Seven billion – and counting

Gary Skinner

On the 31st of October, the United Nations (UN) designated little Danica May Camacho, born in the Philippines and weighing 5.5 lbs (2.5 kg), as the world's seven billionth human.

In this article, ***Gary Skinner*** *considers the possible future for Danica May and her fellow citizens of planet Earth, and wonders whether human activity may lead to a mass extinction event comparable to those in the distant past.*

Key words
population
human impact
mass extinction

Declared the world's 7 billionth human by the UN, Danica May Camacho lies in her mothers arms in a hospital in Manila, Philippines on 31st October 2011. She received a cake decorated with '7B Philippines' and a voucher for some free shoes.

But with a daily birth rate of over 350 000 – 4 per second - it is impossible to be sure she was '7B'. Indeed, when the UN secretary Kofi Annan visited Fatima Nevic in Sarajevo on 12th October 1999 to proclaim her newly born little boy as the 6 billionth human, it is now thought 6 billion had actually been passed more than a year earlier. However, this symbolic event was designed to focus attention on the growth of world population and the same is true now.

With those 350 000 births but only about 155 000 deaths, the population is growing at over 200 000 per day, or about 73 million a year, more than the entire UK population. But is there really a 'population problem'? How many people can the Earth support?

Human impact

It should be appreciated that there is more to the extent of the pressure people put on the Earth's resources than just numbers. Some people consume more than others; on average, people consume more today than in the past. We also must consider affluence (how much money each of us has) and technology. These constitute the main forces driving consumption. So, human impact I equals population P times affluence A times technology T, or

$$\textbf{\textit{human impact index}}\ I = P \times A \times T$$

GDP (Gross Domestic Product) is a good measure of affluence and the number of patent applications is a measure of technology. The table on the next page shows the data for the years 1900 and 2011. In this time interval, the world population increased by a factor of 4 but the human impact index increased more than 1400 times.

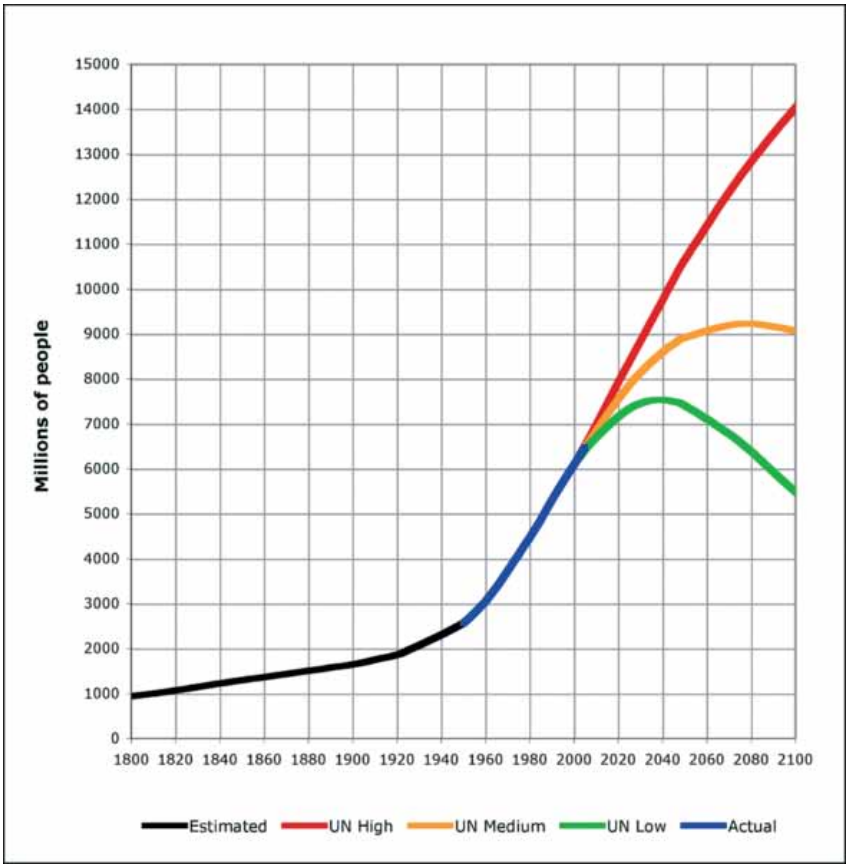
On the other hand, much of the technology and the use to which affluence is put may help with the challenge of coping with the increase in population. As discussed in the article on pages 1-3 of this issue, world rice yield per hectare has been quadrupled in the last fifty years due to improvements in farming technology of all kinds.

Year	1900	2011
World population	1.8 billion	7 billion
GDP (at today's prices)	$2 trillion	$55 trillion
Patent applications	141 000	1 900 000
Human impact index	507 600	731 500 000

How has the human impact index increased since 1900?

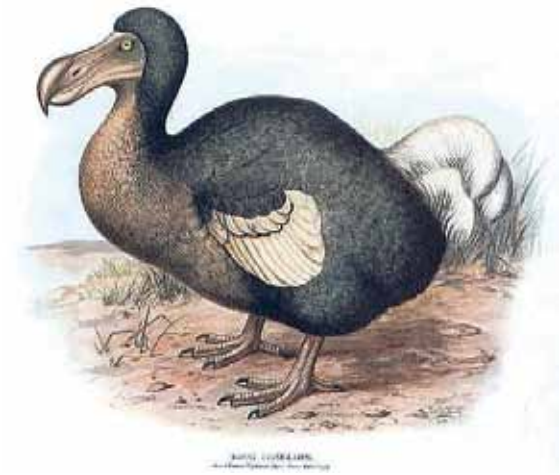
What of the future?

The UN constantly revises and refines its estimates for population statistics. The highest estimate suggests there may be 14 billion people alive by 2100, but the lowest predicts a decrease, back to 6 billion. GDP is expected to double by 2020 but after that it is hard to be at all sure, and who knows about what new technology will arrive! It is certain, though, that the impact will increase for many more decades yet, as population growth in the medium term and the desire by all to be better off are virtually unstoppable forces.

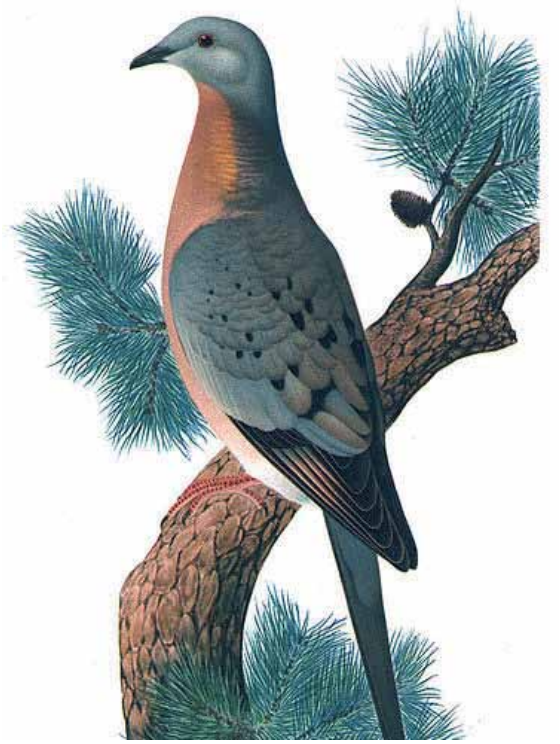


There are many uncertainties in estimating human population changes over the next century, as shown in this graph derived from a UN report.

Will thousands of today's species like the gorilla go the way of the dodo and the passenger pigeon and be labeled 'cause of extinction - Homo sapiens'? Then, all we will have left will be paintings and stuffed animals, like the famous Guy the Gorilla from London Zoo, who died in 1978.



The dodo



The passenger pigeon

Guy the Gorilla

Some believe that the human impact is already as significant as major events of the past, like those that led to the extinction of the dinosaurs 65 million years ago (the so-called K-T or end-Cretaceous event, probably caused by a meteorite) or the largest extinction event of all, the Permian-Triassic or end-Permian event (sometimes simply called the Great Dying) which wiped out 96% of all marine species and 70% of those on land 250 million years ago.

Such events have left traces in the rocks, studied by scientist called stratigraphers. Suggestions for the causes of these events usually involve at least some catastrophic events (see the chart opposite). Five such major extinctions are known to have occurred in the last 500 million years.

Many believe that we are now in the middle of a sixth such extinction and the cause is human beings, through their numbers and their desire for goods, travel and so forth. Nobel prize winning chemist Paul Crutzen has coined the term Anthropocene to describe this new geological age, or epoch, marking the end of the Holocene which started at the end of the last ice age 11 500 years ago. It will be millennia before future stratigraphers will see the traces of the Anthropocene in the rocks. However, more and more present day scientists are convinced that they will identify an 'end-Holocene event', and put it all down to *Homo sapiens*.

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Name of event and when	Effect on life	Possible causes
End-Ordovician, 440 mya (mya = millions of years ago)	Nearly 60% of genera, ranking second to end-Permian.	Possibly a super-continent (Gondwana) drifting over the South Pole leading to massive sea level fall, eliminating many habitats. Some suggest a massive gamma ray burst from a hypernova (exploding star), but there is little evidence for this.
Late Devonian, 360 mya	About 70% of species.	Possibly asteroid impact. A huge increase in plants, so-called greening of the Earth, may have removed carbon dioxide leading to very significant cooling.
End-Permian ('the great dying'), 250 mya	96% of marine and 70% of land species lost.	Possibly a sequence of linked events, a massive eruption in Siberia followed by release of carbon dioxide and methane leading to global warming itself leading to removal of oxygen from the oceans.
End-Triassic, 205 mya	Over 50% of genera including large amphibians lost, allowing the rise of the dinosaurs.	Not really understood. Climate change? - but this does not explain its suddenness. Asteroid impact? - but no known crater coincides. Massive volcanic eruptions have also been suggested.
End-Cretaceous or K-T, 65 mya	75% of all species lost, including non-avian dinosaurs.	Large asteroid hitting Yucatán peninsula, Mexico.
End-Holocene, already under way?	Outcomes unpredictable.	Activities of one dominant species, ***Homo sapiens***?

Mass extinctions of the past

Scientists have gradually gathered evidence of past mass extinctions, when large numbers of plant and animal species have been wiped out. This evidence comes from the fossil record. It's harder to explain why these extinctions occurred – they may have arisen from external causes (such as a collision with an asteroid), or from changes on Earth itself.

An artist's impression of an asteroid speeding towards the Earth. Such asteroid impacts may have had a hand in some of the five major extinction events of the geological past.

A fossil trilobite, a marine arthropod, from Canada. All species of trilobite disappeared in the end-Permian extinction, 250 million years ago.