Anthropogenic Mass Extinction

THE Anthropocene. A proposed new geological age whose name derives from 'human activity', or Anthropogenic. Human activities have had such an astounding impact on Earth that we have entered – no! - created a new geological epoch!

Although it has not yet been officially established by the International Union of Geological Sciences, the evidence suggests that we are at the end of the current geological epoch, the 11,700 year old Holocene. Shifts between geological periods occur, when transgressing one of several of the nine systems that regulate and stabilise the Earth, the so-called 'planetary boundaries'.

In today's world, four of the nine planetary boundaries have been crossed (Fig 1), two of which are core boundaries, namely climate change and biospheres integrity. A significant change in a core boundary drives the Earth System into a new state and further away from the environment we are familiar with in the Holocene. For example, in 2014 the atmospheric CO2 levels hit 400ppm, significantly above the Holocene boundary of 280ppm, which causes global temperature rise.

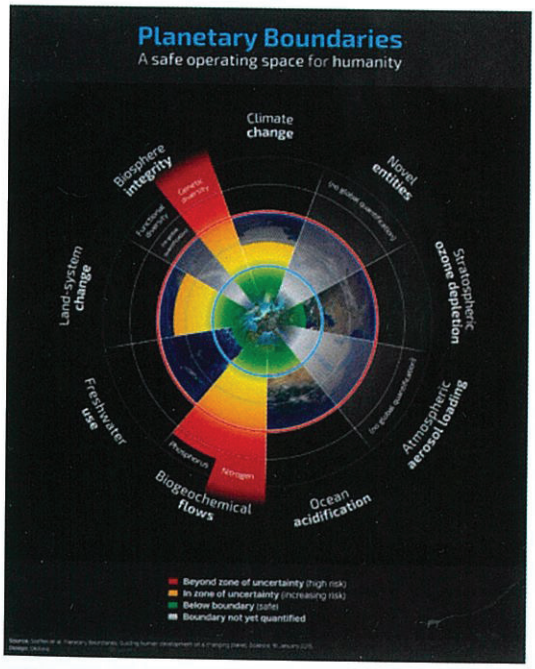


Figure 1. Stockholm Resilience. Illustration of the extent we have affected the 9 planetary boundaries.

The Anthropocene is suggested to have started with the 'Great Acceleration' – also known as the Industrial Revolution - around 1750 when humans first started to tap into fossilised fuels for energy, which lead to an accelerated growth of population, economy, agriculture and greenhouse gases in the atmosphere. Another key marker for the formalisation of the Anthropocene is the atomic age around 1950 which left radioactive pollution that will be visible in rock layers for millions of years.

But what does the Anthropocene have in store for us? With our current unsustainable "business as usual" trajectory, we can expect catastrophic irreversible climate change and a sixth species extinction. Anthropogenic global warming has caused us to propel towards the earth's tipping point, which once we cross, leads to irreversible climate change. Scientists say this 'tipping point' is a global temperature rise of 1.5°C above pre-industrial temperatures, a limit we are approaching fast having already reached 0.9°C. Beyond the tipping point, we could see the earth fall into an unrecognisable mess as positive feedback mechanisms create a domino effect of continuous warming. For example, burning fossil fuels produces greenhouse gases which cause global warming. Global warming causes permafrost melt. Permafrost melt releases trapped methane, a very strong greenhouse gas, which in turn leads to more global warming. And the cycle repeats. The enhanced global warming from this positive feedback

AISHA KHAN
IEN Consultants intern, who is doing a degree in Geography Degree at the University of Lancaster, United Kingdom.

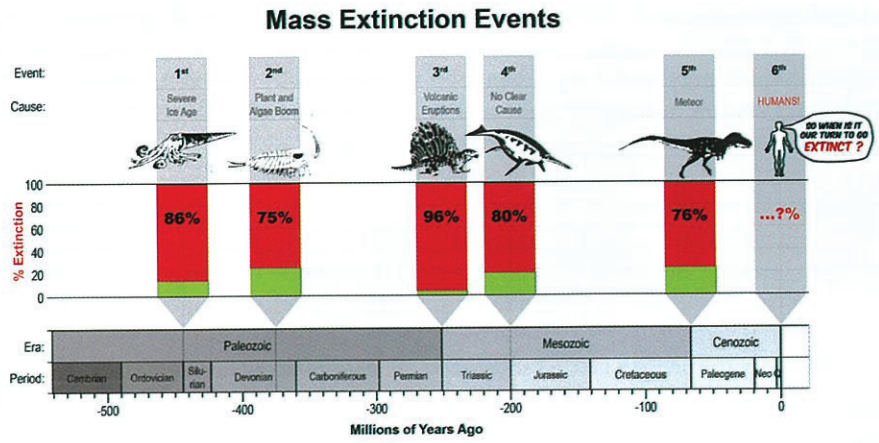
GREGERS REIMANN
Managing director of IEN Consultants, the pioneering green building consultancy in Malaysia.

loop will intensify many other feedback loops making the earth warm exponentially, hurling us faster towards the sixth species extinction.

What do Humans and Meteors have in common?

In the last 500 million years, the planet has witnessed five major sudden extinctions according to studies of geological layers. The most well-known mass extinction was that of the dinosaurs with the widely accepted theory that a meteor hit the earth wiping out 76% of plants and animal species.

Figure 2. Five Mass Extinctions in the Earth's history



Today, with rapid and unprecedented temperature rise and its effects on ecosystems, huge habitat destruction and overhunting, a sixth extinction is already underway.

This time, humans are the culprit, not a meteor.

Dozens of species are becoming extinct every day. The natural background rate of species extinction is one species per million species each year. In the Anthropocene, for some organisms this species extinction rate is 100 times the baseline levels and for others, it is 1000 times or more. Just in the last 10 years, we have lost the Golden Toads, West African Black Rhinos, Baiji Dolphins and hundreds more. Frogs and other amphibians have managed to survive multiple mass extinction, but this time they are disappearing 45,000 times faster than their baseline extinction rate.

Figure 3. Mankind is the deadliest killer.

With a mass extinction, unusual extreme natural disasters, chaos over resources, corruption, war, famine, disease and sea level rise which could inundate nearly 20% of Malaysia by 2100, the Anthropocene looks like a very tragic self-created chapter in earth's history...

First Rule of Emergency Response:

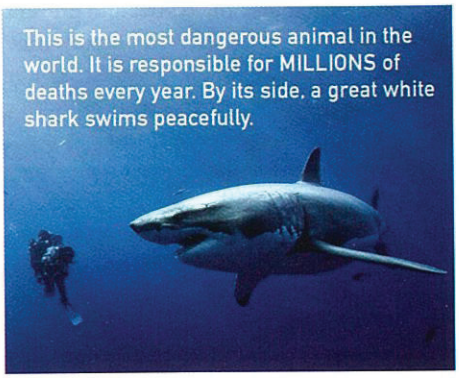


Figure 4. The meteor equivalent: Humans!

Stop the Accident

A proactive and sustainable approach could change that future.

To achieve the most effective results, we have to target the main issue, or 'the accident'; Climate Change. By reducing greenhouse gas emissions as an absolute priority, knock on positive results will be seen.

Unfortunately, although the survival of the planet is at stake, most people blissfully unaware of social cost of greenhouse gas emissions like the future costs of shifting climate zones, disruptions to agriculture, extreme weather events, and the increased outbreak of diseases. In 2010 a group of economists and scientists set out to do the complex Social Cost of Carbon (SSC) calculation arrived at USD36 per ton of carbon. Other less conservative environmental scientists from Stanford University last year calculated the SSC value to be USD220 per ton of carbon. When converting from carbon (C) to carbon-dioxide (CO_2), the two costs above are USD10 per ton of CO_2 and USD60 per ton of CO_2, respectively. Knowing the significant social cost of greenhouse gas emissions, would it make sense to pay for preventing CO_2 emissions instead of paying for the adverse effects?

Interestingly, the bar chart below shows the global greenhouse gas emissions savings that are possible in each sector, insofar we are willing to spend USD20 for each ton of CO_2 saved. The building sector, which accounts for about 40% of the World's resource consumption, is seen to have by far the greatest emissions saving potential, namely 5.6 gigatonnes of CO_2.

Figure 5. The Buildings sector offers the largest global low-cost potential for greenhouse gas emission reductions.

A successful pilot for lowering the national greenhouse gas emissions from the building sector is Denmark. Since the 1960s, when regular revisions of the Building Energy Code were introduced, Denmark has seen a 50% drop in the energy consumption for the entire building stock in terms of heating per square meter floor area. And looking ahead, the country plans to be fossil fuel free by 2050 with a double strategy of 'energy efficiency' and 'renewable energy developments' which

will reduce their CO2 emissions by over 70%.

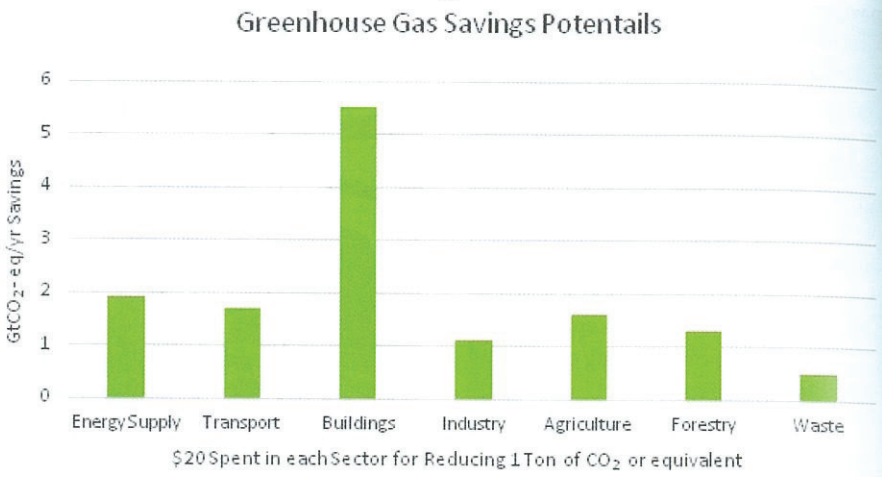
Green Solutions for Malaysian Building and Power Sector

In Malaysia, some of the Danish expertise has been applied to show that innovative and highly energy efficient buildings are also feasible in this part of the world. For example, in Putrajaya the ST Diamond office building has received numerous awards recognising its excellence as an energy efficient and green building. With its iconic self-shading façade creating the diamond shape, atrium daylight, floor slab cooling and other innovative designs, the ST Diamond uses one third of the energy of a normal office building, which with respect to greenhouse gas emissions corresponds to removing about 700 cars from the roads. Another recent example, is the Menara Kerja Raya 37 storey high-rise office building (KKR2), which is about 60% more efficient than ordinary Malaysian office buildings and saves the building owner RM2.5 million per year in energy bills. In addition to the significant energy and greenhouse gas emission savings, the building further reduces its environmental impact by reducing potable water consumption by 70%.

Retrofits are a good way of reducing energy consumption in the existing vast built environment. Moreover, as people tend to spend 90% of their time indoors, let us make our time worthwhile by designing buildings and cities that are both environmentally friendly and cater better to human needs. In Jakarta, an office now uses less than half the amount of energy, and even then, the indoor conditions are cooler and more comfortable with an efficient VRF cooling system. The retrofit created a more pleasant and healthy work environment, reduced noise and provided the office occupants to more pleasant diffuse daylit environment which is proven to increase occupant productivity.

There is a common misconception that it's expensive to build green, energy efficient and healthy buildings. But these examples have proven that wrong. With an average added expense of only 3% and a payback time of just 3 years, in the long term, the reduced energy consumption is reflected in your pockets with significantly lower energy bills. It actually increases the resale value of the property, it is future-proof, and it gives better indoor climate as well as architectural lift. It's expensive not to go green!

Figure 5



Furthermore, the International Energy Agency carried out a study to determine the unrealised energy efficiency potential for different sectors, and the findings were 56% (industry), 63% (transport), 80% (power generation) and the highest at 82% (buildings). Hence, this is yet another study confirming that there are sound financial reasons to invest in energy and greenhouse gas emission savings in the built environment. On a related note regarding the power sector, the recent study by the IMF (2015) showed that annual true cost of fossil fuels amounts to a staggering 6.5% of the global GDP or USD5.3 trillion, when including the cost of environmental damage and adverse effects to human health. Therefore the focus in the power generation sector should not just be on improving energy efficiency, but also on shifting to clean low-carbon neutral energy sources.

Avoiding mass extinction

The Anthropocene does not have to be the morbid age of extinction and chaos. By 'going green' and reducing consumption, we still have time to stabilise the planet and prevent irreversible climate change. Admittedly, time is short, so acting now and investing our time, money and effort in green buildings will help achieve the greatest impact, most cost effectively and in the shortest time. Every industry has potential! So even if buildings are not the route you take, nonetheless, do something! As a consumer, choose wisely. Suppliers and investors, support green initiatives. As parents, take action for your children and grandchildren. And perhaps most importantly, politicians, create a level playing field where the polluters – or should we call them 'Anthropogenic Extinctionists' – pay, and create incentive structures that make sustainable development the easy and natural choice.

The widely accepted definition of sustainable development is meeting the needs of the present without compromising the ability of future generations to meet their own needs. With irreversible catastrophic climate change on the horizon, this is not the time to be complacent about sustainable development. Like the renowned climatologist James Hansen wrote, our complacency today will be the 'storms of our grandchildren'. Future generation are the ones that will really pay the price. They will have to survive in the remains of this selfish age and miss out on the beautiful biodiversity that did not make it through the mass extinction.

So instead, let us build a better future - quite literally.

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