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Addressing climate change through our use of responsible energy

2009 is an absolutely critical year in terms of the worldwide effort to address climate change. With some of the warmest years in the instrumental record having occurred this decade, the amount of carbon dioxide in the atmosphere having exceeded by far the natural range of the past 650 000 years and the Kyoto Protocol being set to expire in 2012, a global action plan for 2009 began with the mobilisation of more than a billion people in more than a thousand cities who turned off their lights during Earth Hour on March 28, in a bold collective call to action intended to bring attention to the urgent need to reduce greenhouse gas emissions for the short- and long-term benefit of the planet.

The action plan continued with the G8 Summit in L'Aquila, Italy, earlier this month when "major advances" were made by countries, such as China and India, and a change of climate policy was indicated by the new US administration. It will round off with the Copenhagen Conference in Denmark in December, when parties will attempt to gain consensus on how to shape an effective international response to our changing climate.

Energy exchange and thermostatic equilibrium

Climate and weather patterns are powered in a continuous, interactive cycle of energy exchange with the atmosphere, hydrosphere, lithosphere and biosphere impacting on each other in a synchronicity of processes that have maintained a thermostatic equilibrium of 15°C for the past 10 000 years, or since the last Ice Age ended.

At the heart of Earth's thermostat lies carbon dioxide, a colourless and odourless gas that plays a critical role in maintaining the balance that is necessary for life to exist on the planet.

As a key component of photosynthesis it occurs naturally in the air, however, it is also a particularly long-lived anthropogenically produced greenhouse gas associated with global warming. By far the biggest contributor towards an increased level of carbon dioxide in the atmosphere is the burning of fossil fuels which power human progress with its ever-upwardly spiralling dependence on energy consumption.

Over the past 10 millennia or 10 000 years, the planet has warmed by a global mean average of 5°C, which is the fastest rise recorded in recent Earth history.

By 2030, when the world's demand for electricity has climbed to around 8 000 GW and carbon emissions have risen by an estimated 52%, the global climate could have warmed up to such a degree that a rapid increase in temperature, occurring in tens of years and not thousands of years, as has predominantly happened before, could send the world's climate into a state of dramatic disequilibrium and, with it, shock waves throughout every natural and human system on the planet.

Sooner than expected

In their 2007 Fourth Assessment Report (AR4) on global warming, the United Nations Intergovernmental Panel on Climate Change (IPCC) predicted a possible rise in global mean temperature of between 1.1°C and 6.4°C in low and high scenarios by the end of this century, depending on emissions.

At this rate of warming the IPCC went on record stating that they believed that changes in global rainfall patterns could be expected, with an intensification of tropical cyclones and other extreme weather events. They projected that sea ice would shrink in both the Arctic and Antarctic, with Arctic late-summer sea ice disappearing almost entirely by the latter part of this century. With the continued melting of ice caps, glaciers and sea ice, sea levels were expected to rise, resulting in major changes to coastlines and river deltas and the inundation of low-lying areas.

The AR4 projected an increase in areas affected by drought, with freshwater becoming scarcer, compromising food security for millions of the world's people. It projected poleward shifts in the ranges of plant and animal species, and even the extinction of a significant percentage of the Earth's species. It also predicted changes in ocean temperature, acidity, salinity and oxygen levels, which were expected to impact on coral reefs, algae, plankton and fish. These changes were projected for around 2020 or 2030; however scientists are finding that some changes, such as Arctic melt and shifts in the locations of different species, are already occurring.

At the very least, at the lower end of the temperature increase spectrum, there will be far-reaching effects on all aspects of the world's environment, society and economy. Beyond an increase of 6°C, a change of temperature of this magnitude could bring about a collapse of the Earth's biosphere on a scale with that of the Permian extinction 251 million years ago, when a series of violent volcanic eruptions produced great quantities of sulphur dioxide and carbon dioxide which warmed the planet by between 6° and 8°.

As the fossil record has shown, at the end of the Permian, reefs died instantly not reappearing on Earth for 10 million years, and animal and plant life was almost entirely eliminated from the planet's surface.

Literally costing the Earth

If our civilisation is to avoid catastrophic devastation brought about by climate change, it has been estimated that the global mean temperature needs to be kept within the bounds of a further 2°C and as the Earth has warmed by 0.74°C over the last 100 years, there is a very small latitude for temperature increase.

According to the IPCC, keeping the mean temperature rise to between 2°C and 2.8°C will require the stabilisation of atmospheric carbon dioxide concentrations at between 445 parts per million (ppm) and 490 ppm. Although still catastrophic for ecosystems and vast numbers of people and species around the world, it is hoped that this limit will keep the global climate from crossing a dangerous and perhaps irreversible threshold.

However, as atmospheric concentrations of carbon dioxide are already at 380 ppm and rising at a rate of 2.54 ppm a year, as opposed to an average increase of 1.8 ppm a year over the previous decade, the window of opportunity for reducing carbon emission levels is closing more rapidly than previously thought and a more realistic scenario may be stabilisation of atmospheric carbon dioxide at 550 ppm, with a corresponding increase in global temperature of around 3°C this century.

To indicate the seriousness of this situation, with a temperature rise of less than 1°C, crop yields will begin to decline in continental interiors, droughts will spread in the Sahel region of Africa, water quality will fall and coral reefs will start to die. At 1.5°C or less, an extra 400 million people will be exposed to water stress and another five million to hunger. Around 18% of the world's species will be lost and the "onset of complete melting of Greenland ice" will be triggered, while at 2°C some of the larger human impacts and the critical positive feedbacks are expected to begin.

If we do not greatly reduce our carbon emissions, temperatures are likely to reach this point in about 2030 when the world's people are likely to number around 8.2 billion. However, even if the world were to be set on a low carbon energy course tomorrow, we will still experience a significant degree of climate change as carbon released today will stay in the atmosphere for around 200 years.

Whether or not it is too late to hold global temperatures below the critical threshold, it is absolutely clear that the greater the cuts we make, the less the eventual impact will be. And, with global warming having the potential to plunge the world into a climate-induced dark age, the only way forward is to impose a stringent carbon budget on humankind through sustainable, long-term emission reductions.

In purely monetary terms, the cost of taking action could be in the region of 1% of world GDP a year. However, the cost of not taking remedial action could be much higher – around 5% of GDP. Beyond that, failure to take timely precautionary action could literally cost the Earth.

Risks to energy supply

Compounding the threat to a sustainable future posed by man-made carbon emissions that could bring about a fundamental and irreversible shift in world climate are risks to the security of energy supply with their knock-on environmental and global-warming effects.

In terms of the fossil triumvirate of coal, oil and gas, coal is our planet's most abundant and widely distributed fossil fuel, with oil and gas being less abundant than coal, although the peak oil debate notwithstanding, at this time there are adequate reserves to meet world energy demand. However by 2020, almost 67% of traded oil supplies, that is two barrels in every three, are expected to be met by imports from just four regions – North and West Africa, Russia, the Caspian and the five states around the Persian Gulf, namely the United Arab Emirates, Kuwait, Saudi Arabia, Iran and Iraq.

This is an uncomfortable degree of concentration in the supply of such a crucial commodity, especially as Saudi Arabia will be required to supply at least 15 million barrels of oil a day by then, with this figure rising steeply if for any reason either Iran or Iraq were producing below capacity.

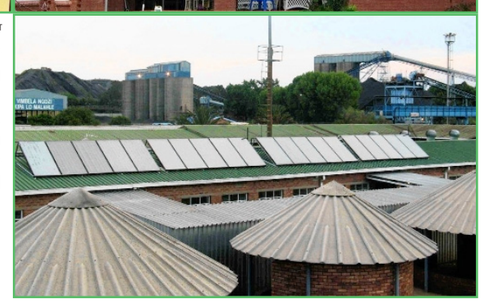
An associated risk of dependence is that with more than 80% of the world's remaining oil and gas reserves lying in areas that are controlled by national governments, decisions taken on the development of the resources needed to meet growing demand may not be taken on the basis of rational market economics, but on the grounds of narrow national interest.

This could mean that from a national perspective it would be more lucrative to limit development and to allow prices to rise, which in turn would mean that energy shortage, expressed in very high prices, would hinder economic progress and reduce living standards around the world. This, in turn, would hamper the reduction of poverty in developing countries, which is a key factor in helping to ease pressures on the planet.

Another risk in terms of the flow of secure supplies relates to the great distances that energy travels between energy sources and points of consumption, when pipelines and terminals necessary to bring oil and gas supplies to customers are situated vast distances from their markets, necessitating the crossing not only of continents, but also political and cultural boundaries along the way. The enormous distances create a host of challenges from oil-related political instability to the environmental risks of long-distance pipelines.

In the case of shipping, major oil spills constitute not only severe risks to marine ecosystems, they also contribute to energy insecurity and, for this reason, single-hulled vessels are being phased out in line with international requirements.

Unstable crude prices, which could be caused by a host of factors such as volatile markets, political agendas, instability caused by continued conflict in the Middle East, terrorism and extreme weather conditions that cause damage to wells and offshore platforms, hampering extraction, could force us into using whatever resources were available regardless of environmental consequences. This would adversely affect not only emissions of carbon dioxide; it would also cripple our ability to finance the clean energy infrastructure that we need to fight global warming.



Pictures: Courtesy of Solar Heat

Pictures: (Clockwise From Top Left) Brenton Geach, Reuters, AP, Leon Lestrade, AP and Murray Williams

Wood, steam and the Industrial Revolution

Throughout the ages, the universal need for energy and the development of various energy technologies, from wood-burning to coal-fired steam power to electricity, has had a considerable impact on the shaping of humanity, with different methods of energy production creating different consequences for humankind and the environment.

The steam-driven Industrial Revolution, for example, revolutionised methods of production, initiating changes from manual to machinery-based manufacturing processes which stimulated productivity enormously. It was the catalyst behind the creation of complex systems of transportation and communication. It also spurred the corporate form of business enterprise and effectively marked the beginning of urbanisation, democratisation, trade unionism and social reform, becoming the forerunner of our modern industrial society.

Clean to use, reliable, smoke-free and fume-free, electricity was a marvel of modern ingenuity, powering progress and pushing human aspiration, initiative and productivity to new heights, opening the way to a booming world economy and an increased standard of living. However, it has become evident that we have developed an insatiable appetite for energy with each of us using four times more energy today than our great, great-grandparents did 100 years ago.

Although electricity has been a boon to the modern lifestyle underpinning significant social developments and powering an unprecedented pace and scale of global economic output, its use is patently not sustainable and if we are to avoid overwhelmingly calamitous social and environmental consequences from burning fossil fuels, tomorrow's energy will have to be cleaner and more responsible than today's.

The progressive technologies that we employ this century could well have just as significant an impact on our cultural and environmental future as steam and electricity had in the past.

Certainly because worldwide around half of the power capacity needed by 2030 has yet to be built, significant opportunities for reductions in carbon emissions can be created by making a sizeable amount of this new capacity from low carbon-generating technologies.

Meeting the energy challenge

Sustainability is a simple idea. Recognising that the planet has ecological limits to growth and that resource depletion occurs when resources are consumed faster than nature can produce or renew them; it is a dynamic process whereby a balance is sought between society's demand on nature and nature's capacity to meet that demand, taking into account the ability of future generations to meet their needs.

In a nutshell, sustainability means caring for natural resources so that they can be used indefinitely, thereby averting an ecologically insolvent future. It means living within the means of our one planet in a way that is responsible and accountable, looking after people, protecting the environment and ensuring economic growth.

By 2050 there will be three billion more energy users on the planet than there are today, making the challenge of creating an energy system that produces more energy with less carbon dioxide, one of the biggest challenges facing the world this century.

With this urgent imperative, the majority of nations around the world are making a push towards reshaping their energy policies in what could amount to a global energy revolution, in which alternative forms of energy feature significantly in the energy supply mix in order to secure energy supplies with sufficient diversity and reduce carbon emissions.

However, worldwide, carbon emission levels reflect the billions of decisions we make individually on heating, electric power and travel every day in our homes, offices, factories and motor vehicles around the globe. From a positive perspective, this power of choice gives us the ability to actively influence our energy future through fundamental social and behavioural changes that enable us to minimise the environmental impact of energy production and consumption, thereby creating a sustainable future through innovative measures and responsible energy choices.

Therefore, along with economic necessity and political will, the main drivers of an energy revolution will be changes in human behaviour and lifestyle and the lowering of psychological barriers towards renewable forms of energy, together with significant advances in technology.

Until a relatively short time ago concepts, such as a carbon footprint, carbon market, carbon neutral summit, emissions capping and trading, food miles and carbon taxes on flights, were virtually unknown except to a select few. Now, however, they have become a widely accepted part of our 21st century world, a world that is becoming greener by the day and, as such, they are indicators of just how far we have come in reconfiguring our energy future.

Creating a sustainable future within the context of a carbon-constrained world is a complex challenge for all of humankind. However, it is not insurmountable, for with a radically decarbonised power sector that utilises renewable sources of energy that are clean, efficient and safe, energy security and enduring long-term sustainability can be attained. We just need the will to reduce our collective carbon footprint, reconfiguring the energy supply mix in a worldwide programme of action in which everyone is involved and everyone has a role to play.

Advanced technological solutions

The transport sector accounts for around one-third of carbon emissions worldwide. As part of its global research and development programme with its cleaner fuels agenda, BP, named South African consumers' top petroleum brand for the past eight years in the coveted annual Ipsos Markinor/Sunday Times Top Brands study, launched BP Ultimate in South Africa for all types of vehicles from vans and family cars to hatchbacks and luxury models, as its answer to emissions reduction.

This highly innovative fuel, available in both unleaded and diesel, has been designed to improve engines' fuel consumption while also reducing harmful exhaust emissions, as verified by independent tests conducted by experts at the Centre for Automotive Engineering (CAE). And in recognition of BP's efforts in reducing emissions, it was the first product to receive the Greenhouse Office's Greenhouse Friendly certification.

The level of scientific and technical support at BP and its access to expertise around the world, allows them to substantiate fuel economy benefits through actual figures which sets BP apart from others in the fuel industry.

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CLOCKWISE FROM BOTTOM: Transporting fuel.

BPSA'S Waterfront office.

SIPHO MASEKO (BPSA CEO) and Karen Bryden (AA CEO) fill up with high-quality fuel.

Pictures: Courtesy of BP