such as the assembly line which pushed industry even faster. Suddenly a farmer with the aid of fossil fuels was 5 times as effective. Ironically, this use of black gold for agriculture was labeled the 'green revolution'.

The petro-fueled automobile became accessible to the average consumer allowing for suburban developments, dramatically increasing the quality of life. Electricity changed industry and domestic life almost overnight. During the majority of the 1900s the USA became the world leader in industry, agriculture, and military might. Spare capacity promoted higher education, entertainment and sports. This resulted in improved medicine and technologies such as telecommunication. The prior logistic barriers to International trade were overcome and the US dollar became the world currency. At this point, the US was a net exporter of goods and services.

In the 1950s, demand of energy outpaced supply and the US became a net importer of crude oil. By 1970, domestic oil production peaked and OPEC enforced an embargo pushing energy prices to the threshold necessary to negatively impact the economy in a meaningful fashion. To combat economic woes the USD moved off the gold standard which allowed the US government to increase the money supply in part countering the energy deficit. The monetization of our energy deficit let the US maintain the previously established standard of living. Starting in 1975 and up to today, the US has incurred a growing trade deficit.

Monetization

Since the 1970s the USD has been a fiat currency, hence it has no intrinsic worth and is not fixed in value based on any trivial objective standard. The current monetary framework also dictates that money is debt, meaning any time money is spent into existence there is an obligation to return that money with interest. Today, all currencies throughout the world follow this general framework.

Money Supply

The quantity of dollars in circulation is controlled by the combination of 2 main factors. First, the central bank (in the USA it's called the Federal Reserve) 'creates' a determined amount of money through the process of creating a liability on itself in the form of debt. This money is then issued to its primary dealers and in turn to other banks. These banks decide how many times the same money is multiplied and lent out through the process of fractional reserve banking. The number of times money can be re-issued is governed by the reserve ratio, a figure controlled by the central bank. In a very naïve sense, the money supply can be expressed as the money printed by the Federal Reserve multiplied by the number of times banks reissue said money.

Value of a Note (Dollar)

The seemingly arbitrary value of a dollar can be best described as the value of all resources represented divided by the total money supply. This important concept means that as the money supply increases, the value of the dollar decreases. Also, as resources decrease the value of the dollar decreases.

Money Supply / Value Lag

Because of many indirections in the financial system, there is a significant lag before changes in resources and the money supply affect the value of a dollar. This lag means the money supply can be increased and holders of the newly created dollars will have a window where they can enjoy an increase in purchasing power before the dollar can react by dropping in value.

World Currency

The US dollar maintains its status as the world reserve currency for many commodities, most importantly oil. This means that any two countries which engage in the exchange of money for oil must do so using US dollars.

The fact that the US dollar is the world currency, combined with the 'Money Supply / Value Lag' concept gives the US a short term unfair advantage. The US can simply increase the money supply to temporarily increase purchasing power and exchange that purchasing power to acquire or subsidize resources. The two artifacts of such a policy are the immediate increase in national debt and eventual devaluing of the dollar. As debt rises and devaluing occurs confidence in the USD will decrease. A complete loss in confidence would result in the traumatic loss of the US dollar as the world currency.

Cost of Resource Extraction

The quality of a resource varies by region and accessibility is dependent on environmental, proximal and geopolitical variables. In any industry the path of least resistance is taken in order to ensure maximum ROI at any given time. Resource extraction is no exception, in that at any point in time the easiest form of the resource is sought after. It's axiomatic that relative to any point in time, going forward the extraction process will be consistently confronted with ever increasing challenges for production. The consequence of this behavior is the increased expense in extraction (in terms of energy invested to get energy out). This cost is twofold. The first cost is the straight forward additional overhead necessary to accommodate for remote locations, through the fixed cost in the increase in equipment necessary and incremental cost of simply moving the product longer distances. The second cost is more subtle. Extraction is a risk vs. reward proposition. This risk is, in general, a function of the in-accessibility of the resource and the lack of regulations in place. In other words, as a resource gets more difficult to extract either more energy needs to be spent upfront in the form of regulations / safety measures, or needs be spent in reaction to accidents due to the lack of regulations.

Prices

The value of a good is represented in economics as a floating price marking the point at which supply meets demand. All goods have price elasticity. The elasticity of a good's price measures the responsiveness of a products demand in reaction to change in supply and vice versa. Several factors play into elasticity of a good including the availability of substitutes, the necessity of a good and the cost of a good as a percentage of total expenditures.

Inflation and deflation in economics represent the rise and fall of prices for all goods in aggregate over time. Central banks closely monitor these shifts in prices and constantly make course corrections to keep inflation at a 'healthy' level. In the USA, the CPI is the index which represents inflation. Unfortunately, this seemingly simple derived index carries a lot of political weight and as a result its calculation has become extremely complex. The hedonics and weightings involved are complex and can serve to influence or "subvert" the number. For example, if cotton were to go up in price the US Bureau of Labor Statistics could simply reduce the weighting of cotton claiming substitutes are available. Or if TV's get 10% bigger and only 5% more costly, that could be deemed as a price drop. Currently, the CPI excludes volatile energy & food prices.

Inflation or "too many dollars chasing too few goods" is the result of a combination of too many dollars (demand-pull-theory) or too few goods (cost-push-theory). Normal inflation within a single currency is tolerable and if it stays within a threshold, central banks have a few levers they can pull to dampen the issue such as increasing reserve rates, increasing interest rates or retracting the physical money supply. Interestingly, all 3 of these measures attack the problem from the demand-pull side of the equation. This means, effectively, much less can be done from a fiscal standpoint in terms of addressing the cost-push or lack of resources.

For clarifications, resources in the financial markets are referred to as a commodity which is also a type of good.

Bubbles

Given the constant media attention the definition of an economic 'bubble' is unnecessary other than to say that it certainly does not exist by design, but is the unintended consequence of how humans perceive and interact with the current economic structure. //TODO:DISCOUNT RATE

Supply Chain

The supply chain describes the chain of events commodities go through before reaching a final consumable good. As commodities move through the supply chain, they are refined and combined with other commodities to increase their net worth in a process called the value chain. It's important to recognize that each step involves some sort of conversion, hence net energy loss. For example, to make a water bottle, plastic pellets are injection molded into a form requiring a good amount of energy.

One can, in theory, take any end consumer good and walk up the supply tree to determine all the commodities that make up that product. This seemingly simple process is actually very difficult to conduct due to the nature of modern industry. Products are constantly combined /separated; transported long distances while byproducts are discarded.

To depict the relationship between earth and humans let's envision a 'Global supply graph'. On the left side we could put all of the resources that we consume (and there quantities), things like solar power, oil and water. Then on the far right side, we could put all end consumer goods and services (and their quantities) such as bread, computers and dental work. In the middle we would have a network of intermediate nodes representing products with associated quantities and segments flowing rightward with weights representing loss of resources along the way. An example intermediate node might be wheat, which relies on the sun for photosynthesis and natural gas for its nitrogen.

Commodity Market Place Model

If a truly accurate 'global supply graph' were available and we could accurately model the price elasticity of all goods then we could reverse engineer the net effect a change in commodities would have on our quality of life. Needless to say, building a global supply graph is difficult and truly modeling price elasticity is unrealistic especially when taking into account product substitution.

Current Landscape

Today we live in an astoundingly global society. Internationally (intra-European excluded) we transport an average of 2 million pounds of goods per human annually for a total of over 7 trillion tons globally. 98% of that transportation is driven by fossil fuels.

Sample Resources

Here is a table with samples of rough estimates for global consumption of resources:

- Lumber - 10,000 million tons
- Coal - 5,000 million tons
- Oil - 3,000 million tons
- Cement - 2,000 million tons
- Steel - 1,000 million tons
- Natural Gas - 150 million tons
- Silicon - 5 million tons

While we may consume slightly more trees than the three fossil fuels by weight, fossil fuels have approximately 4 times the usable energy per pound. Fossil fuels account for over 85% of energy used by human society today. The next leading provider of energy, following fossil fuels is Nuclear energy at 6% and is also a non-renewable resource.

As an aside, in modern society over 50% of energy is deemed 'rejected' meaning that it is lost in the energy process. Rejected energy is either a bi-product of inefficiencies or is energy spent towards the extraction or transportation of other energy.

The United States Gross Domestic Product for 2008 was just over 11 trillion dollars. Approximately 15% of those dollars was spent on energy.

- Retail Electricity - $360 billion
- Natural Gas – $229 Billion
- Petroleum – $874 Billion

Fossil Fuels Today

Crude oil is a constituent in virtually every consumer and commercial product made today. When you see something manmade move there is an 85% chance that you're witnessing fossil fuels in action (in America the likeliness is much higher).

The world currently consumes about 70 million barrels a day, with the USA accounting for about 25% of that. 70% of crude oil is refined into gasoline, diesel, jet fuel and maritime fuel which combined supply the energy for 98% of all transportation. The production and use of goods requires enormous amounts of fuel, here are a few examples:

- Automobiles - A modern automobile consumes between 25 and 50 barrels of oil to make and over its lifetime will consume between 100 and 200 barrels in fuel along with another 3 barrels just for new tires.
- Electronics – Every microchip consumes 600 times its weight in fossil fuels. With well over 10 billion processors developed per year that amounts to over 1 billion barrels of oil.
- Chemical Products - The liquids from oil provide the building blocks for most of our chemical products. For example all waxes, plastics, rubbers, paints, polymers, along with many pharmaceuticals, cosmetics and insecticides are derived from oil. All asphalt is a product of oil as well.
- Industrial Manufacturing – Industrial goods tend to be heavy and there transportation is energy intensive. Most goods, such as steel, are cooked at high temperature.

The cost associated with installing and operating oil wells is complex. Today's oil production has a steep cost increase as the more inaccessible oil is sought after. Currently, offshore wells often exceed 500 million dollars and take years to bring on line.

Once an oil well is tapped, there is no 'on/off' switch. This imposes a limitation on the ability for oil production to dynamically react to the softening of oil demand. This problem is further exacerbated by the difficulty to buffer oil through storage. On average the world produces, transports and consumes 3 million barrels of oil per hour. If demand were to drop by just 10% then that would result in a surplus of 400 Olympic swimming pools of excess oil per day. It is not possible to store those quantities for a significant period of time so instead prices will drop in order to increase demand.

Oil products are moved by over 4000 ships, over 2 million km of pipeline, countless trucks and rail. The oil transport system is global, including super tankers and continental pipelines. Since oil is often used far from where it is found, several means may be used in conjunction along the way.

<u>Agriculture</u>

Around 1800 the process of canning food began which allowed for food to be preserved without dehydration. This energy intensive procedure changed how food could be handled. Increasing the longevity of food storage greatly increased the ability to execute war. Beginning in the early 1900s, the labor intensive ice box was replaced by the refrigerator / freezer; first at the transportation level and then at the domestic level shortly thereafter. This extraordinary event changed the very nature of how food was handled. It also kicked off the large scale consumption of electricity at the domestic level.

By 1950, refrigeration was common place, excellent domestic and international trade routes were available and energy was abundant. With these seeds in place, agriculture underwent radical industrialization coined the Green Revolution. The advance resulted from heavy use of fossil fuels and new hybrid food plants, leading to more productive food crops. Between 1950 and 1984, the amount of food energy available increased by 250% while the world population increased by 30%. The green revolution not only paved the way for a larger population, it also increased the quality of life, obesity aside.

Historically, soil has been the provider of nutrients for food through the decay of plants and crop rotation. With the Green Revolution, soil has become nothing more than a medium for absorbing artificially supplied nutrients through the process of fertilization. Commercial Fertilizers' primary ingredient is natural gas. Farms are supplied with water through irrigation powered by natural gas or coal. Several Oil powered vehicles are used to manufacture food. First oil powered equipment plows, then plants, then fertilizes, and then dusts crops with pesticides. Pesticides are made from petroleum. Next the food is transported using hydrocarbons to a distribution center where it is likely packaged in plastic made from oil. Then the product is redistributed an average of 1500 miles to a retailer for sale.

For products further along the value chain, like animal products, the process is even more energy intensive because much of that process is repeated twice, once to produce the feed stock for the animal and again to convert and distribute the animal as consumer ready food. For example, the production of a single cow requires between 4 and 8 barrels of oil.

On average, it takes 10 calories of energy to make every calorie of food consumed. In total, the USA expends over 3 billion barrels annually just to feed Americans.

<u>OPEC</u>

OPEC is the organization of petroleum exporting countries and, as the name implies, is a consortium of participating countries that are net exporters of petroleum. Currently there are 12 member countries. OPEC's primary role is to control the total production of oil from all of its members. After a flow rate is determined, each member is apportioned a target quota based on estimated reserves. Estimated reserves are difficult to prove without physical inspection and many OPEC members limit physical access to their fields. This means that reserves are determined by local governments and must be taken on faith. This creates a prisoners dilemma, in that each member is tempted to inflate their reserve estimates in order to increase their respective quotas. This provides the means, motive and opportunity to artificially inflate reserve estimates. Because OPEC is such a significant holder of all reserves this makes official world reserves questionable.

For an example of likely 'cooking the books' we can look at Saudi Arabia. In 1972 they published a reserve estimate of 137 billion barrels. In 1990, they magically revised this estimate to 261 billion barrels and shortly following OPEC increased Saudi's quota by nearly 100%. Today they still maintain there are 261 billion barrels in reserve. Between 1972 and 2008, they produced a total of 100 billion barrels which is roughly 75% of their originally stated reserve estimates. Despite communicating that they could produce 12 million barrels per day in 2008, they have topped out at 9.5 million barrels. This could be an indication that they have peaked based on original reserve estimates.

<u>Government</u>

To avoid political controversy I will not address specific events. The representation in US government today is a simple two party system. After much research I haven't been able to correlate energy practices, quality of life, budgetary policies or wars to the party that's in power. I believe it's more important to change your leaders than your light bulbs but unfortunately, it's difficult to believe that voting for one party vs. the other will have a significant impact under the current structure.

Other problems with the government today are the lobbyist system and the commercialized electoral process. Politicians are elected on a basis of popularity. Promoting policy which would reduce today's standard of living in order to prepare for such a calamity would effectively work against one's chance for being elected. Effectively, politicians trying to win the popular vote are no different than OPEC members trying to meet their quota, they have no choice but to deceive.

US City planning

Relative to the rest of the world's countries, the United States is a young toddler. It has grown up in the epoch age of oil and just like a human adapting to its surroundings; the US cities have been planned on the tacit assumption of plentiful oil for transportation. This has resulted in sprawling urban areas connected only by roads and highways. Older cities, such as those in Europe, tend to have the various community functions of work, residence and retail interspersed. In America, the places of work and industry tend to be long distances from residential neighborhoods. Additionally, retailers are generally concentrated in centralized locations and only accessible by automobile.

This city planning provides for an excellent quality of life as long as cheap liquid fuels are readily abundant. As the price for transportation increases, this structure will be less attractive and will make it difficult for America to compete at the global level.

2011 - Recent Events

Middle East

The last two wars have been over the oil rich Iraqi nation. Shortly after 9/11 the US declared war in Iraq under the premise of weapons of mass destruction. Despite not finding WMDs the U.S. did inadvertently manage to secure and contract out the significant oil wells amounting to over 90 billion barrels in reserves. Today, the US embassy located in Baghdad, Iraq is the largest in the world.

In addition to Iraq, the US attacked Afghanistan and justified the establishment of 13 new military bases in the oil and gas-rich countries surrounding it. The US military has sited that its number one concern over national security is energy. Since 2001, The US Strategic Petroleum Reserve (a series of salt domes) has been filled to near capacity with an emergency fuel store of over 700 million barrels of oil.

Saudi Arabia is the world's largest holder of reserves. Their per capita income has dropped by over 75% in the last 10 years and as a result the standard of living has been reduced. Its young labor market is underemployed and tensions have continued to mount. This restive group believes that oil is being sold to the US in exchange for weapons so their leaders can keep control. Recently the United States has begun selling high precision air force weapons to Saudi Arabia.

2008 - Housing Crisis

From January 2007 to July of 2008 the production of oil could not keep pace with demand causing the price of crude to triple from $48 to $145 per barrel. This resulted in prices at the pump climbing from $2.60 to $4.50. Over the last 50 years a growing population of commuters have been traveling longer distances with an average commute of 32 miles per day. In addition, 50% of families have both husband and wife working. The average home value is under $200,000 and the average annual family income is $50,000. In many suburban areas commutes ballooned to 90 minutes or more.

Let's take a couple earning $50K annually that decides to provide a nicer home for their family at the cost of an increased commute. They both decide a commute of 50 miles is acceptable. 2 commuters x 20 days x 50 miles x 2 directions / 20 mpg ~= 200 gallons per month. An increase in gas prices by $2 results in an extra $400 or about 15% of total after tax income. To put things in scale, the monthly rate for a typical mortgage on a $150K home is $750 and tax deductable. This may be a more dramatic case but any family caught in this type of scenario had to decide between going to work and paying their mortgage. The choice was obvious, these families stopped paying their mortgage. The profile and location of the early day defaults were generally in this demographic.

The exotic instruments conjured up by Wall Street played a role in the speed and severity of the collapse. However, if oil-derived commodities had gone down in price instead of up, we would likely have never seen this collapse materialize. If you disagree, research each major recession since we became an oil dependent nation and you will find they have all been preceded by a significant increase in gas prices.

The CDS market and bundling of mortgages into tranches to achieve the maximum rating is another case-study of human nature simply abstracting away from the problem. This is not about lack of monetary regulations, greed of Wall Street, or the incompetence of financial insurers to understand risk. This is about a general lack of regulation, greed and incompetence.

<u>2010 - BP Gulf of Mexico</u>
The "deepwater horizon" rig which failed in 2010 was the deepest well drilled to date. I would submit that the indirect cost incurred from this disaster not be considered an anomaly, but rather an inevitability... either through the increases in regulations inflating the cost of 'business as usual' or through reactive measures to clean up or tolerate disasters.

<u>2010 - Commodities</u>
Due to the large increase in the money supply the dollar's value has been inversely devalued. In the last 10 years the value of the dollar has plummeted 5 fold relative to gold and 7 fold relative to silver. Over the last year we have seen a dramatic devaluing of the dollar compared to various commodities:

- Cotton – up 135%
- Silver – up 106%
- Coffee – up 106%
- Corn – up 90%
- Wheat – up 55%
- Heating Oil – up 44%
- Soybeans – up 38%
- Sugar – up 35%
- Unleaded Gas – up 32%
- Copper – up 32%
- Gold – up 28%
- Oil - up 27%
- Cocoa – up 25%
- Cattle – up 20%
- Platinum – up 18%

<u>2011 – Food Prices</u>
The World Bank reported in February that the cost of food is now at "dangerous" levels and will have a dramatic impact on developing countries. Because oil's supply is on decline, and food is fairly inelastic, this shift in prices should not be surprising.

<u>2011 – North African Riots</u>
Generally, people tend to falsely attribute riots to national policy, politics, or politicians. In reality, most significant riots have been the result in a sudden decline in the quality of life for a population.

In an effort to continue energy subsidies the USA has taken advantage of their printing press for the world currency. As they continue to increase the money supply through the unconventional measures of quantitative easing, the dollar has continued to devalue. Because the USD is the world currency and the US is a large exporter of commodities, the devaluing has also been exported in the form of inflation throughout the world. All countries have been effected by this but those countries teetering on collapse such as Algeria, Tunisia, Egypt, and Libya are the most likely to respond with unrest. In fact, citizens in Algeria were chanting, "Bring us Sugar" as they marched to the capital. Sugar, internationally, has increased 35% in price during the last 12 months.

Egypt spearheaded the revolts. Up until 2010, Egypt was a net exporter of oil and used proceeds to subsidize other basic commodities. In 2010, Egypt became an importer of oil. As the direction of oil reversed, so did the subsidies. Egypt began diverting funds towards oil in order to maintain reasonable energy prices. Unfortunately for Egypt, unlike the US, they cannot print their way out of the problem because oil is not priced in Egyptian pounds.

Future

The forward modeling of changes to renewable and non-renewable resources in isolation is relatively achievable. It is nearly impossible to foresee exactly how governments, nations' people and technological advances will react and shape the changes in these resources.

Oil reduction

10% of all oil consumption has occurred in just the last 10 years. Experts believe the peak of production was sometime between 2005 and 2009. If you assume a symmetrical bell curve, ignoring the diminishing quality of product and an increase in rejected energy we can project that production levels will return to their 1997 rates by 2017. This would indicate a 10% decline in resources while the world population is expected to grow of 5%. This will result in an estimated 17% decline in the energy per capita over just the next 6 years. By 2030, we expect oil extraction rates to be less than 50% of today's rates.

Note that the immediate problem is squarely on liquid fuels, not all of energy per say. Again, liquid fuels are unique in there versatility and use for transportation. A (somewhat poor) analogy would be to say we aren't running out of all energy but we are running out of batteries. Note, peak coal is expected to occur in the middle of the century and that is when we will be truly running out of energy.

Reduction in Non-Essentials

Some products and services we enjoy will be phased out depending on factors such as energy intensity, substitutability and frivolousness.

Aviation will be hit hard. 'Family visiting Relatives' air travel is extremely elastic and will be the first to decline. Second, will be aviation for vacations which will directly impact the tourism industry. Interestingly, the tourism industry is likely to subsidize travel in order to keep their industry afloat. Air business travel will begin to decline in the long run. It's likely that air travel will be available only to the wealthy and public sector.

Many products we consume today are classified as 'Just in Time'. For example, iceberg lettuce and roses are typically flown around the world immediately after being harvested due to their extremely short shelf life. These products are frivolous and highly energy intensive so it's likely they will become an exclusive status symbol only for the wealthy.

The globalization of heavy, low labor goods will begin to be localized. For example, steel and glass manufacturing is already beginning to be manufactured near there customers. This will result in more jobs locally at the expense of reduced overall product variety.

Bumpy Oil Prices

Oil resources will continue to deplete at an ever increasing rate. As supplies slowly decline the markets will respond in a price increase. As prices rise demand will taper in certain sectors such as transportation, especially frivolous travel such as vacations and family visits. This will slow other sectors such as tourism and entertainment thus will be viewed as a 'recession'.

Eventually, as the recession deepens some inelastic sector will 'snap' causing a crisis and sudden reduction in oil demand. Governments will react to the crises. Also, because of the inelasticity of oil supply the oil price will drop significantly allowing for a perceived recovery. The recovery will recreate demand for oil and the process will repeat. This cycle is referred to as a 'bumpy plateau' and the price charts will resemble a saw tooth wave.

As oil prices continue to climb, previously cost-prohibitive fields of oil will become financially viable. Also, substitutes such as coal and natural gas will begin being converted into gasoline and jet fuel. As stated before, this conversion process (currently between $25 and $50 per barrel) is energy intensive and will accelerate the depletion of other fossil fuels. Without accounting for this substitution, coal is currently expected to peak in the middle of the 21st century and natural gas at the end of the century.

<u>Inflation</u>

Recall that in the calculation of the' Value of a Note (Dollar)' that as quantity of available resources dwindle the value of dollars will reduce as well. This will force central banks to spend even more dollars into existence to maintain their purchasing power. This will reduce the dollar's value further.

The US will continue to print dollars in order to offset the energy deficit through subsidies. They will also increase the money supply to support Federal, state and local government programs. Because the USD is the world currency this inflation will be exported to other countries. As the inflation hits other countries, those same countries will be forced to raise prices as well. This will be extremely important when this hits OPEC and other energy exporting countries because they will in turn be forced to raise the price of energy, further fueling the inflationary cycle.

As inflation continues and the value of the USD's stability is brought into question countries will begin to trade energy in other currencies. It's likely a basket of currencies would be used as an instrument for pricing world commodities. If the US loses world currency status the price of oil in America would double almost immediately, effectively bringing it to the same price that the rest of the world pays. Following this, the cost of practically all other goods will sky rocket immediately.

The risk of inflation is that it can feedback into itself creating further inflation in a process called hyperinflation. If we experience world inflation across multiple currencies absolute chaos may ensue because no single central bank will be able to fix the issue. A global summit would be called but there will be a prisoner's dilemma because each country will have their best interest in mind and not want to take the necessary measures. A likely outcome of world inflation would be the establishment of a world central bank… This disastrous outcome would justify a whole write up on its own.

A fiat currency is no stronger than the collective faith people put into it. Over the last century throughout the world there have been more than 30 cases of hyperinflation indicating just how temperamental fiat currencies are.

<u>Unrest</u>

Because governments are the largest employers they will be squeezed hard on budgetary deficits. As such, governments will be forced to take a series of measures. They will default on government Bonds upsetting bond holders. They will bankrupt pension programs upsetting government employees. They will increase ticket prices for minor infractions as a source of revenue which will upset citizens.

Food inflation will dramatically reduce the standard of living. Rising energy prices will also adversely affect the quality of life. As the middle and lower class see their quality of life disappear they will revolt against their government and politicians out of desperation.

War

Wars come in varying styles and severity. Wars may be fought through physical combat, currency / inflationary tactics or through trade by withholding resources such as energy and food.

Oil is a magnet for and facilitator of war. The magnitude for both world wars was only possible because of oil. Oil shaped the strategy and facilitated victory. Most, seemingly ethnic, disputes in places such as Sudan and Darfur are in fact about displacement to secure oil revenues.

As countries with oil begin to experience unrest for a variety of reasons developed countries will be quick to invade and secure resources through force. In addition, once currencies are destabilized countries will likely begin to circumvent the world currency and barter directly. This unfavorable action for developed countries, especially the US, may also result in conflict.

If there is unrest in Saudi Arabia an immediate takeover by the US will ensue. Interestingly enough, if this happens the world will likely find out exactly how little oil is left which may trigger a meltup.

The US seems to be more prepared than ever for international conflict. Despite a spiraling national deficit, the US continues to be the world leader in military spending. It is estimated that the US has over 40% of the entire worlds military might. These decisions certainly position the US for a crisis scenario.

An interesting dynamic is developing between the US and China. The US has a vast and powerful army and China has an abundance of wealth. It's likely that China will aggressively purchase futures on remaining oil. The diversion of oil from the US to china will cause prices at the US domestic pump to sky rocket. The sequestration of land and defaulting on debt by the US is a possibility. At worst, this could spark an epic war between the two super powers.

Decay

We are at the end of the first half of the oil age. During the last 150 years we have seen the explosive growth of everything. This unprecedented growth has resulted in a globalized community with intricate interdependencies along with financial markets and value / supply chains at levels of sophistication beyond comprehension. These complexities will likely masquerade the relentless decline in our quality of life ultimately caused by the remorseless drop in oil reserves. Experts and industry question whether the decline will be swift or gradual.

I would submit that the 2008 panic which resulted from only minor declines is an indicator of what is to come as the brunt of these issues comes to light. Make no mistake, as minor bubbles pop governments and world leaders will do everything they can to resurrect and defer the problem for as long as possible. This, perhaps altruistic, effort will buy several years. Once no more can be done, a world bubble will pop and a swift break down will occur as society unduly blames Wall Street and Governments. Fortunately, a swift collapse will leave infrastructure intact as society stabilizes under a new paradigm.

Renewable Solutions

There are solutions to the energy supply crisis. The earth is awash with sun light and the efficiency of solar panels has quadrupled over the last few decades. Algae are a sponge for sunlight and, as we know, has the full potential to change the atmosphere and the way we live. Maybe we will get lucky and realize the energy at the atomic level through fission.

Unfortunately, I believe that democratic governments will have a difficult time in promoting solutions due to self interest at every level. My personal hope is that more nimble countries such as China understand the severity of this paramount situation and react accordingly with sweeping policy changes.

Terrestrial Bio-fuels

Corn ethanol and other bio-fuels requiring arable land with standard agricultural means are ineffective as a replacement. As discussed above, agriculture is an extremely energy intensive process, so producing these fuels uses more energy then it creates. The fact that this was entertained as a solution is a sad example of politics trumping science and common sense.

Hemp is the most viable of all plants for use as a bio-fuel but is unfortunately illegal in most parts of the world due to the psychoactive nature of certain species. Cannabis sativa is known for its ability to grow like a "weed", needing little input such as fertilizer to flourish. Its seeds have the same oil concentration as canola. This could be a low cost solution for utilizing non-arable land to convert solar energy into fuel. The harvesting and refinement are still energy intensive though, reducing the net energy gain.

Algae fuel

Microalgae fuel's research is still in its infancy but it has the most potential and is cited as the only remotely viable solution for our energy crisis in the long term. It has been estimated that in ideal conditions algae could potentially produce between 100 and 400 barrels of oil per acre annually.

The overarching problem with today's existing solutions is there reliance on energy to circulate water necessary for the metabolic processes. The challenge is to identify and bring into culture a species with 'optimal' attributes meaning a species with a favorable combination of high growth rate, high lipid content and ease of harvest / extraction. Once a compromise on these parameters is economically competitive I believe this technology may explode onto the scene.

More good news is that algae are environmentally friendly and do not require arable land, otherwise displacing food production. They are a carbon neutral solution, meaning that CO2 levels will remain constant as algae is cultivated and burned for energy. They do not affect fresh water resources because production can source ocean and wastewater. In addition, they are biodegradable meaning they are relatively harmless to the environment if spilled.

Wind / Solar / Geothermal, Etc.

Wind, Solar, Geothermal and similar solutions are the only technologically proven sources of renewable energy available today. Unfortunately, the energy outputs are circumstantial to their surroundings and they need to generally be installed in fixed locations. This means that they can only produce electricity unless used on sight for energy. Electricity is notorious for its energy loss when moved long distances.

Nuclear Power

Nuclear power is a dangerously complex, high maintenance, limited resource. Its limitedness and high energy input upfront cost makes it arguably the only energy solution worse than fossil fuels.

Uranium is the raw fuel for Nuclear power and is more common on earth than tin. 99.3% of uranium is u-238, an isotope unsuitable for nuclear power. To refine Uranium, it is passed through a series of centrifuges in gas form with each pass skimming a higher percentage of the u-235 'off the top'. One pound of highly enriched uranium is equivalent to 1 million gallons of gasoline.

As an aside, only an increase of ~2.5% in U-235 is needed to produce energy-grade uranium, while weapons grade uranium requires about 90% refinement. This means that source uranium for nuclear reactor facilities is not a direct threat for use in weapons components. The key distinction between weapons and energy uranium lies in the capabilities of refinement centers, and more specifically the number of successive centrifuges they house.

Again, u-235 is a limited resource and needless to say the splitting of u-235 atoms for energy is a one way street. The total estimated energy available from u-235 in the earth's crust, cost-effectively recoverable, is expected to only last 85 years given today's nuclear power foot print. If we replaced half of all oil today with nuclear power, we would likely peak in u-235 within a decade or so.

The logistics for building a nuclear reactor requires a decade or more and billions of dollars (in today's energy-cheep environment). The reactive process of Nuclear Fission is a self-sustained chain reaction, inherently susceptible of runaway reaction. The fundamental purpose of a nuclear reactor is to slow and control this reactive process. Under normal reaction, rods containing u-235 are used to heat water into steam which is fed into turbines.

The risk is that if the reaction is not controlled through constant external means such as cooling through water, then the process will run away. Backup and containment measures are put in place to varying degrees, but those systems also require upkeep and regulations. Everything considered; constant stability at every scope of the problem is absolutely necessary to avoid a meltdown. If the companies that own the reactors, their employees, the governments or even the weather's stability drops below thresholds a meltdown is likely. The problems of war, corruption, and environmental disasters will be compounded if nuclear power is present in said regions. It's worth noting that all of these are more likely as we endure energy deficiencies.

Is a Solution even Possible

Let's pretend that everyone is aware of the impending energy crisis and collectively decide to take persuasive action using solar panels to solve the gap.

A solar panel with a one square meter surface takes about 6000kwh of energy to produce, transport and install which is an equivalent of 2 to 3 Barrels of oil. The same solar panel, in favorable conditions can then produce about 1700kwh annually which is the same energy content as 1 barrel of oil per year.

In a perfect world with extremely optimistic estimates to offset our 10% energy deficit of oil for transportation expected in the next 5 years we would need to:

- Install an additional 400 square miles of solar panels (one square kilometer every two days)
- Revert about 1% of the USA's annual 100 trillion BTUS of energy towards making solar panels.
- Revert about 1% of the USA's annual 9 billion barrels of oil towards replacing 25 million vehicles with electric.
- Overhaul the electric grid to support the additional capacity needed.

The sad truth is that a solution is possible but every day we wait the numbers will work against us at an ever increasing pace.   With over 20% of the population underemployed we have ready labor as well. Long story short, we have the labor, land, resources and knowhow. We just don't have the widespread education or bipartisanship government. Yes, as energy is redirected away from consumerism today the quality of life may be reduced, but doing nothing guarantees the energy will be gone in 5 years anyways.

Personal Preparation

Financial Planning

Reevaluate your financial plan. Factor in a fluctuation of gas prices by 100% which experts predict will follow a 3 to 5 year cycle. Also be prepared for steady food inflation. Stay out of equities and avoid government treasuries and bonds. TIPS are not a counter measure for inflation because they are based on the CPI calculation which does not account for food or energy. If you are interested in trading, the long dated future contracts of oil are highly discounted which I believe represents a mispricing and a speculative opportunity for gains.

Maintain Wealth

I am an advocate of physical commodities and as such I recommended a portfolio of gold, silver and other metals that can be reasonably stored in your home. Many governments including China and the USA have raided safety deposit boxes to cease precious metals in times of financial turmoil so I suggest not keeping your assets there. To be clear, this is not about gaining wealth, it's about maintaining it. As the value of these commodities goes up that's simply a sign of the dollar's purchasing power weakening.

Food

If we experience a sudden shock in food prices there could be a run at grocery stores. Many American cities have less than one week of food in stock. As such, having a supply of food at home which can support you and your dependents for a few weeks is an excellent measure.

Energy Consumption

When choosing an employer or residency, make efforts to minimize your commute. f you're living environment is compatible for installing a renewable energy installation, I'd highly recommend it. As energy prices climb, these energy-intensive products will see a dramatic increase in demand and price. Buying now is not only an excellent safety measure, it will also pay dividends as your local electricity rates will likely climb as well.

Epilog

Conclusion

The United States is the world's bread basket and I believe in its good will towards neighboring nations. Through surpluses, the USA has spent countless dollars on international aid and donations for developing countries.

But we are nearing systemic failure. It's known that in the event of an airplane's depressurization that one should put on their own mask before assisting others. The USA needs to put on its own mask and address our domestic energy issues right now. Failure to do so will not only spell trouble for Americans, but even more so for countries relying on the US for food and aid.

Future topics

This has been a brief overview of the central topics that have consumed much of my free time. In addition, there are several other topics I have not covered but may amend in the future.

- Environment –Water pollution and shortages. Melting of the polar ice caps is causing an increase in heat absorption with more water surface. The redistribution of ice mass may contribute to an increase in seismic activity. The impact that Hydraulic Fracturing will have on our groundwater.
- Employment – Over 80% of employees are now working in the service sector. 25% of people are underemployed or unemployed.
- Technology – Automation, Communication, 3D printing.
- Infrastructure – The current infrastructure in America is in disrepair. Unfortunately, the resurrection is an extremely energy intensive process.
- Central Banks & Consortiums – Alpha Group, Peoples Bank of China, The Federal Reserve, The World Bank, United Nations, G20

Thanks

Thank you for taking the time to read this document. Sorry about my ominous view…. Heck, maybe I'm wrong about all of this; wouldn't that be nice!

Feel free to send comments or questions to cooker123456@yahoo.com