Priority Environmental Issues among Developed Countries of the 21st Century

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ABSTRACT

As the world population and carbon emissions continue to rise, so does the global temperature. It is now obvious that previous attempts to limit carbon emissions have been feeble and have not affected the forecasted concentration of greenhouse gasses in the atmosphere. What then, should be the primary focus for tackling global climate change? There are many options available, ranging from forest restorations to new recycling initiatives. However, one sector provides a scope of change incomparable to other options. It is the sector that was previously addressed by our ancestors: energy. This paper highlights the dangers of continuing with current popular trends in energy consumption; moreover, it offers broad, energy-based solutions that could impact society in many of the same ways the Industrial Revolution and its outcomes impacted the course of civilization: by altering the trajectory of the environment, economy, and public health.

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Introduction

Imagine a world without cars or planes to transport us from "point A" to "point B." Imagine a world without cell phones, computers, microwaves or even coffee machines. Imagine a world where one must use one's own strength, or the strength of cattle to accomplish everything. It is a world without power, and it was common, ordinary life just 250 years ago. It would still be our life, had humankind not sought solutions to the world's greatest problem: energy.

In 1700, people could produce only as much as their physical capacity (and that of their horses) could allow. No matter how hard workers labored, they were never able to produce very much. As the population grew, so too did the need and desire for energy sources. What men and women needed was more power and energy at their disposal. They would then be able to work more efficiently, produce more, and live better lives.

That transition is exactly what happened. The quest for more energy ignited a flame that eventually turned into a brushfire of innovation, and in turn, altered the trajectory of civilization. With changes in technology came changes in work methods and social class. Ordinary people soon had the ability to earn a higher standard of living; cities were able to expand past the confines of rivers and seas; and as printing processes and newspaper distribution increased, so did literacy levels everywhere. Furthermore, the importance of ecology and public health emerged as a result of increased death and disease from the effects of overcrowded cities and industrial waste. Combined, these new capabilities and trends eventually altered political power across the globe and created environments and lifestyles more similar to the ones that we know today (Buckler, 1995).

Although worlds apart, we share something in common with our pre-industrial ancestors. We too are striving to solve the world's great energy problems. However, in this century, our foremost concern is not labor inefficiency, but the deterioration of the environment and its contribution to world-wide health and economic issues. As city populations and carbon emissions continue to rise, so too does the global temperature. It is now obvious that previous attempts to limit carbon emissions have been feeble and have not affected the forecasted concentration of greenhouse gases. This paper highlights the dangers of continuing with current popular trends in energy consumption; moreover, it offers broad, energy-based solutions that could impact society in many of the same ways the Industrial Revolution and its outcomes impacted the course of civilization: by altering the trajectory of the environment, economy, and public health.

Global Climate Change

Although all contributing factors to global climate change are of great concern, it is especially important to focus on and modify the factors that, if changed, could lead to the greatest impact on current and forecasted weather trends. To do so, it is first important to understand climate change's causes, trends, and projected effects more completely.

There are two main views of climate change as portrayed by the Intergovernmental Panel on Climate Change (IPCC) and the United Nations Framework Convention on Climate Change (UNFCCC). The IPCC (2007) refers to climate change as a statistically significant variation in either the mean state of the climate or in its variability. The IPCC adds that this change persists for an extended period (typically decades or longer) and may be due to natural processes *or* to persistent anthropogenic changes in the composition of the atmosphere. On the other hand, the UNFCCC (1994) voices climate change to be a change of climate that is attributed to human activity. This human activity directly or indirectly alters the composition of the global atmosphere, in addition to natural climate variability observed over comparable time periods. Although the causes of climate change are often disputed within the scientific community, most climate scientists share the belief that global warming patterns *are* occurring *now*, and will continue to persist. Scientists forecast a temperature rise of 2.5 to 10 degrees Fahrenheit over the coming century. To put this in perspective, at the end of the last ice age, when the northeast United States was covered by more than 3,000 feet of ice, average temperatures were only 5 to 9 degrees cooler than today (IPCC, 2007).

In accordance with the IPCC perspective of climate change, Lutgens and Tarbuck (2007) assert that the climate change phenomenon is not new, but has occurred slowly over time by natural processes. Volcanic ash, windblown dust, smoke, salt particles, pollen, spores, and other elements are naturally occurring pollutants that make air impure. However, anthropogenic activities like transportation and the use of fossil fuels to generate electricity have increased the rate of pollution and have thus catalyzed the naturally slow occurring process of climate change. Substances like sulfur dioxide, nitrogen oxide, carbon monoxide, particulate matter, volatile organic compounds, and lead are capable of causing serious environmental problems when released into the atmosphere. The gases in particular have significant effects. These gases, known as greenhouse gases, reproduce the greenhouse effect in the atmosphere, thus trapping heat from escaping the earth. Continuous and enormous releases of these substances have contributed to the type of climate change known as global warming.

In addition to polluting the air, sulfur and nitrogen oxides (formed as byproducts of combustion and industrial activity) are transformed into acids during complex atmospheric reactions. During precipitation processes, these oxides combine with rainwater and manifest as acid rain. Acid rainfall is capable of changing the pH of lakes and rivers, thereby producing water that is toxic to fish and other aquatic life, and in general, altering complex environmental ecosystems. Lutgens and Tarbuck (2007) indicate that acid precipitation has already lowered the pH in thousands of lakes in Scandinavia and eastern North America.

Another consequence of climate change is the alteration of ocean life patterns. Small, photosynthetic phytoplankton grow in the well-illuminated upper ocean, forming the base of the marine food web, supporting the fish stocks we harvest, and underlying the biogeochemical cycling of carbon and many other key elements in the sea. Phytoplankton growth depends upon temperature and the availability of light and nutrients, such as nitrogen, phosphorus, silicon and iron. Most of the nutrient supply to the ocean's surface comes from the mixing and upwelling of cold, nutrient-rich water from below. Tropical and mid-latitude regions, experience limited vertical mixing (and therefore minimal phytoplankton growth) because the water column is stabilized by thermal stratification; i.e., light, warm waters overlie dense, cold waters. Global warming patterns may inhibit mixing even further and thus reducing the upward nutrient flow. Such relationships of ocean stratification and productivity have been observed in year-to-year variability of satellite ocean color data, a proxy for surface phytoplankton (Beherenfeld et al., 2006). According to GeoEYE's satellite data for 1997-2005, and NASA's Sea-Viewing Wide Field-of-View Sensor (SeaWiFS), phytoplankton declined in the tropics and subtropics during warm phases of the El Niño-Southern Oscillation (NASA, 2011).

The potential future effects of global climate change are broad; they could include frequent wildfires, longer periods of drought, and an increase in the number, duration, and intensity of tropical storms (NASA, 2011). Areas particularly sensitive to climate change include the Alps, Great Barrier Reef and oceans.

The Alps

The Alps are particularly sensitive to climate variation; recent warming in this range has been roughly three times the magnitude of the global average. Climate models project even greater changes in the coming decades, including a reduction in snow cover at lower altitudes, receding glaciers, melting permafrost at higher altitudes, changes in temperature, and precipitation extremes.

Last century's global warming pattern caused virtually all Alpine glaciers to recede, resulting in an upward migration of Alpine plants at a rate of 0.5 - 4 meters per decade. Over time, it is likely that lowland plants will continue to drive Alpine species to everhigher altitudes, effectively forcing them into extinction. This shift is not unique to Alpine plants alone; exotic species from parks and gardens in the Southern Alps are experiencing the trend as well. Here, evergreen trees, and even palm trees, are invading the natural forests. The composition of plant species could continue to change with consequences as yet unknown for the whole food chain. Furthermore, climate change could cause an invasion of southern pathogens in the Alps. This invasion would further disrupt the region's plant life by bringing diseases against which the flora and fauna of the Alps have no defence. Global warming will also foster changes in rain and snowfall patterns and thus increase the frequency of extreme meteorological events, such as floods and avalanches. Last of all, higher temperatures also will degrade the permafrost layers, causing slope instability, thereby increasing the potential for rock falls and landslides.

The Great Barrier Reef

The Great Barrier Reef of Australia is internationally renowned for its biodiversity. Its network of reefs (about 2,900 in all) is home to thousands of species. Extensive areas of sea grass meadows, mangrove stands, salt marsh and sand, and mud areas provide a diverse range of habitats for species. The diversity of the Great Barrier Reef makes it a particularly unique and valued ecosystem.

Many of the corals of the Great Barrier Reef are currently living at the upper edge of their temperature tolerance. Under the stress of waters that remain warm for too long, corals expel their photosynthesizing zooxanthellae (which provide up to 90% of the coral's energy requirements) and turn colorless, revealing their white calcium carbonate skeletons. At this stage the coral is still alive, and if the water cools, the coral can regain its zooxanthellae. If the water does not cool within about a month, the coral will die of starvation.

The vulnerability of coral to climate change has received considerable attention, as the impact on it has already been observed. Coral bleaching has begun to increase in frequency and severity due to rising sea temperatures. These events have led some experts to claim that coral reefs around the world are "in crisis" (International Union for Conservation of Nature [IUCN], 2010). Mass coral bleaching has occurred worldwide, devastating reefs in some regions including the Maldives, Seychelles and Palau.

Although only approximately five percent of reefs in the Great Barrier Reef were severely damaged in each of the 1998 and 2002 mass coral bleaching events, projections of future water temperatures suggest coral bleaching could become an annual event in the course of this century. Such projections, as formulated by the UNFCCC (2007), state that the Great Barrier Reef is at grave risk and will be "functionally extinct" by 2030.

Oceans

One of the most striking trends resulting from global climate change is the decline in Arctic sea-ice. September Arctic ice-cover from 2002 through 2006 was 18% lower than pre-1980 ice-cover, and some models predict near ice-free conditions by 2040. Recent studies of the Greenland ice sheet highlight alarming increases in melting surfaces over the summer. Percolation of melted water to the base of the ice sheet could lubricate ice flow and potentially greatly accelerate ice loss and sea-level rise. These new findings have not been fully incorporated into projected sea-level rise estimates; consequently, they may be underestimated.

Over half of the human carbon dioxide emissions in the atmosphere are absorbed by the ocean and land biospheres (Sarmiento & Gruber, 2002). The excess carbon that is absorbed by the ocean results in increased ocean acidity. The physical and chemical mechanisms by which this occurs are well understood. Once carbon dioxide enters the ocean, it combines with water to form carbonic acid and a series of acid-base products, resulting in a lowering of pH values. The amount and distribution of human-generated carbon in the oceans are well determined from an international ocean survey conducted in the late 1980s and early 1990s (Sabine et al., 2004). The rate of ocean carbon uptake is controlled by ocean circulation. Most of the excess carbon is found in the upper few hundred meters of the ocean (upper 1,200 feet) and in high-latitude regions, where cold dense waters sink into the deep ocean. Surface water pH values have already dropped by about 0.1 pH units from preindustrial levels and are expected to drop by an additional 0.14 to 0.35 units by the end of the 21st century (Orr et al., 2005).

Acidification harms shell-forming plants and animals including surface and deep-water corals, many plankton, and shellfish such as marine snails, clams, oysters, and lobsters (Orr et al., 2005). Many of these organisms provide critical habitat and/or food sources for other organisms. Emerging evidence suggests that larval and juvenile fish may also be susceptible to pH changes. Marine life has survived large climate and acidification variations in the past, but the projected rates of climate change and ocean acidification over the next century are much faster than experienced by the planet in the past except for rare, catastrophic events in the geological record.

Food-web interactions are often complicated; it is expected that some species will suffer under climate change while others will benefit. Broadly speaking though, warm-water species are expected to shift pole-ward, which already appears to be occurring in some fisheries (Brander, 2006).

Biological transitions may be abrupt rather than smooth. Large-scale regime shifts have been observed in response to past natural variability. Regime shifts involve wholesale reorganizations of biological food-webs and can have large consequences for plankton, fish, marine mammals, and sea-birds. Thus, rather subtle climate changes or ocean acidification may have the potential to disrupt commercially important species for either fisheries or tourism. Decadal time-scale regime shifts have been documented in the North Pacific; in the southern ocean, observations show a large-scale replacement of krill, a food source for mammals and penguins, by gelatinous zooplankton known as salps.

Other factors also need to be considered. Species that spend part of their life-cycle in coastal waters will be impacted by degradation of near-shore nursery environments, such as mangrove forests, marshes and estuaries, because of sea-level rise, pollution, and habitat destruction. Rainfall and river flow perturbations will alter coastal freshwater currents, affecting the transport of eggs and larvae. Some of the largest fisheries around the world, for example off of Peru in South America, and the west coast of Africa, occur because of wind-driven coastal upwelling, which may be sensitive to climate change. Warming will reduce gas solubility, and thus, increases the likelihood of low oxygen or anoxia events already seen in some estuaries and coastal regions, such as off the Mississippi river in the Gulf of Mexico

Public Health

During the height of the Industrial Revolution, it became clear to researchers like Edwin Chadwick that environmental cleanliness plays a large role on the public's health (Buckler, 1995). This concept sparked a mass cleaning of cities everywhere to reduce infirmity and disease. Since this first public health movement, authorities have come to realize that health is influenced by more than just the cleanliness of a population's immediate environment. Although important, environmental risk factors are not limited to waste, but expand to ocean currents and air molecule concentrations. Due to the growing understanding of climate change, it has become apparent that the environments of the world are interconnected: they equally impact the lives of all the world's inhabitants, regardless of location. Climate change has the power to alter global public health by fostering increases in microbes, food insecurity, and natural disasters, while also suppressing human immune responses (Moore, 2007).

Emerging "Pests"

One of the main concerns expected to stem from climate change is an increase of biting flies, insects, and vector-borne diseases (Healey et al. 2010). This trend is expected to occur due to adaptation and opportunistic tendencies. As the environment continues to change, many insects and microbes will be forced to adapt as a species. Adaptation rate is a challenge that many microbiologists, pharmacists and drug companies already face. Many species of microbes, such as tuberculosis and the common flu virus, already undergo rapid adaptation. These emerging diseases pose great threats to public health as they are unfamiliar to treatment methods and may prove to be particularly resistant to antibiotics.

In addition to the emergence of new strains of vectors and diseases, the abundance of pests is expected to increase as a result of global climate change due to increasing opportunistic conditions. Extreme weather patterns have consistently been followed by outbreaks of disease (Moore, 2007). It is partially because of this trend that many scientists analyze El Niño events so thoroughly. The El Niño effect, which produces extensive rainfall in some areas and droughts in others, has the capacity to foster many ideal habitats for pests. For example, in 1993 and 1994, after six years of drought, the southwestern United States experienced excessive rain. The surge in rainfall created an ideal environment for many insects and their consumers. Deer mice, vectors of hantavirus, flourished. Thus, hantavirus infection spread, killing 48% of the infected human population (Moore, 2007). Instances such as the spread of hantavirus vectors are expected to increase in congruence with the forecasted persistence of climate patterns. The World Health Organization (WHO) also predicts that many vector-borne diseases will migrate to areas that would normally be unsuitable to their natural environment (Moore, 2007). Such diseases (e.g., dengue fever) have already shown patterns of migration (Schneider, 2006). If the WHO is accurate in their predictions, insect-borne diseases could spread as far north as New York and affect as many as 620 million additional people (Moore, 2007).

Food Insecurity

It has also been hypothesized that the large-scale effects on ocean currents may result in flare-ups of cholera due to increased marine reservoirs of the bacteria (Moore, 2007). Such opportunistic species not only pose the threat of vector and disease migration, but also food insecurity. If such reservoirs were to continue to move to normally less warm coasts, vibrio cholera could be contracted by humans through the consumption of fish and shellfish. Similarly, as the climate changes, many opportunistic insects also pose both the threat of vector disease as well as food insecurity. As the environment grows to be more conducive for the proliferation of insects, the impact of pests on vegetation will continue to increase (Schneider, 2006).

Natural Disasters

Countless lives are greatly impacted from natural disasters such as hurricanes, tsunamis, flash floods, and heat waves. If the WHO is accurate in its prediction that the mean temperature of the planet could rise 2.7^{o} F to 8^{o} F by 2030 (Moore, 2007), up to 20% of the world's people could be displaced due to rising ocean levels alone (Schneider, 2006). Furthermore, it is predicted that precipitation patterns could alter the intensity and frequency of storms, especially hurricanes (Schneider, 2006) implying graver results than previously seen.

Suppressed Immune Systems

Although less observable than the aforementioned trends, strong correlations have been found between the increases of certain adverse health conditions and the rising levels of criteria air pollutants. Criteria air pollutants include carbon monoxide, nitrogen oxides, ozone, sulfur dioxides, and particulate matter. These pollutants are byproducts of fossil fuel combustion and greatly contribute to the climate warming patterns (Moore, 2007). These pollutants also have been implicated in numerous health adversities including problems such as asthma, reduced lung functions, emphysema, chronic bronchitis and other acute respiratory infections (Moore, 2007). In addition to these ailments, alterations to the atmosphere concentrations of ozone have shown to increase the risks of skin cancer, melanoma and cataracts (Schneider, 2006).

Although less obvious than other trends resulting from global warming, these impacts are by no means minute; in fact, they greatly influence the physiological response to the aforementioned health threats. According to Moore (2007), not only do the current weather patterns foster the growth of opportunistic infections and pests, but they also suppress the immune systems of the at-risk populations. In other words, a drought in a normally sodden area that favors opportunistic vectors of disease, such as rodents, insects, and microbes also could depreciate the immune systems of humans due to increased heat, UV radiation, and pollutants (Moore, 2007).

To review, should extreme weather patterns continue, vector-borne diseases, food insecurity, natural disasters, and suppressed human immune systems are all expected to increase. With such a plethora of health complications arising from environmental changes, it is easy to understand why nearly all climate scientists believe that an increase in diseases is likely to be the most important threat that climate change poses to human health (Moore, 2007).

Economics

Until recently, there has been little opposition to the use of fossil fuels as a main source of power. In general, the dependence on fossil fuels has resulted from their relatively low cost, availability and extractability. Unfortunately, fossil fuels are non-renewable, politically influenced, and contribute greatly to pollution and climate trends. These facts pose current and future economic issues for all countries.

As the world becomes increasingly interdependent, the need to have stronger internal economies intensifies. As noticed in current news, political events in one country can lead to economic repercussions elsewhere. This domino effect poses great risk to many western nations that depend on foreign oil as a reliable energy source. As such conditions are not easily controlled or predicted, it is in the interest of most countries to increase energy self-reliance. Unfortunately, countries only have a limited supply of fossil fuels. Therefore, it would be unsustainable "to put all of our eggs in the fossil fuel basket." At some point the transition from fossil fuels to a more reliable source of energy will (and must) occur. The effects on the environment from fossil fuels may accelerate this transition.

As we continue to utilize fossil fuels, we continue to emit greenhouse gases; thus we contribute to another economic issue: natural disasters. Although many places, identified as "natural disaster prone areas," are given careful attention, efforts are mainly dedicated to lessen the aftermath of disasters - not to stop or avoid them. Unfortunately, even with surveillance systems to alert inhabitants, the magnitude of destruction caused by natural disasters is devastating. Apart from the impacts on individual lives, these phenomena strongly influence the economy of the world by affecting agriculture, energy use, transportation, water resources, and industries. As estimated by Japan and the World Bank, the cost of the recent earthquake disaster in Kesennuma is worth about $300 billion (2010). About 11,000 lives were lost and about 189 billion Euros will be needed to rebuild the eastern part of Japan which the Japanese minister estimated to last approximately five years (World

Bank, 2010). The magnitude of destruction has been compared only to the same destruction at the time of World War II (World Bank, 2010).

The United States, despite being a world power, has not been able to control the occurrence of natural disasters either. The U.S. has had its fair share of disasters with mudflows in California, tornadoes in the Midwest and hurricanes causing several deaths and destruction worth billions of U.S. dollars. According to the National Oceanic and Atmospheric Administration (NOAA), "the four hurricanes that struck the US in August and September 2004 collectively caused more than $40 billion in damages and 152 deaths" (2007). Hurricane Katrina alone caused about 1,800 deaths and destroyed about $130 billion worth of property.

Such economic costs are astounding. Primary prevention has consistently proven to be more cost-effective than secondary or tertiary prevention methods (Institution for Work and Health [IWH], 2006). Given the costs and figures of natural disasters, it seems prudent to implement such a method to environmental preservation by reducing the usage of factors that contribute to the incidence of natural disasters.

Implications of Energy Interventions

In summary, the globe's changing weather patterns are affecting the world's environment, health, and economy. Although many factors contribute to the changing climate trends, there is one component of the global warming equation that we can greatly reduce ourselves. Making changes in our energy technology has the capacity to slow the progression of global warming, hinder the progression of vector-borne diseases, reduce mal-health effects due to pollution and climate change sequelae, and solidify domestic and global economies.

The last two benefits of energy interventions are of particular interest to the many citizens and scientists who are not convinced that global warming is significantly influenced by human behaviors. Despite the debate of responsibility, there is agreement that our energy sources are harmful to human health and are unsustainable in the long run (Ratliff & Smith, 2005). Therefore, scientists and citizens who don't agree with the concept of anthropogenic contributions to climate change should still find investing in newer energy sources important, as doing so *will* increase our health and economy. In particular, the implications of cleaner, more reliable and more efficient energy on economies are vast. According to researchers like Steven Pacala and successful businessmen like Richard Branson, climate sector innovations will create more wealth than any other sector for the next decade due to the increasing desires to preserve our ecosystems and bank accounts (Apsell & Hamilton, 2011). New energy technology is one growing industry that has the potential to decrease climate change and wasteful spending.

Developed Countries' Responsibility

In the 19th century, many countries began to emerge as "great nations," categorized by large increases in population growth, urban city development and giant industries. These nations, known today as the "developed nations" are categorized according to their National Income (NI), Gross Domestic Product (GDP), level of industrialization and the Human Development Index (HDI). These countries, which are concentrated in Europe, North America, Oceania and Asia, all have high HDIs, are highly industrialized, and have high GDPs.

Scientific evidence has shown a correlation between industrialization and pollution. Furthermore, evidence shows that a greater percentage of pollution comes from the major fossil fuel consumers of the industrial developed countries (UNFCCC, 1997). Unfortunately, despite the location of the source, developing countries will suffer most of the consequences of climate change because of little capacity to address the resultant stressors (Paavola & Adger 2005). Mutual understanding between those responsible for the problem and the sufferers must be reached if there is to be a solution (Dessai & Risbey, 2005).

As the developed countries have had a bigger role in the onset of global warming by releasing greenhouse gases into the atmosphere, and as the less developed countries bear a greater burden as a result of these actions, it would be appropriate for the developed countries to aid the third world countries should they experience consequences from climate change. Such a response would not be unusual for the developed countries; groups of countries are already giving assistance to the third world countries in terms of developmental aid and aid to fight poverty. Organized into a body known as the Organization for Economic Cooperation and Development (OECD), their major responsibility has been to render assistance to third world countries and to steer global trade (OECD, 2001). Supporting the fight against global warming and assisting countries with its sequelae would fall under this responsibility. According to the UNFCCC (2007), the "common but differentiated responsibilities" term was coined in the 1992 conference to confront the issue of global warming. It was stated categorically that all countries should be responsible for the issue of global change, but the primary responsibility should rest with developed countries.

Ideas for the Future

In the past, measures were taken in the form of treaties to control the progression of global warming. Unfortunately, treaties such as the Kyoto protocol were of little success due to the binding nature of the agreements. It was no surprise that major world economies refused both the ratification of the Kyoto and commitment to reduce emissions. Reasons given were economic (as greater industrial activities depend on emission). Other reasons were based on lifestyle.

Although the idea to restrict the amount of greenhouse gases is effective, it was not feasible for all countries to do so without major lifestyle changes. For some developed nations, particularly the U.S., lifestyle was based on extravagant luxuries such as gas-guzzling vehicles. Affordable SUVs with efficient mileage were not existent at the time. Forcing citizens and industries to change their way of life to comply with a treaty was unacceptable to Americans. However, if perceived barriers such as cost and lifestyle change were decreased, it is likely that more people would be willing to accept the treaty. In other words, nations must have tools to reach the collective goal of reduced emissions.

Thus, the focus of developed nations on environmental issues for the current decade should be to invest and implement in new energy conserving technologies. Apart from the already impactful 'greener' hybrid vehicles and safer nuclear power plants such as the AP1000 model, developed nations should also invest in other cleaner energy sources that leverage waste sources and the sun. One investment that is particularly promising is fortified solar panels produced by Suntech in China. Zhengrong Shi has successfully remodeled solar panels to be more efficient by making the plates' metal lines thinner and closer together so as to maximize surface area. In doing this, the electrons that are emitted from photon impact have less traveling distance to generate electricity. Therefore, the technology is more efficient, and cost-effective. Suntech can now produce in two days what it used to produce in a year (Apsell & Hamilton, 2011). Needless to say, the success of Zhengrong Shi is a prime example of the economic potential that innovative energy technology holds.

Conclusion

In conclusion, the globe's changing weather patterns are affecting the world's environment, health, and economy. Although numerous factors have contributed to the new climate trends, there is one component of the global warming equation that we can greatly reduce ourselves. Making changes in our energy technology has the capacity to slow the progression of global warming, reduce negative health effects due to pollution and climate change sequelae, and solidify the global economy. Investing in such technologies will provide countries with the tools they need to comply with effective treaty agreements. Together, if all countries employ the new tools, previously unforeseen outcomes could be achieved. As in the pre-industrial age, we are faced with a growing population and a growing need for more –and different- energy. Our present standard of living tells us the result of their innovation. Only the future holds what our technologies will bring to the world.

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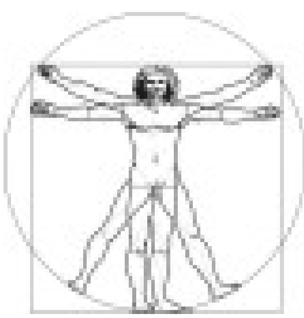

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